

## DESIGNING EDUCATIONAL MESSAGES TO IMPROVE WEANING FOOD HYGIENE PRACTICES OF FAMILIES LIVING IN POVERTY

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**Abstract**—This paper describes a methodology to design feasible interventions to improve weaning food hygiene practices of families living in extreme poverty. Educational messages to promote specific behavioural changes were defined and tested by utilizing a combination of ethnographic, survey and observational methods, and integrating viewpoints and suggestions of mothers and caretakers into the decision-making process. This new approach culminated in a household trial in which five groups, each of 15 non-practising mothers, were invited to adopt defined behaviours (handwashing before and after defined events, boiling water for reconstituting powdered milk, feeding gruel by spoon rather than bottle-feeding, not storing gruels and milks, and all four together). All initiated the advocated behaviours and most (53–80%) sustained the new behaviours and practised them every time during a one-month period. Of the four advocated behaviours, spoon-feeding was the most difficult to adopt wholly. The methodology was developed in response to the high priority given to reducing weaning food contamination for diarrhoeal disease control, and the lack of any existing methodology for defining appropriate educational interventions in resource-poor regions. This approach, with its combination of qualitative and quantitative methods and community focus, is recommended for future studies to design hygiene and other health education interventions in developing countries. © 1997 Elsevier Science Ltd

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### ISSUES IN CHANGING FOOD HYGIENE PRACTICES

In developing countries, diarrhoeal diseases are a major cause of morbidity and mortality among infants and young children. The peak incidence occurs during weaning (Bern *et al.*, 1992), and reducing weaning food contamination has been identified as a high research priority for diarrhoeal disease control, as home-prepared foods are considered major routes for pathogen transmission (Black *et al.*, 1989; Esrey and Feachem, 1989; Feachem *et al.*, 1983). Since food contamination may be linked to specific food hygiene practices (Black *et al.*, 1982, 1989; Henry *et al.*, 1990; Rowland *et al.*, 1978), it is plausible that specific messages about food hygiene can be developed and promoted to improve weaning food hygiene at home (Esrey and Feachem, 1989).

The classical approach for determining specific hazard points for pathogen contamination during food preparation is through systematic bacteriological investigation. This process is expensive, logisti-

cally complex, and time-consuming, and thus unsuited to routine application for designing interventions in developing countries. Some argue that sufficient bacteriological evidence already exists to permit educated guesses to be made as to which specific behaviours to target (Schroeder *et al.*, 1989). Of most concern, however, is that the classical approach does not take into account cultural and resource constraints within the target population which may limit behavioural change. Previously there has been no strategy for designing and testing potential interventions for improving weaning food hygiene practices in resource-poor populations (Esrey and Feachem, 1989). The study reported here sought to fill this gap, and we describe how a multidisciplinary team, utilizing a combination of qualitative and quantitative methods and a strong anthropological focus, improved weaning food hygiene practices of impoverished mothers living in an urban slum in north-eastern Brazil.

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*Study location: an unsettling resettlement community*

The study was undertaken from March 1990 to February 1991 in Conjunto Palmeiras, an urban slum (*favela*) in Fortaleza, the capital of Ceará State, in the impoverished drought-prone region of northeastern Brazil. Infant mortality is high (estimated to be 96 per 1000 live births in Ceará in 1990), with diarrhoeal diseases accounting for approximately 50% of infant deaths (FCE/UNICEF/IPLANCE/SES/HOPE, 1989). Between 1981 and 1986, harsh drought interspersed with two years of floods caused immeasurable hardship in the region's rural communities. An exodus of peasant farmers fuelled rapid population growth in Fortaleza, the *favelas* increased to bursting point, and families were resettled in "*conjuntos*" (low cost housing) built by the federal government on large tracts of cheap land at the city's edge. Subsequent arrivals built their own makeshift cardboard and tin structures, and sections of the *conjuntos* deteriorated into *favelas* (Kendall, 1987). Conjunto Palmeiras was established in 1984 near the municipal garbage dump where the waste of Fortaleza's two million residents is deposited and scavenged daily. It has a population of 20,000 with no sewage or waste disposal, and is typical of the *favelas* in which live approximately half of Fortaleza's population. Poverty, unemployment, and crime (often violent) overshadow daily life.

As elsewhere in Brazil, institutionalized (and insidious) discrimination against those of African and indigenous descent (Ribeiro, 1995) and women (Freyre, 1964) has resulted in a poor majority remaining largely marginalized and unable to modify the forces which influence their lives (Freire, 1977). In their struggle to make best use of scarce resources, mothers in Conjunto Palmeiras have little support from health professionals who often consider them ignorant, lazy, disorganized and lacking motivation (Nations and Rebhun, 1988) and ignore them as an essential resource for child survival. Nevertheless, when given opportunity, mothers do participate in community education activities (Drummond, 1975), developing individual and group consciousness, which facilitates behavioural change (Freire, 1977).

## METHODS

From the study's inception, it was agreed that only a limited number of behavioural changes could be successfully promoted in any hygiene education intervention. Five educational messages were considered the upper limit for mothers in this setting to assimilate. It was therefore necessary to devise a process for selecting which adverse behaviours should be targeted for change. The

approach used was to identify adverse behaviours and then characterize each one according to the following three criteria: (1) prevalence in the community, (2) likely impact on weaning food contamination if the behaviour were to be changed, and (3) extent to which the behaviour is amenable to change, considering the cultural and resource contexts. By assigning a score from 0 to 3 to each criterion, a composite score was created so that the adverse behaviours could be ranked and prioritized.

