

Special Quetzaltenango (Xela) Edition

Center for Studies of Sensory
Impairment, Aging, and Metabolism
(CeSSIAM)

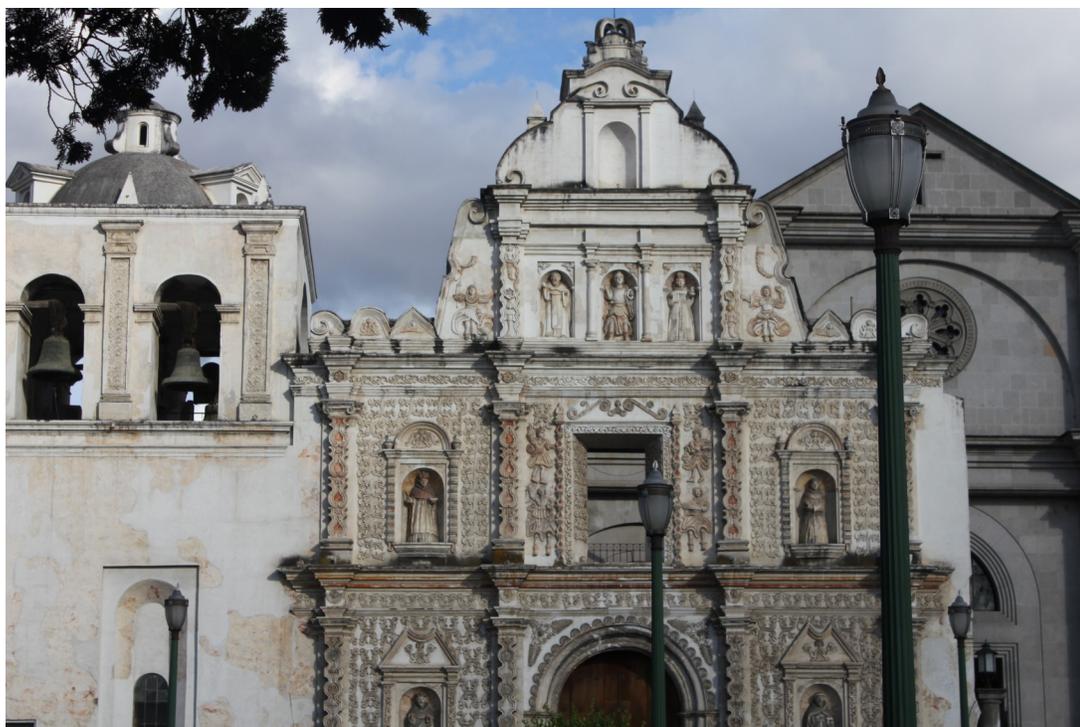
BULLETIN OF RESEARCH ABSTRACTS

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Editorial

Special Editorial for a Special Bulletin Issue on a Renaissance of CeSSIAM Research in Quetzaltenango, Guatemala

CeSSIAM was founded in 1985; for 15 years, its research and the projection of its staff and students were largely in the Central Highlands of Guatemala. Our early research was generally confined to metabolic research or surveys of institutionalized populations (old age homes, schools, day-care centers) in Guatemala City. In our field studies, we examined vitamin A intake in Guajitos in Zone 21, at the energy metabolism among the *guajeros* (recycling scavengers) of the sanitary landfill in Zone 3, both in the capital, and at the iodine and body composition of populations on the hillsides around the city. Occasionally, when the research topic had a geographical implication for the countryside, we wandered further afield. With local and international students, we examined the epidemiology of onchocerciasis and the modernization of diet on the slopes of the volcanoes in Chimaltenango. In Alta Verapaz, we studied the preparation of tortillas, the consumption of herbs, trace elements in breast milk and dietary intake of lactating women. On the southern coast, we studied parasites and anemia in the elderly and the metabolic effects of Dengue fever. We even had two nutrition students from Kings College in London venture to Livingston. For one heralded project on the bioconversion of provitamin A, we mobilized a task-force of our staff to the Santa Rosa Province.

In 1999, CeSSIAM became interested in the Cross-Cultural Research on Nutrition in Older Subjects (CRONOS) multicenter protocol. **Manolo Mazariegos** obtained a grant to perform a CRONOS survey in metropolitan area of Guatemala City (CRONOS Metro). In a follow-up award in 2000, he obtained financing to repeat the survey among adults of Mayan ascent in the Western Highlands in the Province of Quetzaltenango (CRONOS Maya), 210 km along the Pan American Highway from the national capital. The project coordinator was **Liza Hernandez**, and a local research nutritionist, born in Quetzaltenango (also known as "Xela") was contracted to the second survey, **Gabriela Montenegro-Bethancourt**. Following her participation with CRONOS Maya, Gaby traveled to Europe to explore life on another continent. Upon her return to CeSSIAM she worked in the city with dietary research projects until an opportunity to matriculate in a new international masters degree program at the *Vrije Universiteit* (VU) in Amsterdam came her way. Gaby went to the Netherlands for classroom training, and when it came time to perform her thesis research, she returned to Xela to perform an extensive dietary assessment study in schoolchildren in public and private institutions. She was accompanied on her return by a Dutch student from the (VU), **Iris Groeneveld**, who would look at growth and body dimensions in the same population.

