“[the Pediatrician] Said That Maybe My Milk, Instead Of Doing Good, No Longer Helped”: The Ecology Of Infant Formula In Rural Communities In Central Mexico.

Paulina Luna Martinez

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“[The pediatrician] said that maybe my milk, instead of doing good, no longer helped”: The Ecology of Infant Formula in Rural Communities in Central Mexico.

A Thesis Submitted to the Yale University School of Medicine in Partial Fulfillment of the Requirements for the Degree of Doctor of Medicine

by

Paulina Luna Martinez, Diana Bueno Gutierrez, and Rafael Pérez-Escamilla. Global Health Concentration, Yale University, School of Public Health, New Haven, CT.

2021
ABSTRACT

The objective of this study was to determine the social and cultural factors that influence the use of formula in two rural and indigenous communities in Central Mexico. We used a qualitative methodology based on the socioecological framework and integrative model of behavior. Interviews and focus groups were carried out with mothers, fathers, and grandparents of children two years of age or younger and healthcare providers attending to mothers and infants. We found that breastfeeding was still favored in both communities, however, many mothers viewed formula as a complement for breastfeeding. Young and first-time mothers were more likely to prefer formula for the convenience and as a solution for breast pain, insufficient milk, and body image. Healthcare providers promoted the use of formula through their own beliefs, information, communication, and conflicts of interest with formula industry representatives. The recent social and economic changes in these communities combined with the increased advertising and availability of breast milk substitutes, have facilitated the preference for formula. Women in rural, indigenous communities in Central Mexico are increasingly using formula. Efforts at the policy and institutional levels are needed to protect mothers and their children from the detrimental consequences of unregulated formula promotion and the formula culture that it brings with it.
ACKNOWLEDGEMENTS

We thank all the families and healthcare providers who took their time to participate in this study and share their experiences with us. We are very grateful for the entire Un Kilo de Ayuda research team (Dr. Angelica Garcia-Martinez, Tania Valdes, Alberto Zelocuatecatl-Aguilar, Gerónimo Medrano-Loera, and Bábara Guerrero) and staff who provided transportation and guidance throughout our data collection. This project would not have been possible without the help and support from everyone. We also thank the Wilbur G. Downs International Health Student Travel Fellowship, Yale School of Medicine Office of Student Research, and Un Kilo de Ayuda for funding this research.
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INTRODUCTION

Breastfeeding is one of the top interventions for reducing under-5 mortality and improving human development.\(^{(1)}\) The promotion, protection, and support of breastfeeding is a key component of the Nurturing Care Framework, which provides an actionable plan focusing on children’s social, educational, and health needs in order to advance early childhood development.\(^{(2)}\) The benefits of breastfeeding on maternal and child health as well as food security, education, health equity, and environmental sustainability make breastfeeding an essential aspect for meeting the 2030 Sustainable Development Goals.\(^{(3, 4)}\)

Despite the benefits and cost-savings of breastfeeding, Mexico has one of the lowest rates in Latin America, with an exclusive breastfeeding rate of only 28.6\(^{\%}\).\(^{(5)}\) Indeed, exclusive breastfeeding in Mexico’s low-income, rural, and indigenous communities are quite suboptimal and need to be understood in the context of the profound epidemiological and nutritional transition that Mexico is experiencing\(^{(6, 7)}\). In Mexico, 69.5\(^{\%}\) of the indigenous population lives under poverty conditions, 43\(^{\%}\) have not completed primary education, and 55.2\(^{\%}\) work in low-skilled manual jobs.\(^{(8)}\) The percentage of the population in Mexico that self-identifies as indigenous is 21.5.\(^{(9)}\)

Previous studies have shown that economic development in indigenous communities generate changes in breastfeeding practices.\(^{(7, 10, 11)}\) The speed at which these changes occur depends on the socio-cultural context. For example, in some indigenous communities the duration of exclusive breastfeeding is closely associated with mothers’ adherence to social norms, while the overall duration of breastfeeding is impacted by market integration and other individual factors.\(^{(10)}\) Such contextual differences could help explain why certain social changes have led to the deterioration of exclusive breastfeeding practices in Mexico’s indigenous communities.\(^{(7)}\)
Major economic, social, and cultural changes underlying the epidemiological and nutritional transitions in rural and indigenous communities have been linked with an increased use of ultraprocessed foods, including infant formula,\(^{(12)}\) and can lead to the perceptions that formulas are more “modern” and equal to or better than breastmilk.\(^{(4, 13, 14)}\) The infant feeding industry has played a major role in promoting a formula culture. There is compelling evidence that increased availability and large-scale promotion of formula negatively impacts breastfeeding rates.\(^{(15)}\) Infant formula companies are now heavily marketing their products in low- and middle-income countries (LMIC) as they are experiencing rapid economic growth and have higher fertility rates and population densities.

There is limited research on how individual, social, cultural, and economic factors have interacted to influence infant feeding practices across LMICs. Additionally, infant feeding decisions have generally been seen through a biomedical lens that places all the responsibility or even blame for not breastfeeding on mothers.\(^{(11, 16)}\) This is concerning because previous research has shown that improving breastfeeding rates requires support from society at large, including family, friends, health professionals and employers, as well as major structural changes in health and social policies.\(^{(3, 4)}\) Thus, interventions to promote breastfeeding must be based on a socio-ecological framework (SEF)\(^{(17)}\) which not only focuses on individual factors, but also on the mothers’ interpersonal relationships, such as those with family and health personnel, the institutions with which they interact, and the social and cultural norms in which these operate. When a SEF is used, factors that may have been missed when using more individualistic models can be identified, such as the role of sexism, racism and discrimination.\(^{(11, 18)}\)

Mexico has a historical debt with indigenous populations as they have been grossly neglected by government policies and the healthcare system. As a result, they often lack access to
quality health care and other services that are respectful of their cultures. In Mexico there are 68 indigenous groups, each with its own native language.\(^{(9)}\) It is important to study the conditions that occur in different indigenous groups and not generalize the findings obtained from one community to another. Given the limited infant feeding research focusing on indigenous groups in Mexico, we were interested in better understanding the multi-level factors that affect infant feeding practices in communities with a strong presence of indigenous groups. Thus, our objective was to explore the factors that influence formula use in two rural, indigenous communities in Central Mexico where formula use has rapidly increased in recent years. The study was designed based on the SEF with the expectation that it could inform future interventions targeting highly vulnerable populations.
METHODS

Study Sites

For this study, we worked in two rural communities in the State of Mexico, which is located in the center of the country and has almost 15 million people, 9.1% of which identify themselves as indigenous.\(^{(19)}\) The State of Mexico has a Human Development Index of 0.74 and a level of inequality evaluated through the Gini coefficient of 0.42, indicating the strong presence of social inequities which are greater in the poorest communities.\(^{(20)}\) Although the state has a relatively higher economic development than the rest of the country, extreme poverty ranges from 21 to 49% across disadvantaged municipalities.\(^{(20)}\) Twelve percent of its localities lack basic home services and 18% lack food access.\(^{(20)}\) The two communities included in this study were Santa Ana Nichi and Ganzdá, which were selected by Un Kilo de Ayuda (UKA), a national non-profit organization with whom we partnered for this study. UKA selected these sites due to their previous work in both communities. Santa Ana Nichi has a population of 1,213 people, of which 26% are indigenous, with the majority being Mazahua. Ganzdá has 2,433 inhabitants of which 34% are indigenous, mostly Otomí.\(^{(19, 20)}\)