These three criteria shaped the methodological approach and highlighted the need for a strong anthropological focus to capture mothers' daily routines in their natural setting and to provide an understanding of behavioural patterns and orienting ideologies. As behaviours are determined by a wide array of factors, it was also agreed that a combination of methods was needed to reveal the complexity of the cultural, socio-economic and other influences which shape mothers' decisions on the "how, when and why" of infant feeding. Since reported behaviours, especially pertaining to hygiene, may not necessarily reflect actual practice, observations of weaning food preparation and feeding became an integral part of the methodology. Final decisions about the methodological mix also took into account availability of skilled and trainable personnel, time and budget constraints, and cultural characteristics of the study population (e.g. low literacy level, good verbal skills, suspicion of outsiders, etc.). The chosen techniques facilitated a dialogue between the research team and community members, elicited an "emic" reading (Hammersley and Atkinson, 1989) of infant feeding, and also tested representativeness of the information during data collection.

The methodological approach also determined the composition of the research team. Microbiological impact was a key criterion for selecting behaviours to be changed, although no microbiological investigations were planned. Cultural considerations were equally important. Access to the community and homes, and establishing trusting relationships between residents and the research team, were essential. The team therefore included an experienced field microbiologist (A. A. Lima) and two anthropologists from Fortaleza (M. Nations and A. Barreto), and respected community members were recruited and trained as fieldworkers. A multidisciplinary team was systematically assembled with members bringing their individual expertise and perspective to create a methodology that would (1) provide a holistic understanding of weaning hygiene practices and their relative contribution to food contamination, (2) involve mothers and caretakers in the decision-making process, and (3) test the feasibility of the educational messages within their cultural setting.

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The methodology consisted of four sequential but complementary phases, totalling 11 months. They were:

- rapid ethnographic assessment;
- community survey of infant feeding practices and household resources;
- structured observations of weaning food hygiene practices; and
- a household trial to test the feasibility of the advocated behavioural changes.

The *ethnographic study* aimed to identify widely practised behaviours that were likely to lead to weaning food contamination, to probe why certain favourable behaviours were not practised, and to elicit cultural and social information needed for defining and elaborating educational messages. The *community survey* aimed to quantify feeding patterns and available resources, and to provide the sampling frame from which a subset of households could be randomly selected for structured observations. The aim of the *structured observations* was to quantify the prevalence in the community of the "key" adverse behaviours identified in the two previous phases, and thereafter to select up to five "priority" behaviours for intervention. The *household trial* tested the extent to which it would be feasible to implement and sustain the advocated behaviours.

#### *Sample size*

No universally adopted formula for determining sample size exists for qualitative studies (Pelto and Pelto, 1987). Sample size depends on the research objectives, techniques selected, and diversity of the study population (Pelto *et al.*, 1989; Scrimshaw and Hurtado, 1987). In determining sample size for each of the four phases, we took into account (1) the time limit of 11 months to complete the study, (2) experience and recommendations reported by others (Bentley *et al.*, 1988; Griffiths *et al.*, 1988; Pelto and Pelto, 1987; Pelto *et al.*, 1989; Scrimshaw and Hurtado, 1987), and (3) advice provided by the Scientific Working Group on Epidemiology and Disease Prevention of the WHO/CDD. We judged appropriate for our study objectives a sample of 20 mothers and 20 key informants for the ethnographic study; all infants aged 0–11 months ( $n = 441$ ) for the community survey; 100 households for structured observations; and up to 75 mothers for the household trial (15 mothers in each trial group).

#### *Gaining privileged insights about weaning food hygiene practices*

*Rapid ethnographic assessment.* Rapid ethnographic assessment was conducted to elicit attitudes and practices about infant feeding, health and illness, and to identify behaviours that were widely practised and likely to lead to food contamination.

Dominant cultural, socio-economic and demographic community characteristics were identified and summarized by the field team in a background document. A sample of 75 mothers or caretakers with infants aged 0–11 months, drawn from households with a range of characteristics, was identified; of these, 20 were randomly selected for study. Fifty potential informants with keen insights about infant care and feeding in Conjunto Palmeiras were identified. Of these, 20 were selected as key informants based on their range of expert knowledge and penetrating insight into the "lived experiences" (Kleinman and Kleinman, 1991) of the community, and on their communication skills, willingness to participate, mutual respect and rapport with the research team. They were health professionals, traditional birth attendants and healers, community leaders, babies' coffin-makers, street vendors, pharmacists, small shop owners and representatives of community organizations. Mothers, community health workers and leaders confirmed that those selected were knowledgeable about the community.

Ethnographic fieldwork lasted six weeks. Three of the researchers—a social worker, a community nutritionist, and a main investigator (a medical nutritionist)—were trained for one month to conduct in-depth interviews and unstructured behavioural observations. Then, with the anthropologists' supervision, they probed mothers' domestic worlds, learning their beliefs and attitudes about weaning, the causes and consequences of diarrhoea, popular terms, expressions, and hidden symbolic meanings. Existing practical strategies for preparing uncontaminated foods were identified, and constraints preventing mothers from adopting favourable hygienic practices were documented.