This joint effort became known as "Xela-Children." It has led to two papers on body composition, 10 on dietary intake, and one at the intersection of the two. While writing those papers, Ms Montenegro-Bethancourt established an "outpost" for CeSSIAM in Quetzaltenango, where a series of international exchange students traveled through for substantial tours of duty resulting in substantial research contributions: **Sohil Sud** (vitamin D in the elderly); **Emily Yates-Doerr** (perceptions of obesity); **Anne-Marie Chomat** (health care during pregnancy); and **Terri-Lynn Duffy** (giardiasis prevalence and turnover in day-care centers). The contribution of Dr. Sud and colleagues showed a surprisingly high prevalences of insufficient and deficient levels of 25(OH)vitamin D, and has led to further studies, closer to the capital, on vitamin D status in preschool children. Dr. Chomat demonstrated both concordance and discrepancies in the self-perceptions of health and nutrition during a current or recent pregnancy. Ms. Duffy was able to quantify the rates of new infection with the intestinal parasite, *Giardia intestinalis*, as well as the spontaneous clearance of existing infestations.

Assorted students from the *Vrije Universiteit* (VU) in Amsterdam (**Leonie Peters, Robine van der Starre; Marieke Reurings, Ilse van Beusekom**), Harvard College (**Makenzie Dolginow**), UCLA (**Jeniece Alvey**) Tufts University (**Joy Notle, Lauren Whaley, Natasha Irving, Oscar Padilla**) and Boston University School of Public Health (**Linda Oyesiku**) have volunteered in CeSSIAM projects in the past three years in assorted projects. BUSPH was also the alma mater of **Caitlin Crowley**, who earned her MPH in 2007. She took up residence in Xela for almost two and one half years and worked variously with Gabriela Montenegro and **Claudia Arriaga** on protocols of validation of devices from several manufacturers, which purported to provide an immediate analysis and digital read-out of circulating hemoglobin concentrations, with a non-invasive technology involving the projection of light into the skin. Obtaining reference whole blood samples from adult men living at the 2600 meter altitude of San Francisco el Alto in nearby Totonicipan and from pregnant women in the hookworm-infested coastal plain, down the mountain highway from Quetzaltenango in the department of Retalhuleu, the team compared digital values with the reference concentrations of hemoglobin. In 2011, **Juliana Casimiro de Almeida**, a Brazilian-born masters degree candidate at the *Technische Universitaet München*, and **Ana Ventura**, a Guatemalan university student at the national (San Carlos) university, took up the protocol system pioneered in Xela, and compared non-invasive hemoglobin-detection devices of both German and Israeli manufacture.

In the memory of award-winning American Actress, family members provide the funding to establish and maintain an annex facility in Xela, the Frances Reid Memorial Leadership Learning Center of CeSSIAM in Quetzaltenango. Upon leaving for Germany and doctoral studies, **Rosario García** took over as the area coordinator for the highland projects. It was opened in January 2011, in time to host two major project platforms for the region. The first is "Xela Babies", a study on growth and nutrient intake of infants and toddlers, led by **Marieke Vossenaar** with faculty collaborators from the *Vrije Universiteit* (VU) in Amsterdam. The staff included local nutrition students: **Maria Elena Ruiz, Deborah Fuentes** and **Alejandro Maldonado**.

The other is "Mam-Mamas", an joint initiative of CeSSIAM with the McGill University in Montreal, Canada and the faculty advisors of doctoral students, Anne-Marie Chomat and **Hilary Wren**. The pilot phase of a study to examine the interaction of maternal health and stress on variables of growth and health of the offspring from the third trimester through the 6th month of life was conducted in the summer of 2011. Local professionals Rosario García and **María García** and nutrition students, **Susana Barrios** and **Maya García** formed the field team in the Mam-speaking communities above Xela. The definitive platform for the doctoral dissertation work will commence in May, 2012. Quetzaltenango is the setting for another doctoral dissertation, one from the Universidad de Granada in Spain. **Maria-Jose Soto**, of the CeSSIAM staff, will work toward her PhD in a project



in the day-care centers within the system of the Secretariat of Social Works of the First Lady (SOSEP) in which the stability and consistency of variables related to growth, body composition, hematology, infection, inflammation, oxidation and hydration will be examined.

Finally, **Mónica Orozco** has assumed an initiative to formulate improved maize flour with micronutrient fortification. In its earliest phases, Rosario García, Deborah Fuentes and **Marta Lucía Escobar** constitute the local team in the Quetzaltenango area to apply qualitative formative research and formal survey methods to determine how acceptable is this product in urban and rural households. Of specific interest is the preparation of different maize-based recipes and the distribution and consumption among members of the household. Only when the amounts of flour consumed by young children and lactating women are quantified, can the appropriate addition of fortificant micronutrients be calculated.

The normal page-length of a *Bulletin* does not really permit the space to detail all of the exciting and important activities that the outpost location in the Western Highlands has allowed CeSSIAM affiliates and students to initiate in the second half of the Center's history.

Dr. Noel W Solomons, MD
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XELA IN IMAGES



The Frances Reid Memorial Leadership Learning Center of CeSSIAM in Quetzaltenango

Local staff - Elena Díaz , Alejandra Maldonado, Deborah Fuentes



Collection of anthropometric measurements in babies and mothers

Quetzaltenango Health Center

Comparison of concurrent and retrospective assessment for Quetzaltenango clinic population on first semester of life feeding practices

Ilse van Beusekom, Marieke Vossenaar, Gabriela Montenegro-Bethancourt, Colleen M Doak, Noel W Solomons

The World Health Organization (WHO) recommends exclusive breastfeeding (EBF) until the age of 6 mo allowing only the use oral rehydration solution (ORS), drops and syrups (vitamins, minerals, medicines)(1). Moreover, between EBF and mixed feeding, is a category of predominant breastfeeding (PBF), in which items such as water, water-based drinks, juices and ritual fluids are provided, but none of the more substantive beverages (including infant formula) (Table 1). This category has not often been a specific focus of categorization in epidemiological studies.