In Mexico, people who have a formal job have social security that offers health services. Until 2019, people who did not have social security could join the Seguro Popular social program. Between 73 and 75% of the inhabitants in Santa Ana Nichi and Ganzdá were affiliated to Seguro Popular\(^{(19)}\), which included prenatal, postpartum, and neonatal care services. The women of these communities could receive maternal care through Seguro Popular, private clinics and physicians’ offices (some affiliated with pharmacies), traditional midwives and healers, or UKA facilities. The promotion and support for breastfeeding in both sites were also provided by Seguro Popular and UKA as well as the government’s conditional cash program, Prospera,
Design and Participant Selection

Individuals’ behaviors are the result of social influences at different levels of the SEF, thus changing behavior calls for the design of interventions to address those social influences. Bronfenbrenner’s SEF(17) places the behavior of individuals within a broad social context. For this study, we adapted this model to identify modifiable risk factors that influence breastfeeding behaviors that can be addressed through public health programs (Table 1) that address multiple factors across sectors and different levels of influence.

**Table 1**—Definitions from the Socioecological Framework and Integrative Model

<table>
<thead>
<tr>
<th>Themes from the SEF</th>
<th>Definition</th>
<th>Subthemes from the IM</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual Factors</td>
<td>Intrapersonal characteristics such as knowledge, beliefs, and self-efficacy that influence decision making</td>
<td>Behavioral Beliefs</td>
<td>Mother’s understanding and opinions about BF. It refers to the degree to which breastfeeding is positively or negatively valued</td>
</tr>
<tr>
<td>Interpersonal Factors</td>
<td>Formal and informal social support systems who can be important sources of influence</td>
<td>Normative Beliefs (Family and Healthcare Providers)</td>
<td>Mother’s perception of the social pressures for what is acceptable or not acceptable BF behavior. This perception is determined by close referents such as family and doctors.</td>
</tr>
<tr>
<td>Organizational Factors</td>
<td>Influence by established institutions and their structure and process for operation (healthcare system and work/school)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural Factors</td>
<td>The social, cultural and economic context that influence behavior</td>
<td>Social norms/ Background influence</td>
<td>Informal understandings and expectations that govern the behavior of members of a society</td>
</tr>
</tbody>
</table>

SEF: Socioecological Framework  
IM: Integrative Model
From an individual behavior perspective, we chose to follow the integrative model (IM) because it has been previously applied to understanding breastfeeding behaviors\(^{(21,22)}\). This model proposes that different types of beliefs (behavioral, normative and control) influence the maternal intentions to breastfeed, which in turn influence actual breastfeeding practices (Table 1). One critique of this model suggests that the intention of an individual is not enough to change behavior, but that there are other social factors to consider.\(^{(23)}\) To address this, we integrated elements of the SEF to the IM to create a final model that takes into account structural factors such as cultural, social and economic influences.

The experience of the individuals that are considering adopting a behavior must be considered along with a socio-cultural perspective to interpret its determinants.\(^{(24,25)}\) Qualitative methods are essential for identifying such determinants.\(^{(26)}\) Therefore, in this study, we conducted in-depth interviews, focus groups, and observations with parents, grandparents, and healthcare providers. Participants were selected through purposive sampling and were approached in areas with high population density (i.e., plazas, waiting areas in clinics). Inclusion criteria consisted of mothers, fathers and grandparents of children two years of age or younger and healthcare providers who attended to mothers and infants (physicians, nurses, health workers, and traditional healers). This study is reported as per the consolidated criteria for reporting qualitative research (COREQ) checklist.\(^{(27)}\)

**Data Collection**

**Focus Groups and Interviews**

Interviews and focus groups were conducted in Spanish by four female researchers, including the lead author, between June and July 2018. All interviewers were trained in qualitative research methods and were native Spanish speakers. Interviews lasted 15 minutes to one hour
while focus groups lasted approximately one hour. A short demographic questionnaire was administered at the end of the interviews and focus groups. The number of interviews and focus groups conducted were enough to reach data saturation.

**Script Guide**

The interview and focus group guides were semi-structured, and their design was based on the SEF. These guides were reviewed by members of UKA to ensure cultural appropriateness. The guide for mothers explored: 1) prenatal experiences; 2) infant feeding practices before/after six months; 3) infant feeding practices in the community; 4) benefits of breastfeeding; and 5) work and school. Similar topics were included in the guides for fathers, grandparents, and healthcare providers as well as additional topics that were more applicable to these groups. For example, the guide for healthcare providers explored: 1) protocols surrounding pregnancy and birth deliveries; 2) breastfeeding recommendations; and 3) formula industry practices.

**Observations**

Direct, nonintrusive observations in the clinics, hospitals, and during interviews were carried out by the four female interviewers to further understand the factors affecting breastfeeding practices. While no structured guides were used for this process, we wrote down any especially noteworthy exchanges that we wanted to make sure were reflected on the interview transcripts. We also visited the main pharmacies, clinics, and hospitals in each community to note the brands, prices, and visibility of infant formulas being sold.

**Data Analysis**

Focus groups and interviews were recorded and transcribed verbatim by native Spanish speakers, including the lead author. The lead author reviewed all recordings and transcripts to ensure quality and accuracy. Data analyses were conducted in two stages. First, PL and DBG
analyzed the transcripts independently using thematic and constant comparison analysis.\(^{(28)}\) When differences between the first two coders were identified, they were discussed until a consensus was reached. They created a codebook using \textit{a priori} codes based on the SEF. For the main themes, four levels of the SEF were used (individual, interpersonal, institutional, and structural) while some elements from the IM were added as part of subthemes (Table 1). Behavioral and control beliefs were integrated into individual factors as they pertain to the mothers’ own understanding and perceptions. Normative beliefs were placed within the interpersonal level because they are perceptions determined by close connections, such as family and healthcare providers. Structural factors included social norms and infant feeding industry roles. These two elements appear in the IM as “background influence” accompanied by others, such as demographics, culture, and media exposure.

In the second stage of analysis, two male research assistants from UKA analyzed 16 transcriptions (20% of interviews) on Dedoose, a web application for qualitative and mixed method analysis (Dedoose, LLC, Los Angeles, CA). These transcriptions were randomly selected and were representative of all participant groups. Analysis from the second set of coders was highly consistent with the initial analysis and additional observations were integrated into the final results.

\textbf{Figure 1} summarizes the data collection, analysis, and validation process. To maximize the validity of our findings, we used a rich data (verbatim transcripts and descriptive notes) approach and data triangulation strategy.\(^{(29,30)}\) The latter was done at different levels by having: 1) multiple sources of information provided by mothers, family members, and healthcare providers; 2) different methods for data collection through interviews, focus groups, and observations; 3) four different data coders with different genders and backgrounds (medicine, psychology, community nutrition, and child development); and 4) theoretical validation through the comparison of our data
with the SEF and IM from previous studies. This triangulation strategy allowed us to prioritize the findings that were found by most or all of the coders through discussion and consensus.