Open-ended interviews and unstructured behavioural observations were conducted in each mother's home on two occasions, each lasting 60–90 minutes. Key informants were interviewed for two hours using a semistructured guide to explore factors likely to constrain or promote favourable weaning practices, information channels utilized by residents, and the community's previous experience with educational programmes. The main method for deciphering interviews was content analysis. All interviews were tape-recorded, reviewed daily, transcribed and coded. A daily summary of each interview was prepared using a standardized form. Field notes of unstructured observations were reviewed and typed. Analytic codes, with main topics and subtopics, were identified by the field team during collective reading and discussion of the first 10 transcribed interviews. This initial coding underwent repeated modification as new topics emerged during later interviews. Related words and segments of the transcripts were given corresponding codes, then entered into the software programme *Ethnograph* (Seidel *et al.*, 1988) for subsequent computerized searching. In all, 27 main topic codes and 150 sub-

topic codes were created; these are described elsewhere (Monte, 1993) and are available on request. Twice weekly, the field team and anthropologists met to discuss major discoveries. Findings were then interpreted against a backdrop of current theory in social and medical anthropology, human nutrition, infectious diseases and microbiology. To guard against idiosyncratic interpretation by a single investigator, each member of the field team and anthropologists independently interpreted the same material to check for discordance and maintain data validity (Kirk and Miller, 1986).

This first phase yielded an ethnographic description (Hammersley and Atkinson, 1989) of infant feeding in Conjunto Palmeiras. Drawing on these descriptive results and the informed judgements of the multidisciplinary team, 10 adverse weaning food hygiene behaviours were identified which were specific, widely practised, and amenable to change. A behaviour was considered as being widely practised when reported by more than 15 key informants and/or observed to be practised by more than 15 mothers. Behaviours were only considered amenable to change if there already existed in the community an alternative behaviour, albeit practised by few, which could replace the adverse behaviour. Of the 10 key behaviours initially identified, further review reduced the number to six.

In addition to identifying key behaviours for further exploration and observation, the ethnographic study was also important in developing relevant, culturally appropriate instruments for the community survey and household trial, for example, by identifying mothers' terms and expressions. The ethnographic information also proved helpful in structuring the observation forms so that specific behaviours could be recorded in the correct sequence in which they occurred, and in wording the educational messages.

*Community survey.* The objective of the survey was to quantify patterns of infant feeding and household resources, to reinforce selection of key behaviours, and to provide the sampling frame from which the subset of households could be drawn for the structured observations. Maternal perceptions about weaning and diarrhoea causation and prevention were also included, as well as socio-economic and demographic characteristics. During one week, 14 fieldworkers surveyed all 3275 households in Conjunto Palmeiras and then interviewed mothers of all infants aged 0–11 months. In total, 441 infants were identified and complete data were collected for 432 infants; four were excluded due to low birth weight, four for hospitalization of more than 15 days during their first month of life, and one refused to participate for religious reasons.

*Structured observations.* During four weeks, weaning food preparation and feeding were observed in a random sample of 100 infants, stratified by age (0–2, 3–5, 6–8, and 9–11 months). Since

eight weeks elapsed between the community survey and stratification (because of the need to analyse the survey results and train fieldworkers in structured observations), an additional community census was required to identify infants born in the interim. This guaranteed that infants aged 0–2 months would be adequately represented in the sampling frame. Since weaning practices were our focus, any exclusively breastfed infants selected were replaced randomly by other infants of comparable age.

Of concern was that mothers might not reveal the true prevalence of adverse hygiene practices if they knew the purpose of our observational visit. Families were thus informed that our purpose was to learn about mothers' weaning food recipes and that it would be helpful to observe actual preparation and the infants' acceptance. The difficulty of conducting and recording structured observations without arousing the mother's suspicion was overcome by observers working in pairs. This also enhanced the observational opportunities. One of each pair was recruited from the community to facilitate access into homes and engender trust, to chat informally with the mother and so divert attention from the recording, and to spot check the home environment. Meanwhile, the other observed the targeted behaviours. Observers visited each home at three different meal times to improve representativeness. Visit order, time of day, and day of visit were randomized. Visits were made between 7:30 and 17:00 and unannounced, lasting 45–120 minutes. One mother refused a second visit, and four were replaced after the first visit because their babies became dehydrated, requiring hospitalization; two of the four died. Mothers were classified as non-practising if they were observed not to practise a behaviour during at least one of the three visits.

Upon arrival, *spot observations* were made of the hygiene conditions of the home and family, and of any indicators of food storage. During *structured observations* of weaning food preparation and feeding, besides the targeted behaviours, the entire sequence of practices was observed since foods could be contaminated, sterilized, and recontaminated in a short time-span. On precoded forms the following were recorded: (1) person preparing food, (2) handwashing before preparation and feeding, (3) ingredients added before and after cooking, (4) source of water used and treatment given, (5) cooking and boiling duration, (6) cleaning of feeding utensils, (7) cooling methods, (8) mode of feeding, (9) destination of leftovers, and (10) food storage, place and methods. Forms were developed that enabled the actual sequence of events to be identified so that the contamination–decontamination–recontamination process could be fully understood. The ethnographic information facilitated this task, together with pretesting and revision.