The WHO uses 24-hr dietary recalls to assess prevalence of EBF rates. Recent studies have shown that the estimated EBF and PBF rates vary according to the dietary assessment method used (2, 3)

Study I—Mothers interviewed before infant completed 6 mo

Within a multifaceted study on adherence to the WHO recommendations for early feeding practices among low-income residence of the metropolitan area of Quetzaltenango in the Western Highlands of Guatemala, we enrolled a convenience sample of 156 infants approaching the threshold of 6 months, when complementary foods becomes a recommended part of infant feeding (4, 5). Dietary intake was assessed by means of a single face-to-face interview using different dietary assessment methods with differing temporal contexts. These were: (i) previous day dietary recall, (ii) current feeding practices, and (iii) recall of feeding practices since birth. We classified the infants among the various feeding patterns defined by the WHO. Furthermore, inconsistencies among the classification approaches were examined.

Rates of EBF, PDF, full breastfeeding (EBF & PBF) and mixed feeding (MF) varied greatly according to dietary assessment used, as illustrated in Table 3. The highest rates of EBF rates were estimated using the previous day dietary recall (56%), while the lowest

rates were estimated using recall of feeding practices since the birth (9%).

When comparing reported intake of drinks or foods other than breast milk based on 3 dietary assessment interview methods, there are only 3 options for the mother to give internally inconsistent answers. In total, only 17 inconsistent answers were giving by 15 of the 156 mothers (*data not shown*).

Study II—Mothers interviewed after child completed 6 mo, but before child turned 2 yrs old

As part of a second study to determine the barriers to appropriate complementary feeding practices of 6-24 month old children in Quetzaltenango, Guatemala, we enrolled a convenience sample of 150 children aged 6 to 23 months. Recruitment took place in the same health center using a similar interview tool. Feeding patterns in the 6th month of life were evaluated retrospectively using recall of feeding practices since birth. These included reported use of and age of introduction of ritual fluids, liquids and drinks other than breast milk, formula milk and foods.

The general characteristics of the mother-infant dyads recruited in both studies were similar, as illustrated in Table 2.

Estimated rates of EBF, PDF, full breastfeeding and MF using recall of feeding practices since birth was very similar in both samples (Table 3).

The findings of the present studies show that the estimate for EBF rates through the first semester of life vary depending on the interview method and temporal context used; EBF rates range from 8% up to 56%. Retrospective reports at up to 2 yrs give plausible outcomes for estimations since birth. Our findings match the findings of other literature conducted in Guatemala (6, 7) and other countries (2, 3).

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Colleen M Doak is professor assistant at the *Vrije Universiteit* (VU) of Amsterdam.

Noel W Solomons is Scientific Director of CeSSIAM.

Table 1: The WHO classification of infant breastfeeding practices

	Requires that the infant receive	Allows the infant to receive
Exclusive breast-feeding (EBF)	Breast milk (including milk expressed or from a wet nurse)	ORS, drops, syrups (vitamins, minerals, medicines)
Predominant breastfeeding (PBF)	Breast milk (including milk expressed or from a wet nurse) as the predominant source of nourishment	Certain liquids (water and water-based drinks, fruit juice), ritual fluids and ORS, drops or syrups (vitamins, minerals, medicines)
Mixed Feeding (MF)	Breast milk (including milk expressed or from a wet nurse) and solid or semi-solid foods	Anything else: any food or liquid including non-human milk and formula or human milk in a bottle

Table 2: Comparison of common characteristics in dyads interviewed in the 6th month versus in the 7th to 24th months of life months of life

	STUDY I Interviewed before 6 months (n=156)	STUDY II Interviewed post 6 months (n=150)	P-value ¹
	%		
Gender			
Boys	50	43	0.243
Girls	50	57	
Place of birth			
National hospital	56	59	0.695
Private clinic or hospital	33	29	
Health center or home setting	10	12	
Marital status mother			
Single	14	17	0.938
United or married	85	82	
Divorced or widowed	1	1	
Level of education mother			
None or primary school	49	55	0.334
Secondary school or higher	51	45	
Occupation of the mother			
Housewife or working at home	69	71	0.693
Working outside the home	31	29	
Ethnicity			
Ladina	76	69	0.172
Indigenous	24	31	

Table 3. Percentages classification of the feeding pattern close to 180 days of life based on different interview approaches and time-lines

	STUDY I Interviewed before 6 months (n = 156)		STUDY II Interviewed post 6 months (n = 150)	
	Previous day dietary recall	Current feeding practices	Recall of feeding practices since birth	
	%			
Exclusive Breastfeeding	56	20	9	8
Predominant Breastfeeding	3	29	22	23
Mixed Feeding	42	51	69	69

The nature of stunting prevalence and progression through infancy in selected *Mam*-speaking communities of Quetzaltenango

Anne Marie Chomat, Hilary Wren, Marilyn E Scott, Kris Koski, Noel W Solomons

Stunting is the situation in which the height of the individual for a given age is two standard deviations below (< -2 SD) the median value from a reference [1] or standard [2] growth curve. Stunting is a predictor in the short-term of increased child morbidity and mortality, and in the long-term of cognitive and developmental delays; lower IQ and school performance; decreased adult physical performance, work capacity and economic productivity; and increased lifetime morbidity [3,4]. Stunting therefore represents a problem for an affected individual, and a high prevalence of stunting within a population represents a public health problem.

The Republic of Guatemala has the third highest prevalence of stunting worldwide. If one were to use the traditional reference measure of the NCHS [1], the national prevalence in the 2008-9 national survey of Guatemala is 42%, a reduction from 49% in the previous survey. If, however, the newer standards for child growth from the WHO 2006 charts are used, the calculated prevalence becomes 54% [2]. In parts of Guatemala where the population is overwhelmingly of Mayan descent, poverty and food insecurity are much higher than the national average, and under-five stunting prevalence can reach 80% [2,5].