**Ethics Statement**

This study received approval by The Yale Human Subjects Committee. We obtained verbal consent from all participants at the start of each interview and focus group.
RESULTS

In total, we conducted 59 interviews with 63 individuals and two focus groups with 11 individuals for a total of 74 participants (25 mothers, 12 fathers, two grandfathers, 11 grandmothers, and 24 healthcare providers). Two interviews were with a mother and a grandmother, one interview was with two healthcare providers, and one interview was with a mother and a father. We included grandfathers with fathers rather than with grandmothers due to limited availability of grandfathers and the unique influence of grandmothers on breastfeeding. Forty-nine participants were from Santa Ana Nichi and 25 from Ganzdá. Thirty-four percent of participants spoke or understood an indigenous language. The median age of the family participants’ youngest child was 16 months. Both focus groups took place in Ganzdá; one with five mothers took place in a community center while one with six nurses was conducted in the hospital after the nurses’ shift. A summary of participants’ sociodemographic characteristics is found on Tables 2 and 3.
### Table 2— Sociodemographic Characteristics of Participants from Indigenous Communities, Santa Ana Nichi and Ganzdá, Mexico.

<table>
<thead>
<tr>
<th></th>
<th>Mothers</th>
<th>Fathers</th>
<th>Grandmothers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Santa Ana</td>
<td>Ganzdá</td>
<td>Santa Ana</td>
</tr>
<tr>
<td>(n=14)</td>
<td>(n=11)</td>
<td>(n=10)</td>
<td>(n=4)</td>
</tr>
<tr>
<td><strong>Age (years), median (range)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>23 (17-29)</td>
<td>27 (16-31)</td>
<td>26 (19-37)</td>
</tr>
<tr>
<td><strong>Education, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary School</td>
<td>4 (28.6)</td>
<td>1 (16.7)</td>
<td>3 (33.3)</td>
</tr>
<tr>
<td>Middle School</td>
<td>6 (42.9)</td>
<td>5 (83.3)</td>
<td>4 (44.4)</td>
</tr>
<tr>
<td>High School</td>
<td>2 (14.3)</td>
<td>-</td>
<td>1 (11.1)</td>
</tr>
<tr>
<td>College</td>
<td>2 (14.3)</td>
<td>-</td>
<td>1 (11.1)</td>
</tr>
<tr>
<td>Did not attend</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>No information</td>
<td>-</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td><strong>Occupation, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homemaker</td>
<td>8 (61.5)</td>
<td>5 (100)</td>
<td>-</td>
</tr>
<tr>
<td>Business</td>
<td>4 (30.8)</td>
<td>-</td>
<td>4 (44.4)</td>
</tr>
<tr>
<td>Student</td>
<td>1 (7.7)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Skilled Worker</td>
<td>-</td>
<td>-</td>
<td>5 (55.6)</td>
</tr>
<tr>
<td>No information</td>
<td>1</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td><strong>Marital Status, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>3 (21.4)</td>
<td>2 (40)</td>
<td>2 (25)</td>
</tr>
<tr>
<td>Living with Partner</td>
<td>11 (78.5)</td>
<td>3 (60)</td>
<td>5 (62)</td>
</tr>
<tr>
<td>Single</td>
<td>-</td>
<td>-</td>
<td>1 (13)</td>
</tr>
<tr>
<td>No information</td>
<td>-</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td><strong>Speak/Understands Indigenous Language, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>6 (42.9)</td>
<td>1 (20)</td>
<td>1 (14)</td>
</tr>
<tr>
<td>No</td>
<td>8 (57.1)</td>
<td>4 (80)</td>
<td>6 (86)</td>
</tr>
<tr>
<td>No information</td>
<td>-</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td><strong>Recipient of Social Program, n (%)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5 (35.7)</td>
<td>3 (60)</td>
<td>3 (38)</td>
</tr>
<tr>
<td>No</td>
<td>9 (64.3)</td>
<td>2 (40)</td>
<td>5 (62)</td>
</tr>
<tr>
<td>No information</td>
<td>-</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

*Percentage is for individuals with known information*
**Table 3**— Sociodemographic Characteristics of Healthcare Providers from Indigenous Communities, Santa Ana Nichi and Ganzdá, Mexico.

<table>
<thead>
<tr>
<th></th>
<th>Santa Ana</th>
<th>Ganzdá</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=14)</td>
<td>(n=10)</td>
</tr>
<tr>
<td><strong>Age (years), median (range)</strong></td>
<td>31 (25-52)</td>
<td>23 (22-46)</td>
</tr>
<tr>
<td><strong>Sex, n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>7 (50)</td>
<td>9 (90)</td>
</tr>
<tr>
<td>Male</td>
<td>7 (50)</td>
<td>1 (10)</td>
</tr>
<tr>
<td><strong>Title, n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Doctor</td>
<td>8 (57.1)</td>
<td>1 (10)</td>
</tr>
<tr>
<td>Pediatrics</td>
<td>1 (12.5*)</td>
<td>0*</td>
</tr>
<tr>
<td>Obstetrics/Gynecology</td>
<td>3 (37.5*)</td>
<td>0*</td>
</tr>
<tr>
<td>General Medicine</td>
<td>4 (50*)</td>
<td>1 (100*)</td>
</tr>
<tr>
<td>Nurse</td>
<td>4 (28.6)</td>
<td>9 (90)</td>
</tr>
<tr>
<td>Hierbera (Healer)</td>
<td>1 (7.1)</td>
<td>-</td>
</tr>
<tr>
<td>Health Promoter</td>
<td>1 (7.1)</td>
<td>-</td>
</tr>
<tr>
<td><strong>Time practicing (years), median (range)</strong></td>
<td>0.5 (8 days-20 years)</td>
<td>12 (0.5-19 years)</td>
</tr>
<tr>
<td><strong>Time in current community (years), median (range)</strong></td>
<td>3.25 (0.5-31)</td>
<td>4 (5 months-19 years)</td>
</tr>
</tbody>
</table>

*Percentage amongst medical doctors

**Overview of Themes**

A summary of participants’ key quotes by themes and subthemes can be found on Table 4. Figure 1 shows our final conceptual model combining the SEF and IM with our findings. In these communities we found that breastfeeding continues to be an infant feeding norm. However, we observed that: 1) there was a low frequency of exclusive breastfeeding and 2) there was a negative connotation about breastfeeding related to ideas of “modernity”.
## Table 4—Themes, Subthemes, and Exemplary Quotes