During one month, 12 fieldworkers were trained. Inter-observer reliabilities were tested before and during data collection: there was at least 95% agreement between events simultaneously recorded by the principal investigator and observers, and between observers.

*Household trial.* The aim of the trial was to identify, from among the previously identified key behaviours, up to five priority behaviours to be changed, based on their observed prevalence, expected impact on weaning food contamination if changed, and feasibility of change. Information collected in the three previous phases was used for selecting the priority behaviours. For estimating impact on pathogen contamination, the microbiologist and other team members with prior experience in diarrhoeal studies independently scored the risky behaviours. Their scores were highly consistent. Feasibility was estimated based on (1) existence of an alternative, favourable behaviour and, for mothers who practised this behaviour, their motivation for doing so, (2) reported and observed ease with which practising mothers performed the behaviour, (3) resources required for implementation (financial, time, and physical burden), and (4) likely resistance to change. The final decision concerning feasibility was influenced by the popular concept of "*cuidadosa*" (see below).

Four single behaviours—handwashing before food preparation, boiling water for reconstituting powdered milk, feeding gruel with cup and spoon rather than by bottle, and not storing gruels and milks—were prioritized for promotion. To test mothers' ability and willingness to adopt and sustain these priority behaviours, a household trial was conducted. Mothers who did not practise at least one of the four priority behaviours were eligible for the trial. Non-practising mothers were identified from the structured observations and 15 were randomly allocated to each of the four trial groups. A fifth group of 15 non-practising mothers was invited to adopt all four behaviours. For each individual trial behaviour, only non-practising mothers were allocated into the corresponding trial group. Thus, non-handwashing/non-boiling mothers might have been allocated to either the handwashing trial or the boiling water trial.

Educational messages were defined for each priority behaviour, instructing mothers what to do, how, and when, and motivating implementation. Messages were creatively tied to mothers' existing knowledge about infant growth and well-being, as well as to popular notions of diarrhoeal diseases, dehydration and death. This was facilitated by the involvement of mothers as "co-investigators" during the ethnographic phase and household trial.

During the trial, 293 unannounced home visits (75 first and 218 follow-up visits) were made by seven fieldworkers who had also participated in the structured observations. For the trial they received

one week further training. At the first visit, mothers were taught the educational message and how to perform the recommended task, and were asked about anticipated difficulties and/or factors facilitating adoption. During three follow-up visits, one week apart, fieldworkers evaluated (1) mothers' message recall, (2) success (and frequency) or failure of adoption, (3) helpful strategies in achieving adoption, (4) difficulties and facilitating factors, and (5) mothers' opinion of the advice and suggestions how to advise other mothers. Verbal responses were checked against actual observation of the adequacy and ease with which mothers performed the new practice in 180 (83%) follow-up visits. All but two mothers were observed at least twice, and 23 (31%) were observed three times.

Mothers candidly voiced their difficulties or failures in adopting the trial behaviour and often described strategies that they had initiated to facilitate the advocated action. The presence or absence of necessary resources for implementation, such as soap, cup, spoon, were recorded. Mothers' expressions, comments and suggestions were recorded to improve future message development.

#### *Data quality control*

In the ethnographic study, 20% of interviews were supervised by one of the anthropologists. Independent summaries were made and compared. In the community survey, 10% of interviews were supervised. Similarly for the structured observations, 10% of visits were conducted with a supervisor present and observations were independently recorded. There was at least 95% agreement between observer and supervisor. In the household trial, 10% of visits were supervised. For follow-up visits, 20% of the mothers were revisited at least once by the supervisor alone. There was agreement for 90% or more of the responses.

#### *Data analysis*

During fieldwork, analyses of the community survey and structured observations were minimal. Only those relevant to subsequent phases of the study or to message development, such as frequencies of specific behaviours and constraints, were undertaken, using the software *Epi-Info* (Dean *et al.*, 1990). After completion of fieldwork, initial data analysis and interpretation were reviewed.

## RESULTS

### *Ethnography of infant feeding*

Infant care is given high priority by mothers in Conjunto Palmeiras despite difficult conditions. Lack of employment opportunities, low wages, etc., contribute to a high level of frustration and anger, particularly among males who often vent their aggression by drinking and fighting. Violence

against women is all too common here, where the pattern of *machismo* or male dominance prevails (Wagley, 1968). In general, men have a limited role in household tasks and infant feeding, which is relegated to mothers and their female kin. The multiple demands on women keep them constantly busy and overworked; many report sleeping only four to five hours per night.

While mothers generally believe breastfeeding for at least six months is the best and safest way to feed a baby, and most hope to breastfeed for at least one year, duration is short and exclusive breastfeeding for six months rare. All 20 mothers in the ethnographic study introduced fruit juices and water within the first month and complementary feeds before three months. Gruels and powdered milks (*Ninho*, *Pelargon*, *Nan*, *Nestogeno*) are the most common breastmilk substitutes for babies of all ages, and are the only foods given on a regular basis, mainly due to economic constraints but also because mothers perceive them to be similar to breastmilk. Gruels are prepared mostly with maize flour (*Maizena*) and milk. Rice flour (*Arrozina*) is a common alternative. In poor households, cassava flour may be substituted and milk omitted. Beans, which are staple foods for the family, are considered "heavy" (*pesado*) and difficult for infants to digest, and are withheld until 12 months of age. These results led us to focus on the preparation and feeding of gruels and milks in the subsequent phases of the study, and to include infants older than three months of age in the observation study.