A puzzling and somewhat paradoxical feature of stunting viewed globally is that the slowing of linear growth begins in the first semester of life, even when exclusive breast feeding would be presumed to be the dominant feeding mode; it then accelerates its downward trajectory with respect to the median value through the rest of the 18 to 30 months leading up to the third birthday [6].

We aimed to determine stunting prevalence and severity in *Mam* communities in the municipality of San Juan Ostuncalco, Quetzaltenango. Towards this end, we obtained anthropometric measurement of children aged 0-5 years of age in seven

communities, during Summer 2011, through both existing archival data ($n=277$) and direct anthropometric measurement ($n=76$). The archival data were obtained from CORSADEC (*Cooperacion de Servicios y Apoyo para el Desarrollo Comunitario*), a local health organization contracted by the Quetzaltenango Department of Health (*Area de Salud*) to serve these communities, and represented all children seen in their mobile clinics between February and May 2011. Direct anthropometric measurements were made in four of the seven communities, on all children brought by their mothers to be measured by our research team. Height-for-age (HAZ) scores were calculated for all children using the WHO growth standards.

Figure 1 shows the HAZ data by month of life, for all 353 children, charted against the WHO's compilation of mean HAZ scores from 325,760 children in 54 different low- and middle-income countries (sample size per country 1,000-47,000) [6]. Stunting scores within our study population are below the mean of those from low- and middle-income countries, at all age groups, including at the time of birth; statistical significance of this difference is not quantifiable with our data. Both curves show a progressive decline in average HAZ scores between birth and the children's 2nd birthday, followed by stabilization in the scores and possibly a small amount of catch-up growth manifest between ages 2 and 5 years.

Within our study population, stunting prevalence was of 66%. More specifically, 31% of the children were moderately stunted (HAZ score between -2 and -3), and 35% were severely stunted (HAZ score below -3 , data not shown). Mean HAZ scores were -1.54 ± 1.76 between 0 and 6 months of age, -2.36 ± 2.14 between 6 months and 2 years of age, and -3.22 ± 1.42 between 2 and 5 years of age (see Figure 2). Differences between age groups were all significant at $p < 0.05$. Gender differences were not significant (*data not shown*).

Stunting prevalence in study communities is significantly higher than the reported national level. As expected, poor infant growth accumulates with age. Possible risk factors include poverty, young maternal age, poor nutritional status, infection, and infant feeding practices. The timing of growth faltering re-emphasizes the critical need to focus on maternal and early infant health, and on determinants of stunting.

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Figure 1. Mean HAZ scores in study communities (n=353) and from the WHO (n=325,760 in 54 different low-and middle-income countries, Victora et al. 2010)

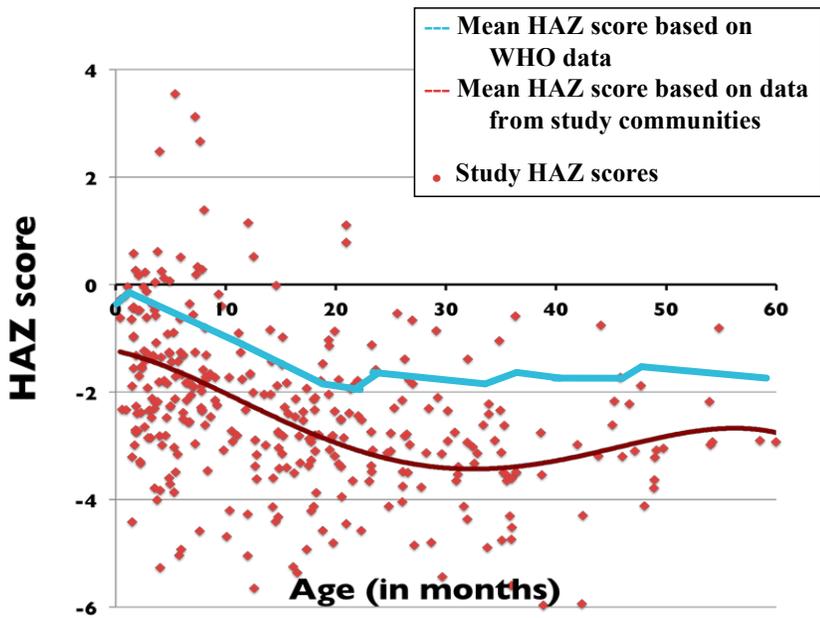
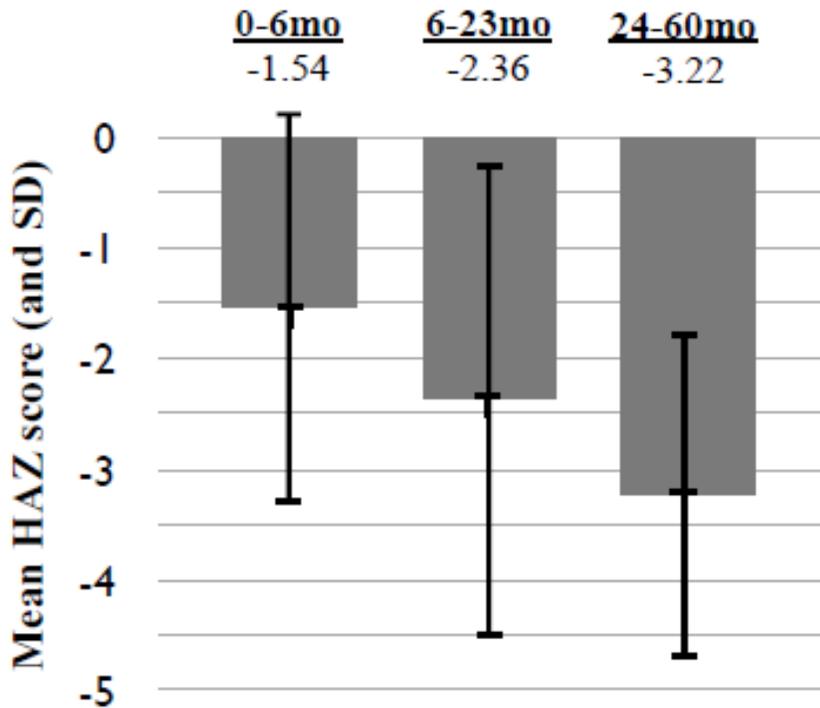