<table>
<thead>
<tr>
<th>Structural Factors</th>
<th>Social Norms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Traditional Practices</strong></td>
<td><em>&quot;We have the belief that [mothers do not produce enough milk] because they are very cold. So once the mother is too cold, the first thing we recommend is steam baths, and you have to start taking care of everything in her diet. Give her [the mother], for example, a little more calcium and the brewer's yeast.&quot;</em> HCP SA10</td>
</tr>
<tr>
<td><strong>Protection from “Bad Vibes”</strong></td>
<td><em>“Something that will help them [babies] a lot is this tea made from chamomile, fennel, star anise because this is the first thing that will prevent, for example, problems with colic, empacho. Because then there are times when the mother does not drink enough water, so one of the things that babies suffer from the most is colic or fullness, or here we know it as when they get too full of milk.”</em> HCP SA10</td>
</tr>
<tr>
<td><strong>Perception of Insufficient Milk</strong></td>
<td><em>“I’ve noticed, as I told you, that sometimes they do give them [babies] teas, or cleanses. Always, out of 10 babies who come here, 9 bring their bracelets, or they already took them to be cleaned. First, even before they are brought here [to the clinic], if they [mothers] don’t know what they [babies] have, they take them to get rubbed, to get cleansed, and then if it they’re not better, then they come for here.”</em> HCP SA5</td>
</tr>
<tr>
<td><strong>Modernity</strong></td>
<td><em>“If they [mothers] feel that they are not going to produce milk, if there is envy or bad vibes from sisters-in-laws, then there are amulets, braids of garlic.”</em> HCP SA10</td>
</tr>
<tr>
<td><strong>Status and Classism</strong></td>
<td><em>Interviewer: And did they do something to increase milk production? Father SA4: She [the mother] only drank atoles. Atoles made of dough. Interviewer: And why the atoles made of dough? Father SA4: [laughs] Well, they normally tell you that’s what makes them have milk. Others say they drink beer or pulque [laughs].”</em></td>
</tr>
<tr>
<td><strong>Breastfeeding in Public</strong></td>
<td><em>“If people that have a little more means will buy milk and those that don’t, don’t. They’ll choose to breastfeed and sometimes until [the baby is] a year and half, two years old.&quot;</em> HCP SA1</td>
</tr>
<tr>
<td><strong>Gender Roles</strong></td>
<td><em>&quot;Also the fear of revealing one’s breast and for others see you, that can also influence [mothers].&quot;</em> HCP SA8</td>
</tr>
<tr>
<td><strong>Interviewer:</strong> “How could fathers help promote breastfeeding?” Father SA3: “You just can’t get through to men [laughs].”</td>
<td></td>
</tr>
<tr>
<td><strong>Gender Roles</strong></td>
<td><em>“Well, unfortunately here and in many other areas, I dare say, machismo is common and sometimes talking to a man about a topic is more feminine is like, ‘No, wait, hold on.’”</em> [Firm and defensive tone]. HCP SA8</td>
</tr>
</tbody>
</table>
"It's just the moms that...take care of themselves a lot and don’t want to lose their figure and everything. But I would tell them, 'You already lost the biggest thing, dear. Ever since you got pregnant, or ever since you had [sexual] relations. So, what else are you going to take care of?... Because if you are not ok, then neither is the baby going to be ok, dear. Besides, your husband is not going to be ok. He’s going to say, 'This girl that I found just wants everything bought for her.' No, no, really. And then they [the moms] themselves start to react." HCP SA3

Body Image

"Today's moms are more modern, they no longer want their breasts to be disfigured, or they don’t want to lose their figure, because even for example, a modern mother right now no longer wants to have a belly or sometimes we already that they don’t want to get pregnant, because [they say], 'I don’t want to lose my figure and my husband will no longer accept me.'" Grandmother SA10

"With the lady I know, it’s because I’ve talked to her: ‘Why don’t you breastfeed your kid?’ ‘Oh, it’s because [my breasts] will start drooping and my husband doesn’t want that.” Father SA6

**Infant Food Industry**

**TV and Social Media**

"Above all, those [formulas] that have advertisements on TV, are the ones that moms most search for. In fact, with regard to formulas, including baby food, like Gerber, diapers, everything, everything, it’s more so what they see on TV, and yea, the formulas that they most look for are exactly those.” HCP SA5

**Formula Nutrients**

"Since they advertise them on TV, they [moms] believe that they can count on them having the adequate nutrients so that [the baby] develops the most. They buy a lot, by the package, I would dare to say, even by the box. But the most significant or the most influential thing here is formula.” HCP SA8

**Formula Availability**

"Perhaps those from the downtown area who have the economic solvency, buy vegetables, fruit and formula. It’s the same as here [periphery of the city], maybe it is only tortillas, a chicken or bean broth and formula. But without saying brands, here one could buy a can of formula for $80-$100 pesos, while some of those in the downtown area could pay $500-$600 pesos for a formula of the same size.” HCP SA8

**Formula Representatives**

"In government hospitals it is prohibited [that formula representatives promote their product], in fact, they aren’t even allowed to go in. But in private hospitals, they will." HCP SA6

"From what I’ve noticed, not specifically at this hospital, but on other occasions and with other doctors, even [formula representatives] will pay for them to have courses or like – come on, I don’t know – they will promote it that way. They bring samples and leave them.” HCP SA4

**Organizational Factors**

**Healthcare System**

**Inadequate Training**

"We explain to the mothers how they can give themselves massages to be able to produce milk. This is done by the nurses who are sort of trained.” Resident, HCP SA13_14

"Well not much [training], in the specialty, not much. You get that more than anything while working... [You] do your online course on breastfeeding and all of that.” HCP SA4

**Time Constraints**

"Sometimes because of time constraints, if there are a lot of people, or for any reason, [mothers] are not given [information] correctly, it is not explained to them, their doubts are not clarified.” HCP SA7

**Private vs. Public Hospitals**

"There are patients who if they don’t have good [milk] production, then sometimes they [HCP] won’t be insistent very much, not here, but in other private hospitals, [they say] ‘No, just give him/her formula.’ Here we make sure [to say] ‘No, no no. Let’s see, keep trying, keep trying.’” HCP SA4

"Yes, some [mothers] say, ‘Oh, I don’t want to suffer, I want a c-section.’ Or others will say, ‘No, I want a normal [birth].’” Grandmother SA10

**Social Programs**

"I’ve been supporting my granddaughter and my daughter, the little that I know, is from when I would take them to consults, and they would explain to them, and I would be learning too...Don’t give them [kids] water before they are six [months]. For me it helped a lot when they went to Oportunidades.” Grandmother SA10

**Work and School**

"I want to give [my baby] formula so that it’s easier to leave her and I can continue with college.” Mother & Grandmother SA2
| Long distance jobs | "There are moms that leave to work and they don’t just leave in the afternoons or in the mornings, they leave the whole week. It’s common that they don’t work close to the community… Many work in Mexico City like maids, so, they leave their kids, I don’t know, a week, two weeks, so it’s very complicated." HCP SA6 |
| Infrastructure | “Especially in this area, there are many families that sometimes don’t even have a fridge at home, so there isn’t much for them to be able to store milk for their babies, or to be able to tell them to save it in the fridge.” HCP SA6 |
| Milk Expression | “They view the process as very uncomfortable. They’ll do it with a breast pump. At most, they will do it for a month and afterwards they will move on to formula.” HCP SA1 |