Interviews and unstructured observations in the ethnographic study indicated that weaning food hygiene practices are poor. Water, hands and utensils are likely sources of continuing contamination. When preparing food and during feeding, most mothers follow a sequence of practices that have one or more adverse behaviours which may introduce bacterial contamination and cancel any positive effect of a previous action (e.g. storing milk in a dirty bottle may cancel the benefit obtained by boiling water for reconstituting milk). Finding this sequence was essential for identifying intervention behaviours which either prevent contamination in the first place or cancel the highest number of previous unfavourable behaviours.

The ethnography also revealed important community perceptions of mothers as carers. Despite the gruelling hardships and prevailing high infant mortality, popular culture recognizes and labels mothers who are especially careful and effective caretakers. They are called "*cuidadosa*", or literally "the careful one". The *cuidadosa* trait is considered part of every mother, albeit at times less obvious, as it can be repressed by lack of confidence, emotional stress, and structural constraints in the mother's environment. This popular term expresses the notion that mothers vary in their capabilities for caring for their young and that a visible indi-

cator of this is her home's apparent neatness and "organizedness". A *cuidadosa* mother is loving, well groomed, keeps her home reasonably clean and tidy, and is willing to learn and change her behaviour if she believes that this is best for her baby. Explains one key informant, a 45-year-old male and community leader:

No mother is naturally careless about her baby. Every mother is *cuidadosa*. What might happen is that a mother might become inattentive, clumsy and apparently lazy because she doesn't know what to do or because she is overwhelmed with family affairs. For example, if she hasn't got a supportive husband or if the husband loses his job or abandons her, she becomes nervous and frightened that she might not have enough resources to look after the baby. She has to do everything on her own. How could she possibly be *cuidadosa* under such circumstances?

A second key informant, a grandmother, continues:

Every mother loves her baby and likes being *cuidadosa* because every baby is an innocent little thing and so beautiful that it deserves the very best mothers can do!

There is no necessary fit between *cuidadosa* and wealth; "*cuidadosa* mothers" exist at every socio-economic level. This emic cultural category in northeastern Brazil identifies mothers—without extensive statistical analysis—who are strongly motivated to care for their infant's nutrition and likely candidates to accept behavioural changes, so much so that the concept of a "*cuidadosa* mother" was used in this study to judge the likelihood of a given behaviour being amenable to change. For example, storing foods is not considered appropriate behaviour for a *cuidadosa* mother. Feeding with cup and spoon is highly *cuidadosa* when a child is sick.

#### *Selection of key behaviours from the ethnographic study*

Six adverse behaviours were selected during the ethnographic study. These were: (1) *lack of hand-washing with soap*: (repeated contamination of hands was likely, as the concept of faecal pathogen transmission was ill defined and excreta disposal conditions were poor); (2) *failure to cook gruel*: (reconstituting "instant" preparations with unboiled water was reported); (3) *poor water storage*: (chlorinated water was believed harmful unless first stored and allowed to "sleep" and storage conditions were poor); (4) *failure to boil water when reconstituting powdered milk and adding to cooked gruels*: (unboiled water was used to save time, fuel and to prevent lumps when reconstituting milk; boiling of water was believed unnecessary if it was being added to hot gruels to reduce viscosity); (5) *failure to clean feeding utensils, especially bottles*: (unboilable plastic bottles were common and soap was rarely used, as soap residues were considered harmful to the baby's health); and (6) *storing prepared milks and gruel for more than one hour*: (most mothers denied prolonged storage but instances

were nevertheless observed). The possibility that food was scavenged was kept in mind, although there were no substantiating reports or observations of its use in infant feeding.

#### *Community survey of infant feeding practices and resources*

Survey data confirmed ethnographic findings. Regarding early supplementation, the majority (52.4%) supplemented their infants before two months of age and 13.3% had fully weaned by this age. Gruels were confirmed as the most common weaning food and given by 81.5% of mothers. Milk was used by 53.6% of mothers with infants aged 0-2 months, and by 36.7% of mothers overall.

Gruels and milks were also the only weaning foods reportedly stored for three hours or more. We suspected that the reported prevalence of 11.5% was an underestimate since the survey revealed that 22.5% of babies were fed more meals per day than were cooked, indicating that some meals had been pre-prepared and stored. Fieldworkers also observed feeding bottles being kept warm by wrapping in diapers and in insulated polystyrene containers. Refrigerators were present in 29.6% of households.

Although 72.5% of families had access to piped water, only 24.8% had piped water in the house and 43.5% had no sanitation. The remainder had pit latrines. Scavenged food was present in one household. Most mothers declared themselves to be literate (69%) and to participate in health programmes (81%). Some 31% of mothers reported paid work (18.8% outside and 12.3% at home). Half the mothers had some help with baby care and there was a grandmother living in 30.3% of the households.

From the ethnographic and survey data we concluded that the structured observations should focus on the preparation and administration of gruels and milks.