Figure 2. Mean HAZ scores in study communities, by age group. Bars represent standard deviations



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Salivary cortisol responses follow the expected diurnal pattern in field collections in *Mam*-speaking women in the Western highlands of Guatemala

Anne Marie Chomat, Hilary Wren, Marilyn E Scott, Kris Koski, Noel W Solomons

Moral and ethical principals to seek beneficial information while respecting the sensitivities and sensibilities of human subjects guide the study individuals and communities in CeSSIAM research. As such, CeSSIAM has worked over the years to make procedures for field collection of biomarkers as convenient and free of pain and discomfort as possible.

The diurnal pattern of cortisol secretion is an indicator of the day's accumulation of physical, inflammatory, oxidative and psychological stress [1,2]. Reproductive status also affects cortisol responses, with levels being overall higher in pregnant than non-pregnant women, and to increase throughout gestation [3].

A pilot study was performed during the summer of 2011, to assess feasibility for compliance with saliva collection in *Mam*-speaking pregnant and breastfeeding women in rural Quetzaltenango, and to determine if expected patterns are observed.

To this end, 59 women, 28 in pregnancy (5-9 months gestation) and 31 in lactation (14-130 days postpartum) were asked to collect saliva samples at the time of awakening, 30 minutes post-awakening (peak), and prior to going to bed (evening). Cortisol concentrations were measured at McGill University using a sensitive enzyme immunoassay kit (Salimetrics, State College, PA) [4].

Eighty-five percent of the women provided all three samples. Awakening cortisol levels were higher in pregnant ($0.41\mu\text{g}/\text{dl} \pm 0.15$) vs. breastfeeding ($0.25\mu\text{g}/\text{dl} \pm 0.13$) women, $p < 0.01$. Peak levels were also higher in pregnant ($0.43\mu\text{g}/\text{dl} \pm 0.21$) vs. breastfeeding ($0.24\mu\text{g}/\text{dl} \pm 0.14$) women, $p < 0.01$. In contrast, there was no significant difference in evening levels between pregnant ($0.20\mu\text{g}/\text{dl} \pm 0.16$) and breastfeeding ($0.13\mu\text{g}/\text{dl} \pm 0.15$) women ($p = 0.10$) (Figure 1). We found no significant differ-

ence between awakening and peak cortisol levels in either pregnant or breastfeeding groups. Both however exhibited significant differences in cortisol levels between awakening and evening levels, and between peak and evening levels ($p < 0.05$).

These findings confirm that the Guatemalan highland socio-cultural context is no impediment to undertaking quality cortisol response research. They also suggest that there may be little utility in gathering both awakening and peak levels within this study context. The variability in cortisol levels between individuals portends the possibility to associate this indicator with stressor exposures.

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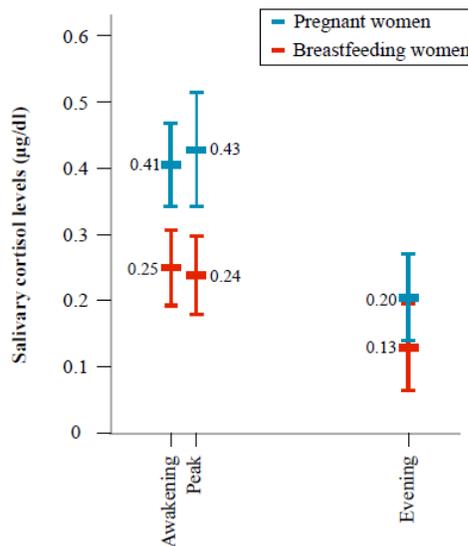


Figure 1. Salivary cortisol responses in pregnant (n=28) and breastfeeding (n=31) women in rural *Mam* communities in Quetzaltenango



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Framework for evaluation of guidelines for appropriate complementary feeding in the Xela Babies Study

Marieke Vossenaar, Ilse van Beusekom

The 2003 WHO “*Global Strategy for Infants and Young Child Feeding*” recommends the introduction of complementary foods at 6 mo of age (1). “*Infants are particularly vulnerable during the transition period when complementary feeding begins. Ensuring that their nutritional needs are met thus requires that complementary foods be: **Timely** – meaning that they are introduced when the need for energy and nutrients exceeds what can be provided through exclusive and frequent breastfeeding; **Adequate** – meaning that they provide sufficient energy, protein and micronutrients to meet a growing child’s nutritional needs; **Safe** – meaning that they are hygienically stored and prepared, and fed with clean hands using clean utensils and not bottles and teats; **Properly fed** – meaning that they are given consistent with a child’s signals of appetite and satiety, and that meal*

frequency and feeding method – actively encouraging the child, even during illness, to consume sufficient food using fingers, spoon or self-feeding – are suitable for age.”

Furthermore in the 2003 WHO/PAHO report entitled “*Guiding principles for complementary feeding of the breastfed child*” a series of 10 guiding principles for complementary feeding of the breastfed child were highlighted (2), these are summarized in **Table 1**.

Together with the WHO indicators for assessing infant and young child feeding taken from the WHO report entitled “*Indicators for assessing infant and young child feeding practices - Part I: Definitions*” (3), these principles serve as a framework for evaluation of appropriate complementary feeding in young children.