**Interpersonal Factors**

| Normative Beliefs (Family) | “Even if the mother goes to live with the husband, her mother-in-law ends up being the role of her mother. Generally, if they [the mothers] live nearby, they have both, their mother and mother-in-law. And if they go to a more distant town, only the mother-in-law will be there.” HCP SA10 |
| Grandmothers’ Positive Influence | “What happens is that I like to read and when I go to hospitals, I read there. And then there are brochures and I read those.” Mother & Grandmother SA2 |
| Grandmothers’ Negative Influence | “Well, I think that 99% [of mothers] come accompanied … now about 10% are accompanied by the couple and all the others come with their mother, the grandmother and things like that.” HCP SA1 |

**Normative Beliefs (Healthcare Providers)**

| Recommendations for Formula Use | “If they [the babies] are older, like eight months, formula is recommended and if they don’t want a bottle, then with cups… They [the pediatricians] recommend NAN 1 over others and if they are low in weight, Enfamil.” HCP SA3 |
| Lack of Knowledge | “They [the babies] should have a range [for eating] of 2 to every 3 hours, the first months. There are people who say, ‘No, every time they cry, right?’ ‘Goodness, well, it can’t be every time they cry, ma’am, because then we would give them … all day right?’ … As for teas, definitely nothing, sometimes I tell them [the mothers] that water [can be given] every so often, just to let them [the babies] be disciplined at meal times which are every 3 hours.” HCP SA1 |
"If the mom is not well nourished then it’s not going to matter that she is breastfeeding, so I tell them to breastfeed until they turn one... You start seeing that the baby is stagnating in weight...and they [mothers] say, ‘Well, I am only breastfeeding them’ ‘Well you know what, you should start to give them formula. Because truly, the nutrients that you’re giving them are not working anymore.’” HCP SA1

“I was going to give them PediaSure milk because they [the pediatrician] said that maybe my milk, instead of doing them [the baby] good, no longer served them... that later, [breastfeeding] was nothing more than entertainment.” Mother SA9

Negative Attitudes

"I feel like sometimes it depends a lot on the help that the nurses give you at the hospital. Some of them simply will leave them [mothers] there and say, ‘Here is your baby, breastfeed him/her.’ And others will tell you to take care while breastfeeding, to watch them, caress them, make eye contact, and more." HCP SA8

"If you really don’t want to give your baby [breastmilk] it’s because you don’t love him/her. Truthfully. Because what does it cost you?” HCP SA3

"And then the nurse told me ... as they say, 'Give them a little of this, give them a lot of this.' And then I get confused because it’s this there, this that.” Mother G4

Racism, Classism, Sexism

"People don’t understand because of ignorance." HCP SA13_14

"Oh yes. Mothers-in-law and grandmothers. Because where we live, it’s kind of like lower level. So, the women are clinging to what the grandmother said, what the other grandmother said, the one that already died, and the great-grandmother.” HCP SA3

"In the downtown, for example, they think that I don’t know anything, but I’m here and I know that I have a degree and I know why I’m here. But many times, they believe that because you are from this town you don’t really know anything.” HCP SA8

Individual Factors

Behavioral Beliefs

Breastmilk is Insufficient

"[We have to] try to make sure they [the mothers] don’t include other foods in their [the baby] diet because many times here, since they were little, 2, 3 months, they want to start including atoles, tortillas, even soup, bean broths, everything, then [we must] orient them to the fact that all that can cause babies illness or digestion problems.” HCP SA5

Supplementation with Liquids/Formula

“No, I think that we should give them [babies] a little [water] because their body, for example, we give them a little water, and that kind of cleanses their body from the inside a little bit. Because I feel that when they are born, they still keep something inside themselves if they [the doctors] don’t get it out at birth.” Grandmother, SA1

"I think they [mothers] have the belief that formula is better than breastmilk... I have noticed that they have that idea that maybe formula will give [babies] more nutrients or will help them grow more." HCP SA5

"Sometimes we gave her [the baby] tea or water ... we gave her in the afternoon, when she was thirsty, you could say. So as to not give her only milk, we gave her tea in the afternoon when it was hot.” Father SA4

Probaditas or Tastes

“Since he would watch us sometimes, I say that he craved [what we were eating] and so we gave him little by little. But we didn't give him much. Only small tastes to let him try it and see how he likes it. Well, the results, if he liked it, then we would give him little by little.” Mother SA6

Heavier Babies

“We can measure and weigh the kids, and they are fine in weight, but if the moms think they are skinny, they feel that maybe breastmilk is not enough and what they look for is precisely formula, to complement breastmilk with formula.” HCP SA5

Breastfeeding After 6 Months

“Previous beliefs were that after a year the milk was no longer good, that it was like giving them [babies] pure blood.” Grandmother SA4

“They [babies] are already big... they’re about 2, 2 and a half years old and they still hang on their mother, truly. And I say that that no longer helps them, or I don’t know.” Father SA6
“After 2 years it is not so recommended [to breastfeed] …because there are no more immunoglobulins… There are children who just suck boob and no longer eat and are underweight.” HCP G3

Control Beliefs

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<th>Pain</th>
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<td>“You have to give them until the child accepts it [the breast] and when the child accepts it, they will no longer hurt your chest. That’s the situation for many [mothers], that since they [babies] don’t want to accept it [the breast], the babies hurt them. And that's why they prefer to give them milk with the bottle.” Grandmother SA3</td>
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<th>Babies' preferences</th>
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<td>“Well, she [the baby] did not want to be breastfed. We had to give her formula because she did not want her mother’s breasts. She did not want the breastmilk; we would bring her near [the breast] but she did not want her mother’s breast. It was as if it disgusted her. Like she wanted to throw up.” Grandmother SA4</td>
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<td>“Well, we started giving her [formula] because she [the baby] was no longer feeling full with milk. Then we began to give her porridge and that's how she started eating. When she drank only milk, she cried a lot at night. She was hungry, I guess. And then she would eat her baby food and felt more, I think, fuller, so she rested more.” Father SA4</td>
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<th>Convenience</th>
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<td>Interviewer: Why did you stop breastfeeding at eight months? Mother SA8: Because I was tired. . . and if I gave her formula, she would not have to be glued to me and I could do my errands. . . for convenience.” Mother SA8</td>
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<th>Perception of Insufficient Milk</th>
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<td>“At first she [my partner] did not have milk. That is why we switched to bottle.” Father SA4</td>
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<th>Maternal physical conditions</th>
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<td>“Sometimes when she [the mother] is a young lady, the nipples are not well formed. And then when she has her first baby, the baby has trouble forming the nipple.” Grandmother SA10</td>
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Unique Characteristics

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<th>Adolescent Mothers</th>
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<td>Nowadays, young women don’t want to breastfeed, they only want formula. . . Well, they don’t want to stop being young, I guess, when breastmilk is better.” Grandmother SA10</td>
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<th>First-Time Mothers</th>
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<td>“The mentality of a girl or young adult who is mature is very different. Sometimes they don’t want to feed them [babies] because the baby was not even wanted and they [mothers] don’t develop the capacity to take care of it, they don’t see a good reason as to why they have to breastfeed the baby, they are not interested.” HCP SA9</td>
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We identified several factors undermining exclusive breastfeeding, ranging from the individual beliefs of mothers, to those of their family members, and to the social norms of the community. It was common for liquid and solid foods to be introduced to infants at two to three months of age, sometimes earlier. The reasons were varied, such as giving water for hydration, especially when the weather was very hot, or to alleviate discomforts like colic or empacho.