#### *Structured observations of the prevalence of specific food hygiene practices*

Successive contaminating and decontaminating behaviours were confirmed in the structured observations. For most gruels (91.5%), any contamination introduced during preparation is likely to have been eliminated by boiling, but then nullified by the later addition of water or milk reconstituted with unboiled water (75.9%). Even when mothers prepared food safely, they often contaminated food during feeding. Prepared milks and gruels were poured into unsterile plastic bottles during 90.5% of observations. Soap was used to clean 17.3% of feeding utensils, and only 0.9% were cleaned by boiling. Food storage for more than one hour occurred in 21.7% of observations. In addition, 10% of mothers reported that they had stored weaning foods in the previous 24 hours even though

they were not observed to do so on the day of the observation. Insulated polystyrene containers for feeding bottles were also in 30% of households, indicating the likelihood of more mothers storing, at least occasionally. Stored foods were never refrigerated even when a working refrigerator was present. Table 1 summarizes the prevalence of observed weaning food hygiene practices and the assigned scores for expected impact if changed and feasibility of change. Based on Table 1, priority behaviours for the household trial were selected.

#### *Establishing priority behaviours for the household trial*

Four of the adverse behaviours were selected as a priority for change. These were (1) lack of handwashing with soap, (2) bottlefeeding, (3) failure to boil water when reconstituting powdered milk, and (4) storing prepared gruels or milks. Those excluded were behaviours which had a low score on either expected impact or expected feasibility to change (Table 1).

The next step was to define the messages to promote the advocated behaviours. Table 2, compiled from data from the ethnographic and observation phases, summarizes the main constraints of non-practising mothers, and motivations articulated by practising mothers. This information helped in formulating the actual messages. For example, the handwashing message was as follows:

Wash your hands with soap and water before preparing your baby's food and feeding him/her, and after changing diapers and going to the toilet. It is easy to do, it does not take much time, and it protects the baby against the microbes which cause diarrhoea.

The guiding principles used to formulate the messages were that they should be positive, motivational, non-threatening, and would reinforce mothers' existing knowledge about microbes.

Table 1. Basis for selecting priority behaviours to be changed

Adverse behaviour	Prevalence from observational study %	Expected impact if changed	Expected feasibility to change
(1) No handwashing	95.2	+++	+++
(2) Utensils			
(a) Not cleaned	82.7 (no soap) 99.1 (not boiled)	+++	+
(b) Bottlefeeding	90.5	+++	++
(3) Water not boiled when reconstituting powdered milk	75.9	++	++
(4) Poor water storage	36.0	+	++
(5) Gruel not cooked	8.5	+	+
(7) Scavenged food	0	NA	NA
High: +++			
Intermediate: ++			
Low: +			

Table 2. Favourable behaviours: constraints expressed by non-practising mothers and motivations articulated by practising mothers

Favourable behaviour	Prevalence from observational study	Constraints from ethnographic study	Motivations from ethnographic study
Handwashing	4.8%	No soap No recognition of risk to baby Perceived time constraint	Easy to do It takes no time to do Clean hands do not bring microbes to the baby
Using boiled water for reconstituting powdered milk	24.1%	Forgetfulness Milk gets lumps Perceived time constraint Fuel constraint Thinks hot gruel will overcome any risk from adding unboiled water	Boiled water protects against diarrhoea
Feed with cup and spoon instead of bottle	9.5%	Needs utensils Takes time and patience Mother/baby already familiar with bottle Bottle is convenient for the mother Change in consistency to thicker gruel	Cup and spoon are easier to clean Takes time and patience but is worth trying
Feeding only freshly prepared gruel/milk	68.3%	Money for extra flour/milk Mother needs to leave food for baby Prepare but then baby not hungry Baby will need to eat again later Mother cannot cook (for several reasons) Mother needs food fast when baby cries	Microbes multiply in stored food Stored food spoils Stored food is harmful for the baby and it will give him diarrhoea

#### Household trial

Table 3 shows the percentage of mothers who changed their hygiene practices, and the extent to which these changes were sustained. All 75 mothers initiated the advocated behaviours and at least half did so consistently throughout the one-month trial period. Boiling water for reconstituting milk and freshly preparing feeds were sustained by 80% of mothers. Spoon-feeding was the least easy practice to sustain (53%). For mothers implementing all four practices at once, the sustainability of each practice was similar to that of mothers in the other groups. Thus, the overall figure of 60% for the "all four" group reflects their particular problem of sustaining spoon-feeding, rather than any extra difficulty in implementing four behaviours instead of one.

Table 4 compares the frequency of difficulties anticipated by mothers in adopting the advocated behaviours with those actually experienced. Despite a high prevalence of anticipated (52%) and actual difficulties (61%), most mothers nevertheless sustained behavioural change and developed their own coping mechanisms. Some of these served to

prompt the mother, for example, by placing the soap in a strategic place, or were time-saving devices. Assistance from other family members was also utilized, for example, to console a hungry baby whilst gruel or milk was freshly prepared. Mothers felt they would have been better able to sustain spoon-feeding if their baby had not already been accustomed to the bottle. The difficulties experienced by mothers in this trial regarding spoon-feeding may therefore overestimate those that would be encountered in a fully fledged intervention which would encourage this practice immediately after weaning is begun.