We propose to examine concordance with the WHO recommendations for young child feeding in a sample of 300 children aged 6 to 23 mo, attending a public health in the City of Quetzaltenango (Xela) located in the Western highlands of Guatemala. Interviews were conducted in 2011 with a structured questionnaire querying sociodemographics, current and past feeding practices, and morbidity.

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Table 1: Summary of the WHO guiding principles for complementary feeding of the breastfed child

1.	Practice exclusive breastfeeding from birth to six months of age, and introduce complementary foods at six months of age (180 days) while continuing to breastfeed.	
2.	Continue frequent, on-demand breastfeeding until two years of age or beyond.	
3.	Practice responsive feeding applying the principles of psychosocial care, specifically:	Feed infants directly and assist older children when they feed themselves, being sensitive to their hunger and satiety cues. Feed slowly and patiently, and encourage children to eat, but do not force them. If children refuse many foods, experiment with different food combinations, tastes, textures, and methods of encouragement. Minimize distractions during meal times if the child loses interest easily. Remember that feeding times are periods of learning and love. Talk to children during feeding, with eye-to-eye contact.
4.	Practice good hygiene and proper food handling.	
5.	Start at six months with small amounts of food and increase the quantity as the child gets older, while maintaining frequent breastfeeding.	The energy needs from complementary foods for infants with average breast-milk intake in developing countries are approximately 200 kcal/day at 6–8 months of age; 300 kcal/day at 9–11 months; and 550 kcal/day at 12–23 months.
6.	Gradually increase food consistency and variety as the infant gets older, adapting to the infant’s requirements and abilities.	Infants can eat pureed, mashed and semi-solid foods beginning at 6 months. By 8 months most infants can also eat ‘finger foods’. By 12 months, most children can eat the same types of food as consumed by the rest of the family.
7.	Increase the number of times that the child is fed complementary foods as he/she gets older.	For the average healthy breastfed infant, meals of complementary foods should be provided 2–3 times per day at 6–8 months of age and 3–4 times per day at 9–11 and 12–24 months of age, with additional nutritious snacks offered 1–2 times per day, as desired.
8.	Feed a variety of foods to ensure that nutrient needs are met.	Meat, poultry, fish, or eggs should be eaten daily, or as often as possible. Vitamin A-rich fruits and vegetables should be eaten daily. Provide diets with adequate fat content.
9.	Use fortified complementary foods or vitamin–mineral supplements for the infant, as needed.	In some populations, breastfeeding mothers may also need vitamin–mineral supplements or fortified products.
10.	Increase fluid intake during illness, including more frequent breastfeeding, and encourage the child to eat soft, varied, appetizing, favourite foods. After illness, give food more often than usual and encourage the child to eat more.	



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Exploring mother's practices and beliefs regarding offering traditional ritual fluids (*agüitas*) in the indigenous and non-indigenous contexts of metropolitan Quetzaltenango mothers

Leonie Peters, Claudia Arriaga, Rosario Garcia, Colleen M Doak

The WHO recommends exclusive breast feeding (EBF) for the first 6 months of an infant's life. However, they recognize another feeding pattern, called "predominant breast feeding" (PBF) which allows for water-based liquids. Among the exceptions that may be offered to an infant without a pattern reaching the "mixed feeding" stage are liquids called "ritual fluids." As the title implies, this practice is linked to cultural beliefs and norms. The common moment in an infant's life for ritual fluid administration is in the immediate post-partum period, either before offering milk from the breast (pre-lacteal feeds) or shortly after initiating breast feeding (post-lacteal feeds). The objective of the present study was to apply qualitative research techniques to identify the attitudes, beliefs and behaviors regarding traditional feeding practices, in particular the use of ritual fluids (*agüitas*) to facilitate the development of culturally adequate intervention strategies to improve child health.

The qualitative research approach, from anthropology, in which a framework of possible causal interactions is devised and examined, was the approach explored here. It was introduced to the Quetzaltenango academic community in a capacity-building effort. A modular methods course, lead by two of the authors – C.D. and R.G. – was conducted under the auspices of the branch of the Universidad "Rafael Landívar" in Quetzaltenango, and the students from the course participated in the collection of data analyzed here.

Fieldwork was conducted in the health centers of the urban municipalities of Quetzaltenango and La Esperanza in the Quetzaltenango Province of Guatemala. A conceptual framework was developed to identify questions most relevant to the personal, biological, broader socio-cultural and environmental factors influencing mothers' decisions regarding infant feeding practices. The bases for the analysis reported here come from a study that was conducted in the health center of Quetzaltenango in three phases.

In the first phase, dietetics students conducted key informant interviews related to early feeding practices with 12 mothers; these results were used to revise and refine the questions to further explore the use of *agüitas*. With this background, the second phase was conducted in a local health center by the second author (C.A.), primarily among non-indigenous mothers. In the final phase, key-informant interviews were moved over to a more suburban health center with a mixed ethnic clientele to evaluate differences between non-indigenous and indigenous mothers and performed by the third author (R.G.). A total of 37 interviews were conducted; 22 interviews with non-indigenous mothers and 15 with indigenous mothers of infants aged 20 days to 19 months.

We learned that the use of *agüitas* emerged as a common practice in the population in the first two phases, even among largely non-Mayan respondents. What was clarified in the final phases were the similarities and differences across ethnicities. Both indigenous and non-indigenous mothers reported using *agüitas* to heat up the body for preventing or treating "cold" infirmities (hot-cold concept). The most influential person in the decision to use *agüitas* for both ethnic groups was a close family member. As a generalization, indigenous mothers used more different types of *agüitas*, and they employed them for a broader variety of motives. Among the infusions mentioned for the relief of infant constipation were prunes, raisins and spearmint. Rice water was mentioned in relation to diarrhea. Colic is addressed by chamomile, anise, orange leaf, and spearmint according to the informants.