Regarding the second observation, negative messages about breastfeeding were prevalent, most of them related to ideas of “modernity”. Several participants reported that breastfeeding was for “small-town people” who did not have the money or status to afford formula. These messages
were more prevalent in the new generations, in which women were also subject to Western beauty ideals that could not be achieved when breastfeeding. Formula was perceived as a comfortable and practical option, especially for mothers returning to study or work. In addition, while most women breastfed for around 18 months, breastfeeding up to two years or more was deemed improper as some believed that babies become “too old or big,” which could lead to dependency. Others believed that breast milk lost its nutrients after a certain period of time and that other foods were better for the growth of babies.

An interesting finding was the meaning assigned to some traditional foods such as those derived from corn (*atole*, a non-alcoholic drink) and *maguey* (*pulque*, an alcoholic drink). Participants indicated that both *atole* and *pulque*, could be beneficial for the mother if she could not produce sufficient milk, and for the baby in case of colic or fullness. Knowledge about the preparation of *pulque* was used as an analogy for the changes that breast milk undergoes after time, in the same way as the mead of the *maguey*.

**Structural Factors**

**Social Norms**

As mentioned above, ideas of modernity were present in these communities. The use of formula was related to higher socio-economic status, embodied by the women seen using it on television (generally white), and the people for whom mothers worked in Mexico City.

In addition, more and more women felt pressured to comply with certain ideals of beauty. With this came the idea that breastfeeding could deform their bodies, making formula the better option. The relationship of women with their bodies has changed as their environments become more “modern.” For example, we noted that in both communities, women were having fewer vaginal deliveries and more caesarean sections—especially in private clinics—and they no longer
felt the need to breastfeeding due to the high availability of formula. Furthermore, breasts were often hypersexualized, and many women believed that if their breasts were deformed, their husbands would no longer accept them. These ideas were more prevalent in younger women, whom reported to uncomfortable breastfeeding in public.

Insufficient milk production was also frequently reported. Participants indicated that the lack of milk was often due to the lack of some foods or nutrients in the mother's diet (teas, atoles, brewer's yeast), the cold, or the effect of “bad vibes,” such as the evil eye. Participants indicated that the prevention of and treatment for insufficient milk included protection with amulets, garlic braids, cleanses, and temazcales, or ceremonial saunas. These treatments could be for both the mother and the baby. In the case of the baby, they could be used to heal discomforts such as empacho or colic. A general practitioner mentioned that 90% of babies arrived at the doctor's office with a "bracelet" (an amulet) and had already been taken to a cleanse or traditional massage to heal their empacho. When such traditional treatments did not work, families then resorted to medical care.

*Infant Food Industry*

Many healthcare providers believed that the infant food industry had a significant influence on mothers, especially as access to television and social media had increased substantially over time. Television commercials had a great impact on breastfeeding practices, as mothers always asked about the formulas that were most heavily advertised. Media advertisements convinced mothers that infant formulas contained the nutrients their babies need.

The availability of formula was also starting to increase, and we found it in most pharmacies, clinics, and hospitals. Even the director and pediatrician of a hospital shared that their pharmacy sold formula for the same price as other places in town. The availability of formula also
depended on the geography. A healthcare provider indicated that families near the center of town could afford and find more expensive formula while families in the peripheries continued to breastfeed.

Furthermore, formula representatives increased availability by providing samples to physicians. While this was a bigger issue in private hospitals, many physicians who worked in those private hospitals also held positions in public ones, which could influence their practice anywhere they go.

In our observations, we found five points of sale in one of the communities. Two points of sale corresponded to a public hospital and a private clinic while the other three were pharmacies affiliated with a doctor's office. In most places there were several cans of formula visible to anyone entering the place and one of the places had a discount. The most frequently encountered brand of formula was Nestlé's NAN.

**Organizational Factors**

At this level we found two important issues that impact breastfeeding: the lack of support in health services and problems that arise when women want to work outside the home.

*Healthcare System*

In this section we report findings related to health services from the institutional and structural perspectives under the organizational category. The findings regarding healthcare providers beliefs, attitudes, and ways of relating to mothers and their babies are included in the interpersonal factors section below.

Healthcare providers did not have sufficient knowledge to support mothers with breastfeeding. They reported a lack of training and education on breastfeeding. One gynecologist stated that breastfeeding support for mothers was mostly given by nurses, who were “sort of
trained.” Furthermore, many healthcare providers indicated not having sufficient time to clarify mothers’ doubts or give adequate lactation counseling.

In addition, we noted several practices that hinder breastfeeding, such as cesarean sections, separation of the dyad, and the use of formula. Respondents stated that in many hospitals, especially private ones, mothers have the choice of vaginal birth or cesarean section, which can affect breastfeeding. One gynecologist indicated that mothers who have cesarean-sections have delays starting breastfeeding, leading to formula use. Furthermore, healthcare providers mentioned that public hospitals are more insistent with mothers about breastfeeding while private hospitals are more lenient about providing formula.

At the time of this study, some social and healthcare systems that were dedicated to promoting breastfeeding (Progresa, Seguro Popular) were still actively operating. Most of the people interviewed from the community, whether they were mothers or family members, recounted positive experiences with these programs, mentioning that they learned various information about breastfeeding from them. Some healthcare providers also indicated that interventions to increase breastfeeding would be best implemented through these social programs.

**Work and School**

While most mothers worked at home (housework and childcare), others worked outside the home in nearby places where they could be in close proximity to their babies and continue breastfeeding. However, due to social and economic changes, more and more women were working in nearby cities, mainly as domestic workers. For them, it was very difficult to take their babies to work, as most of them left for the weekdays and only returned home on weekends. This led to a discontinuation of breastfeeding, either because it was difficult to continue with the baby's
sucking stimulus or because mothers were influenced by observing formula use by their employers and other women in the city.

To further complicate the continuation of breastfeeding in the workplace, several participants indicated that milk expression was very difficult. They stated not having the time at work as well as that breast pumps could be uncomfortable and expensive. Another obstacle was that a good proportion of women did not have the infrastructure to keep milk refrigerated, both on the way home from work and in their own homes.

Younger women were usually the ones who had to be separated from their babies for long hours, either for work or school. For them, the use of formula was already part of their social norms as they found it more comfortable or practical.

**Interpersonal Factors**

This section describes the factors identified that could influence breastfeeding from the people closest to the mothers and babies, that is, the family and the healthcare providers who are in direct contact with the dyad.

*Healthcare Providers*

In general, we found that healthcare providers did not have the necessary knowledge to support mothers during the breastfeeding stage. Some of them indicated that breast milk was not a sufficient source of nutrition, some recommended establishing feeding schedules instead of free demand, and others reported that after a certain time, usually six months, breast milk lost its nutritional properties.

In addition, a significant proportion of healthcare providers had negative attitudes towards breastfeeding. Many providers often made recommendations to use formula instead of breast milk, and at times described breastfeeding as ineffective. This unfavorable view of breastfeeding could
also be explained by the lack of practical experience on the subject. Some healthcare providers acknowledged their own difficulties in breastfeeding their children, mentioning that they understood why their patients could not do it either. Furthermore, the exposure to diverse healthcare providers led to mothers receiving confusing and/or contradictory messages.