#### DISCUSSION

This study investigated whether and how weaning food hygiene practices can be improved in slum conditions. To this aim, a methodology was developed to identify behavioural changes that would be (1) feasible for mothers with few resources, (2) culturally appropriate and accepted, and (3) sustainable. The methodology involved four stages, each having clearly defined complementary objectives.

Table 3. Frequency of adoption of advocated behaviours during the trial (%)

	Handwashing (n = 15)	Boiling (n = 15)	Spoon-feeding (n = 15)	Not storing (n = 15)	All four (n = 15)
Started	100	100	100	100	100
Practised for 1 month	100	100	73	94	87
Full practice for 1 month	73	80	53	80	60



Table 4. Frequency of difficulties anticipated and experienced by mothers during the household trial

Practice	n	Difficulties anticipated %	Experienced %
Handwashing	15	33.5	40.0
Boiling the water for reconstituting powdered milk	15	46.7	60.0
Feeding with cup and spoon rather than bottle	15	73.3	86.7
Not storing	15	60.0	46.7
All four practices	15	46.7	73.3
Total	75	52.0	61.3

The methodology also explicitly involved mothers and caretakers in the decision-making process. The results demonstrate that the new methodology succeeded in its task, and that behavioural changes can be achieved even by poor mothers through carefully designed educational messages. These were formulated to give specific instructions, incorporated vernacular terms and expressions, and provided the motivation for change.

The study culminated in a household trial to test adoption and sustainability of four advocated behaviours (handwashing before and after defined events, boiling water for reconstituting powdered milk, feeding gruel by spoon rather than bottle-feeding, and not storing gruels and milks). All mothers in the trial initiated the behaviours, even though they had previously been non-practising. Most were able to sustain the new practice, despite difficulties, both anticipated and real. Mothers who were asked to implement all four practices instead of just one succeeded with no additional difficulty. Interestingly, they reported that they enjoyed the challenge of trying to do everything correctly. Education interventions elsewhere have been less successful in promoting behavioural change (Manderson *et al.*, 1992), even though the messages may have been successfully conveyed. Education interventions are often based on the erroneous and simplistic assumption that if people are exposed to information for long enough, behavioural change will occur. This "top-down" approach fails to address the reality of people's lives, both culturally and materially (Ashworth and Feachem, 1985). This study sought to overcome such failings.

The methodology was developed in response to the high priority given in diarrhoeal disease control programmes to reducing weaning food contamination, and the lack of any pre-existing methodology for defining appropriate educational interventions. Certain behaviours are more difficult to study than others. Hygiene and sexual behaviours are two such examples. Methodologies used to study less sensitive behaviours, for example, to define educational interventions pertaining to oral rehydration therapy (Kendall *et al.*, 1984) or to improving weaning recipes (Bentley *et al.*, 1988; Griffiths *et al.*, 1988), are thus unlikely to be transferable to studies of weaning food hygiene, because

of concern that reported hygiene behaviours may be unreliable (Boot and Cairncross, 1993; Curtis *et al.*, 1993; Stanton *et al.*, 1992). For these reasons, an alternative methodology needed to be created.

Ethnography is widely regarded as an essential tool in developing educational interventions (Manderson and Aaby, 1992a; Pelto and Pelto, 1992; Scrimshaw and Hurtado, 1987; Vlassoff and Tanner, 1992), including food safety (Foster and Kaferstein, 1985), and its inclusion in our methodology is by no means exceptional in diarrhoeal studies (Akitoye *et al.*, 1991; Bentley, 1988; Bentley *et al.*, 1988; Griffiths *et al.*, 1988; Lozoff *et al.*, 1975; Mull and Mull, 1988; Nations, 1992; Nichter, 1988; Scrimshaw and Hurtado, 1987, 1988). Similarly, household trials have been used elsewhere for intervention testing (Schroeder *et al.*, 1989; Smith and Morrow, 1991), but in contrast to previous studies, the methodology developed in this study ensured a high degree of representativeness through its sampling strategies.

Priority behaviours for change were selected based on their prevalence, feasibility to change, and expected impact. Except for prevalence, which was determined by direct structured observations in the home, decisions concerning feasibility and impact ultimately depended on sound judgement. This was anticipated from the outset, and was achieved in two main ways: first, by carefully selecting the research team so that the necessary microbiological and anthropological expertise and insights were fully available; and second, by systematic collection of ethnographic data, focusing on key aspects.

When developing the methodology, careful consideration was given to the selection of appropriate techniques. The ethnographic component not only proved essential to understand the cultural determinants of behaviour, but shaped every aspect of message formulation. Data collection and analysis proceeded in tandem, and despite data analysis being a considerable burden, even with computer software, we conclude that ethnography is indispensable. Provided support, training and guidance are given by experienced anthropologists, we also conclude that formative field research can be successfully carried out by professionals with no formal training in anthropology.

An unexpected but important outcome of the ethnographic study was discovery of the emic category of "cuidadosa". Pelto, 1990 reports a similar concept—"organizada"—from rural Mexico, but this is the first time that such a concept has been reported in Brazil. Both terms encompass the notion of good maternal household management. In studying the relation between *organizada* and child nutrition, Pelto demonstrated that positive traits of *organizada* influence child growth irrespective of socio-economic factors. Such a belief, namely that mothers can be *cuidadosa* at every socio-economic level, exists in popular culture in Conjunto Palmeiras. An

added dimension to the concept of *cuidadosa* in the Brazilian context, which appears to be absent from *organizada*, is that the term also embodies a loving, caring quality.