As a final insight, we found that mothers, themselves, consumed *agüitas*, putatively to maintain the quality of the maternal milk. Infusions based on lavender, alfalfa, barley and rice were among the ritual fluids taken by mothers for a lactation-related purpose.

This study shows that *agüitas* are commonly given to young children in Guatemala, and that the use of *agüitas* is culturally rooted. In general, a variety of types of *agüitas* are given to prevent or cure different kinds of symptoms and conditions or to maintain mothers' and child's health. A distinction in their use can be made between indigenous and non-

indigenous mothers, with indigenous mothers believing in the use of more and more varied types of *agüitas* in prevention and treatment of conditions affecting infants. Still too little is known about the preparation of *agüitas*. Because of the importance of *agüitas* in the Guatemalan culture shown by this study, one would be advised to move cautiously in intervening to change or eradicate the practices surrounding these ritual fluids.



Mint



Barley



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Editorial

The Art and Science of CeSSIAM

Late one night in 2006, two years into my anthropology doctoral coursework, I sent an email to CeSSIAM asking whether it would be possible to spend the upcoming summer at the Center. I was interested in how people who had long seen fat as a sign of fitness were making sense of rising rates of obesity in Guatemala. What were the local perspectives on these changes in body weight averages, I wanted to know. A few hours later I received a response from Dr. Noel W Solomons that didn't reply directly to my question, but instead critiqued the way I had phrased my inquiry and, at the same time, demanded that I be more precise about my notion of "obesity." This was my introduction to the character of the research at CeSSIAM: critique, improve-upon, critique again.

I spent that summer, and then the following year, affiliated with CeSSIAM. Many of my university colleagues warned me that medical anthropology's qualitative methods were not always well-received by the scientists we work among. We have a tendency to make situations complicated. Rather than develop analyses that sidestep the diverse, hard-to-quantify practices of every day life we ask questions and take inconvenient cultural diversity seriously. It's hard to create clean models that 'disprove null hypotheses' from this framework of critique, and my colleagues warned me that public health scientists would tire of this. If my colleagues are right, I was very lucky to find myself at CeSSIAM.

In the months I spent studying the nutrition transition as a cultural anthropologist, I saw countless nutritionists teach Guatemalans about foods' component parts: carbohydrates, fats, proteins, etc. Likewise, many of the public health programs I encountered created nutrition pedagogy that treated the human body as though it was an engine that could be easily controlled; the assumption was that if people knew more about vitamins and minerals they would make better dietary decisions. Yet many highlanders were frustrated by this model of nutrition education, finding that "global facts" about nutritional health failed to account for local experiences with food. More scientific knowledge about nutrition did not always translate into healthier bodies; more work was needed to bridge the gap between scientific knowledge and its implementation in public health programs. The science of nutrition needed to account not only for nutrients but also for cultural understandings of bodies and food.

CeSSIAM scientists have the tradition of meeting twice a week to do what most *social* scientists pride themselves in being good at: in a collegial way they critique each other, strategize ways to improve each other's projects, and think carefully about the questions they are asking and the implicit assumptions hidden in these questions. CeSSIAM is a center that promotes debate and I have thought many times while at these meetings that their researchers would make good anthropologists. The laboratory science of nutrition might be made up of facts. Certainly, there are plenty of scientists at the center who are concerned with these. But nutrition, as experienced in quotidian practices of homes, schools, grocery stores, etc. is often not reducible to mere facts and CeSSIAM researchers are dedicated to making sense of these complexities. They care about something as difficult to pin-down as "culture." (Or many cultures, as is the case in Guatemala). It is notable that much of CeSSIAM's research focuses not only on outcomes and results, but on the scientific methods through which these are achieved. While nutritional facts remain an important baseline for what they do, there is also encouragement to think reflexively about how these facts are collected.

The researchers at CeSSIAM were concerned about metabolic illness long before it became the hot topic that it is today. They were also willing to study obesity – of all things! – in Guatemala when the field of public health found this idea laughable (the science of the double-burden of malnutrition has advanced considerably in the past few years and no one should be laughing any longer). More recently, they have turned their attention toward water and hydration. They are trying to improve reporting of the liquids consumed in the context of the need for adequate water intake amid controversies of the marketing and choices of commercial beverages. They will even install a chemical analyzer to assess hydration status of children from samples of urine. Their prescience in matters of public health can be attributed to the critical-thinking culture of the center, as well as to the insistence of its researchers that knowledge about nutrition depends upon engagement with the people with whom they work. The center encourages its researchers to be critical and to ask difficult questions. In turn, its researchers are dedicated to the art of doing better science. It is a model of scientific inquiry that other centers would do well to emulate.

Emily Yates-Doerr

Emily Yates-Doerr is an anthropologist at the University of Amsterdam.



See you at EB 2012 in San Diego!