The lack of support from healthcare providers was further aggravated by racist, classist, and sexist ideas. The majority of healthcare providers had “higher status” profiles that differed greatly from those of people from these rural and indigenous communities, thus creating a cultural and social shock which made adequate and empathetic communication difficult.

**Family**

The family figure with the greatest influence on mothers were the children’s grandmothers, either mothers or mothers-in-law. They often lived very close to the mother and due to their experience, could have a positive or negative influence on breastfeeding. Generally, the majority of comments indicated that grandmothers were in favor of breastfeeding, but not necessarily exclusive breastfeeding. Some grandmothers recommended adding water, teas, or *atoles* if the mother did not produce enough milk or to cleanse the babies’ bodies. They also endorsed giving solid foods to provide other nutrients and promote growth. Additionally, some made some comments that after some time, breast milk was no longer enough and could even turn into feeding the baby with blood.

Although we did not find evidence of grandmothers supporting the use of formula, by encouraging the addition of other liquids or solids, they perpetuated the idea that breast milk was not enough and other foods were needed to supplement it.

**Individual Factors**

This section describes the beliefs that mothers had about breastfeeding, whether positive or negative (behavioral beliefs), the perception of their main obstacles (control beliefs), and some
particular characteristics that placed them under the ‘sub-population with special risks’ category (first-time mothers and adolescents).

**Behavioral Beliefs**

Similar to what was found in social norms and family normative beliefs, individual beliefs also continued to place breastfeeding as the natural or normal infant feeding practice in both communities. However, other liquids and solids were given to infants before six months of age and it was perceived that after six months breast milk lost some of its nutritional properties.

Several participants expressed the idea that breast milk needed to be supplemented. Infant formula was then mentioned as a good option to supplement because it was thought to contain special nutrients that stimulate growth and development. Another frequently mentioned idea was that chubbier babies were healthier. Mothers worried when they thought their babies were “too skinny” or were not gaining sufficient weight, leading them to believe that they needed to supplement with formula.

**Control Beliefs**

The main obstacles that mothers experienced when breastfeeding were breast pain, insufficient milk production, dissatisfaction of the baby, and the impracticability of breastfeeding.

Regarding breast pain, many respondents also mentioned that having nipples that were not shaped properly for breastfeeding led them to experience more pain and abrasions associated with a poor latch. Many family members also indicated that today's mothers do not endure any painful discomfort and prefer to give babies a bottle.

In relation to the perception of insufficient milk, many mothers reported that their milk did not always meet their babies’ needs. This could be because they did not produce enough milk or because they perceived that it was too watery. In addition, certain behaviors by the babies were
interpreted as dissatisfaction with their mothers' milk, such as unexplained crying, wanting to nurse too often, refusing to latch, or not sleeping well. Respondents also mentioned that at times, the babies seemed to crave the foods that the family ate, so mothers would feed their babies probaditas, or small tastes, to decrease their craving. One participant also mentioned that previously they gave babies pulque and now they give them juice or soda, "as long as they are quiet."

As for the impracticability of breastfeeding, mothers mentioned that it was easier to use formula in public and at school or work. They also indicated that they often felt fatigued from breastfeeding and using formula granted them the independence to complete their daily activities.

**Unique Needs of Vulnerable Subgroups**

New mothers had more trouble breastfeeding due to lack of experience. With the lack of good family and professional support, they were more likely to experience breast pain, discomfort, and difficulties with breastfeeding technique that led them to abandon breastfeeding early.

In addition, adolescent mothers seemed to encounter additional problems with breastfeeding, from experiencing unwanted or unplanned pregnancy, to being in school, to having the stigma of being an adolescent mother with the consequent lack of family and social support. In addition, at times, healthcare providers expressed negative attitudes towards adolescent mothers, indicating that younger mothers may lack maturity to face maternity issues.
DISCUSSION

In these rural and indigenous communities of Central Mexico, we found infant feeding beliefs, attitudes, and practices consistent with an advanced epidemiological and nutritional transition in the context of “modern life” in a high-middle income country. While social norms still favored breastfeeding, we documented beliefs that formula was associated with modernity and higher social status, facilitating women to work outside the home and maintain a body image consistent with Western standards of beauty.

We identified the prevalent use of formula associated with messages of its compatibility with modernity from the infant feeding industry and from society in general. The idea that formula can be used to "complement" breast milk may be having a strong penetration in these communities due to an already established belief in early supplementation of breastmilk with foods such as teas, atoles and even pulque. Formula was also promoted as the best solution for a modernity lifestyle that includes studying or working. Furthermore, formula was depicted as a product with “special nutrients” that promotes development, helps babies feel full, gain weight, and sleep better. Therefore, it is not surprising that women in these communities perceived that providing babies with breast milk substitutes is the most practical and comfortable option for mothers to separate from their babies in order to better adapt to a modern consumer society.

Previous studies have observed similar infant feeding transitions, where the consumption of formula begins in high-income groups and then “trickles down” to low-income groups.\(^{(13, 31, 32)}\) A study in Laos, found that mothers in rural areas were more likely to breastfeed exclusively and less likely to use breastmilk substitutes, although breastfeeding rates decreased in areas near the bigger cities.\(^{(31)}\) The consumption of formula has been positively correlated with higher income
within and between LMIC, and as countries become more developed, measures to protect breastfeeding should be implemented, particularly among the poorest communities. 

Studies on acculturation and migration have shown mothers’ adaptations from breastfeeding in more traditional and rural environments to formula use in more modern and urban ones. One meta-ethnographic study showed that migrant women were often exposed to messages from the media and healthcare providers promoting formula as convenient, providing mothers with the freedom to “get on with [their] lives” and avoid the embarrassment of breastfeeding in public. Furthermore, the increased visibility of infant formula in the new environments of migrant women affected their sociocultural expectations and practices.

Western standards of beauty can further influence infant feeding practices, as having body image dissatisfaction (BID) increases the risk of abandoning lactation. One study in Mexico found that for each one-unit increase in the BID score, the odds of breastfeeding decreased by six percent, a decrease that was even greater among obese and indigenous women. These effects of BID on lactation can be particularly dangerous in countries experiencing rapid epidemiological transitions, where the high prevalence of obesity further increases the risk for BID and decreased lactation.