Of the four methodological components, the community survey contributed least to defining and formulating the educational messages. It reinforced the choice of key behaviours which had been identified in the ethnographic study and provided quantified information about feeding practices and household resources. This additional information, however, served only to confirm conclusions already deduced from ethnographic insights. No further refinements were made on the basis of this phase. The community survey was essential, nevertheless, in providing the sampling frame for structured observations. Given the availability of alternative sources of data for sampling, this phase could be optional.

The observational component painted a clearer picture of the prevalence of the target behaviours. The alternative was to rely on mothers' reported practices, which have been shown to be unreliable, especially for hygiene behaviours (Boot and Cairncross, 1993; Curtis *et al.*, 1993; Stanton *et al.*, 1992). Structured observations were helpful in understanding the dynamics of practices and relative ease or difficulty with which mothers performed various tasks. Structured observations also permitted non-practising mothers to be identified in readiness for the household trial. Had this trial proceeded without such knowledge, thus risking inclusion of mothers already practising, the results in terms of assessing feasibility would have been difficult to interpret. Spot observations of the cleanliness and neatness of the home, and of the mother and children, were included at each home visit as a possible visible expression of maternal household management (*cuidadosa*). These results and their relation to behavioural change are the subject of a separate paper.

In communities such as Conjunto Palmeiras, where it is feasible to observe mothers directly, we consider that structured observation is an essential methodology to quantify the prevalence of adverse weaning food hygiene behaviours, and to understand the sequence of decontaminating and recontaminating practices. Three observations were conducted in each home to capture possible variability in hygiene practices depending on household dynamics at different times of the day, or in resource availability on different days. This helped to assign mothers to behavioural groups more reliably than if a single observation had been conducted. Three observations were the maximum that was deemed tolerable to mothers. Visits were restricted to daylight hours for security reasons and because visits at other times were socially unacceptable to families. This may be regarded as a limitation of the method, as we cannot know whether

hygiene practices differed at night, for example, when mothers are exhausted or with the arrival home of a drunken husband. We believe, however, that even had we observed practices at night, it would not have altered our selection of priority behaviours. Any potential limitation in the observational component *per se*, therefore, does not weaken the overall methodological approach.

The usefulness of household trials for assessing feasibility and acceptability of behavioural change has been previously documented (Schroeder *et al.*, 1989). For this study, clear definitions of compliance in terms of frequency and maintenance of the advocated practice were made at the outset. Full, partial and non-adoption were categorized. When a practice was not sustained, this occurred in the first two weeks, suggesting this as a critical period for message enhancement and support.

Data validity and reliability were overriding concerns. Triangulation was extensively used to check validity (Denzin, 1970; Kirk and Miller, 1986; Manderson and Aaby, 1992b), and representativeness was achieved by using the total population for the community survey, and random selection for the structured observations and trial. This is a particular strength of our methodology, and is lacking in previous household trials.

In this study, we accepted that mothers have a wealth of experience and knowledge, and that they have a valuable role to play as informal "co-investigators". Their emic classification of a *cuidadosa* mother, for instance, guided the selection of intervention strategies and message development. Mothers were encouraged to develop and fully express their "natural *cuidadosa* self". This stimulated them to overcome difficulties and constraints by creatively developing their own coping strategies. Building a trusting relationship between mothers and the research team was achieved in three main ways. First, people already working and living in the community were trained and employed as field-workers, after consulting community leaders. Second, mothers were always approached in a warm, friendly, attentive and supportive manner. Third, mothers understood that the team respected their knowledge and valued their opinions, which encouraged their full expression. This was especially important in the trial, as it was important to avoid any impression of success or failure. Equal value was placed on adoption as on non-adoption, and the reasons in each case were equally significant. This reassurance allowed mothers total freedom of expression and creativity, and generous praise was given to their endeavours at the end of each visit, regardless of the outcome. Being a good listener was an essential attribute for the field team.

Finally, it must be remembered that the extent to which hygiene behaviours are sustained during a household trial is only indicative of the potential impact that a full-scale educational intervention

might have on diarrhoea incidence. This paper defines the educational messages: for any future intervention in Fortaleza, communication strategies will also need to be defined. With this end in mind, relevant data on literacy, access to media, etc., were collected in the ethnographic phase and community survey (although not reported here). Also examined (but data not shown) were the characteristics of the non-adopters in the trial. This was achieved by linking the socio-economic, demographic and resource variables (from the community survey) with the trial outcome, and applying logistic regression techniques. This information has relevance for a full-scale intervention, as mothers who had never been previously exposed to health education were less likely to adopt the advocated behaviours than other mothers. This indicates that special efforts will be required with this category of mothers in any future intervention in this setting.

In summary, a methodology was developed to identify which weaning food hygiene practices should be a priority for change and, thereafter, to formulate the messages that would be used. The context was a Brazilian slum, and emphasis was given to feasibility, cultural acceptance, and careful wording of messages, so as to maximize the likelihood of behavioural change. The methodology had four components, culminating in a one-month household trial. The process, including training of the field team, required 11 months. The desired objective of changing the hygiene behaviour of non-practising mothers was achieved, despite their limited material resources.

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