ORAL PRESENTATIONS

[Sunday April 22, 2012](#)

ABSTRACT ID: 2791. Concordance with the WHO guidelines for early child feeding through the first six months of life in a sample of infants of the Guatemalan highlands. [Ilse van Beusekom](#), Marieke Vossenaar, Gabriela Montenegro-Bethancourt, Colleen Doak, Noel W. Solomons. Session Title: Breastfeeding, Early Child Feeding, Diet and Growth Trends
Session Time: 3:00 PM - 5:00 PM, Program Number: 130.1, Location: San Diego Convention Center, Room 29D

[Tuesday April 24, 2012](#)

ABSTRACT ID: 2776. Intergenerational Transmission of Factors that Determine Infant Feeding Practices: a Qualitative Approach to Examining Guatemalan Maternal Experiences. [Rosario Garcia](#), Oscar Padilla, Colleen Doak, Marieke Vossenaar, Noel W. Solomons. Session Title: Feeding Young Children
Session Time: 3:00 PM - 5:00 PM, Program Number: 391.1, Location: San Diego Convention Center, Room 29D

ABSTRACT ID: 1535. Contribution of leading food sources, meals and presentations to dietary intake in government sponsored day-care centers in Guatemala (SOSEP). [Liza Hernández](#), Gabriela Montenegro, Lydia Kim, Odilia I. Bermudez, Marieke Vossenaar, Noel W. Solomons. Session Title: Feeding Young Children
Session Time: 3:00 PM - 5:00 PM, Program Number: 391.5, Location: San Diego Convention Center, Room 29D

POSTER PRESENTATIONS

[Sunday April 22, 2012](#)

ABSTRACT ID: 2789. Anthropometric assessment of lactating mothers attending public clinics in the Guatemalan highlands in metropolitan Quetzaltenango. [Linda Oyesiku](#), Colleen Doak, Marieke Vossenaar, Noel W. Solomons
Program Number: 652.1, Poster Board Number: C350, 12:45-1:45PM (I)

[Monday April 23, 2012](#)

ABSTRACT ID: 1540. Nutritional Status for less-explored micronutrients in underprivileged Guatemalan preschool children: Vitamin B12. [Liza Hernández](#), Noel W. Solomons, María-Eugenia Romero-Abal, Flor de María Gamero, Ligi Paul, Jacob Selhub, Melissa J.L. Bonorden, Richard M. Herreid
Program Number: 811.4, Poster Board Number: C43, 1:45-2:45PM (II)

ABSTRACT ID: 496. Comparison between self-reported nutrient intake from 24-h recall and Food Frequency Questionnaire (FFQ), at baseline, among Spanish overweight and obese participants in a metabolic trial. [María-José Soto-Méndez](#), Emilio Martínez-de-Victoria, Gabriela Lobo, Julio Boza, Michelle Kellerhals, Antonio Pérez-de-la-Cruz, Angel Gil, María-Dolores Mesa, Concepción-María Aguilera
Program Number: 813.6, Poster Board Number: C72, 1:45-2:45PM (II)

ABSTRACT ID: 2801. Energy contribution on non-breast milk items reported for 5 month old, low-income infants in metropolitan Quetzaltenango, Guatemala. [Jeniece Alvey](#), Marieke Vossenaar, Colleen Doak, Noel W. Solomons
Program Number: 828.3, Poster Board Number: C338, 12:45-1:45PM (I)

ABSTRACT ID: 5549. The pattern of initiating mixed feeding by Guatemalan infants and toddlers: reported age of introduction of drinks and foods in breastfeeding children. [Marieke Vossenaar](#), Ilse van Beusekom, Gabriela Montenegro-Bethancourt, Colleen Doak, Noel W. Solomons
Program Number: 828.4, Poster Board Number: C339, 1:45-2:45PM (II)

ABSTRACT ID: 7968. The pattern of offering ritual fluids (agüitas) to infants and toddlers in the Guatemalan highlands in metropolitan Quetzaltenango. [Colleen Doak](#), Robine van der Staare, Ilse van Beukoms, Maiza Campos, Marieke Vossenaar, Noel W. Solomons
Program Number: 828.6, Poster Board Number: C341, 1:45-2:45PM (II)

ABSTRACT ID: 1531. Classification of the Items (Ingredients) in a 40-day Rotating Menu Offered to Day-Care Center Attendees in a Government-Sponsored Program (SOSEP) according to the Monteiro Scale of Food-Processing. [María José Soto-Méndez](#), Liza Hernández, Noel W. Solomons
Program Number: 1004.4, Poster Board Number: C4, 1:45-2:45PM (II)

ABSTRACT ID: 1541. Nutritional Status for less-explored micronutrients in underprivileged Guatemalan preschool children: Vitamins D. [Liza Hernández](#), Noel W. Solomons, María-Eugenia Romero-Abal, Flor de María Gamero, Laura Armas, Melissa J.L. Bonorden, Richard M. Herreid. Program Number: 1030.1, Poster Board Number: C314, 12:45-1:45PM (I)

ABSTRACT ID: 331. Age of introduction of ten sentinel complementary foods as reported for 6 to 12 month old, low-income infants in metropolitan, Quetzaltenango (Western Highlands), compared to Guatemala City and Santo Domingo Xenacoj (Central Highlands). [Marieke Vossenaar](#), Raquel Campos, Liza Hernandez, Noel W. Solomons
Program Number: 1028.3, Poster Board Number: C294, 12:45-1:45PM (I)

ABSTRACT ID: 361. Reported changes in feeding practices during and after illnesses in 6 to 23 month old children receiving continued breastfeeding in the Western Highlands of Guatemala. [Marieke Vossenaar](#), Rosario Garcia, Colleen Doak, Noel W. Solomons
Program Number: 1028.5, Poster Board Number: C296, 12:45-1:45PM (I)

ABSTRACT ID: 2795. Stunting rates in young children aged 6 to 23 months in infants and toddlers born in metropolitan Quetzaltenango, Guatemala. [Marieke Reurings](#), Colleen Doak, Marieke Vossenaar, Noel W. Solomons
Program Number: 1030.3, Poster Board Number: C316, 12:45-1:45PM (I)

ABSTRACT ID: 8650. Prevalence of rearing by an overweight/obese mother (early exposure to an obesogenic environment) among infants in a urban metropolitan area of the Guatemalan highlands. [Colleen Doak](#), Marieke Reurings, Maiza Campos, Marieke Vossenaar, Noel W. Solomons
Program Number: 1030.7, Poster Board Number: C320, 12:45-1:45PM (I)