An important factor affecting breastfeeding is marketing by the infant food industry. We observed the strong influence of the infant food industry through the widespread availability of formula and advertising, which has been shown to increase mothers’ interest in buying formula. Interestingly, in our study mothers developed a liking to formulas they saw on television, consistent with formula companies’ marketing strategy to create brand preference. A UNICEF report on the violations of the World Health Organization International Code of Commercialization of Breast Milk Substitutes (The Code) in Mexico indicated that over 50% of
mothers received recommendations from healthcare providers to feed their baby with dairy products and 80% saw advertising about breastmilk substitutes in the previous six months.\textsuperscript{(46)} Furthermore, infant feeding companies visited 15.5% of private practices, reaching up to six communications per healthcare provider during the previous six months in 22% of those cases.\textsuperscript{(46)} Such violations to The Code have been documented elsewhere in Latin America. In Peru, visits by formula representatives to healthcare providers are common and mothers often report receiving free formula and vouchers and even purchasing formula samples at discounted prices during their health visits.\textsuperscript{(15)} Studies have shown that providing nursing mothers with formula samples in hospitals can lead mothers to question the benefits of breastfeeding and doubt their own ability to breastfeed.\textsuperscript{(47-50)} About 60% of pediatric associations receive some form of financial support from the infant food industry, and this increases up to 82% in the Americas.\textsuperscript{(42)} This is worrisome since research shows that doctors experience a feeling of loyalty towards companies and feel obligated to prescribe their products.\textsuperscript{(51, 52)}

Several participants expressed that physicians recommended particular brands of formula, justifying the indication that breastmilk was no longer sufficient or that babies were not gaining enough weight. A previous study found that mothers who received formula recommendations from healthcare providers were almost 10 times more likely to feed a mixed diet and up to four times more likely to abandon breastfeeding.\textsuperscript{(15)} In contrast, healthcare providers’ support for breastfeeding has been associated with increased odds of initiating and continuing breastfeeding.\textsuperscript{(53, 54)} Lu and colleagues found that when healthcare providers recommended breastfeeding, women were over four times more likely to initiate breastfeeding than mothers who were not.\textsuperscript{(55)} Combining the influence of the infant food industry on healthcare providers, lack of breastfeeding training for healthcare providers, time constraints impeding adequate breastfeeding
counseling, lack of social programs offering breastfeeding counseling, and the increase in obstetric practices that hinder breastfeeding (i.e. C-sections), we can understand how a formula has now also become a social norm in highly socio-economically vulnerable communities.

Communication between healthcare providers and patients in Mexico is not always adequate, leading to additional obstacles to breastfeeding.⁵⁶ In Peru, mothers have reported that nurses often only tell them to breastfeed but without providing specific instructions, and they have described their clinical encounters as impatient and disrespectful.⁵⁷ When interviewed, the nursing staff acknowledged that time constraints and resource limitations deterred appropriate breastfeeding counseling.⁵⁸ Another important aspect little studied in Latin America is racism and classism within health services. Previous studies have documented forms of institutionalized racism and discrimination towards vulnerable mothers in the context of infant feeding, as healthcare providers showed apathy towards those mothers and considered them as “too submissive” to family influences, especially those of grandmothers.¹¹,³⁷,⁵⁷-⁵⁹

At the individual level, mothers most often experienced obstacles related to beliefs that their milk was not satisfactory or sufficient, which is highly consistent with previous studies conducted in Mexico⁶⁰,⁶¹ and globally.⁶²,⁶³ Some mothers believed that they did not produce enough milk, that their babies did not like their milk, or that after the babies drank their milk, they remained hungry, experienced colic, or did not sleep well. Mothers also experienced breast pain due to inadequate professional lactation support and counseling. Consistent with previous studies,⁶⁴-⁶⁶ younger and first-time mothers had the most difficulty with breastfeeding possibly because they had lifestyles that were incompatible with breastfeeding (i.e. work), had less experience breastfeeding, and were under more pressure to not breastfeed due to stigmatization and body image.³⁴,⁶⁴,⁶⁷ In our study, younger mothers specifically were more subject to feeling
embarrassed to breastfeed in public due to *morbosidad*, consistent with previous studies.\(^{(68)}\) Such obstacles can lead women to feel uncomfortable with breastfeeding and instead resort to formula in the context of rapidly “developing and modern” environments.\(^{(37, 68)}\)

It is important to note that some factors identified did not easily fit into just one socio-ecological level, as almost all elements are both shaped by society and experience of the individual. One example is the interconnection between social, normative, and behavioral beliefs regarding the use of traditional beverages that carry symbolic meaning. For people unfamiliar with Mesoamerican culture, it may be surprising that infants can be given *pulque*. However, this derivative of the *maguey*, as well as foods derived from corn, are strong cultural and social traditions.

The replacement of traditional foods with infant formula identified in our study was similar to a study in Laos, which found that while mothers traditionally introduced rice to infants early on, they had begun to instead use breastmilk substitutes, which they believed to have similar nutritional value to rice.\(^{(31)}\) It would be interesting to inquire whether traditional infant feeding practices, such as giving teas or *atole* to infants in Mexico, are based on beliefs that these foods complement infants’ nutrition and if now formula is replacing those traditional foods. Beliefs that breastmilk alone is insufficient may be influenced by the social and economic changes that communities experience, perhaps in response to strong infant food industry marketing. Formula advertising can represent formula as an option equal or complementary to breastmilk, influencing infant feeding normative behaviors and social norms.\(^{(14)}\) The infant food industry also has an impact on mothers’ confidence in carrying out breastfeeding since it takes advantage of the main obstacles that mothers experience and creates specific formulas that “solve” those challenges. Murray has argued that we must scrutinize the origin of ideas that breastmilk is insufficient and
we must analyze if these beliefs are related to the claim that reproductive bodies are insufficient and need better management.⁶⁹

Our study had several limitations. First, the external validity of our findings needs to be interpreted with caution as participants from our purposive sample were mostly low-income homemakers from indigenous communities in Central Mexico. In addition, most of our findings were based on self-reported behavior and were dependent upon the participants’ recollections, associated feelings, and their recall may have been influenced by socially acceptable behaviors. Lastly, we were not able to return to the communities for validation and feedback of our results.

Despite the limitations, this study had several key strengths. We collected information from a diverse range of individuals and settings using a variety of methods and data analysis by different people to triangulate information and reduce the risk of chance findings and systematic biases. Furthermore, our work was guided by sound conceptual models. The findings of this study were organized in a SEF and IM of behavior that allowed us to integrate the main factors that influence breastfeeding at different levels, from the individual to the social, as well as identifying more easily the elements that help track changes in behavior. This approach can be used for the design of assessment instruments and interventions adapted across different contexts.
CONCLUSION

Our study offers new insights into the social ecology of infant formula in rural and indigenous communities in Central Mexico. Our findings are consistent with previous studies that demonstrated an epidemiological and nutritional transition in rural populations, but that had not been able to connect the dots as we did in the context of a SEF and IM of behavior. While breastfeeding was still widely accepted so is infant formula nowadays. It is urgent to design multilevel and multisectoral interventions to prevent the further dissemination and revert the already strong infant formula culture that has formed in these highly vulnerable communities. Marketing regulation policies that are consistent with The Code need to be well enforced in order to protect the right that women have to breastfeed their children for as long as recommended.
REFERENCES


**Figure Legends**

**Figure 1** – Flowchart for Data Collection, Analysis, and Validation.

- Breastfeeding determinants
  - qualitative data collection

- Focus Groups:
  - Mothers
  - Nurses

- In-Depth Interviews:
  - Mothers
  - Fathers/Grandfathers
  - Grandmothers
  - Healthcare Providers

- Data Analysis
  - Constant comparison, thematic analysis

- Results Validation
  - Rich data, triangulation, 2 sets of coders
Figure 2 – Socioecological and Integrative Model of Key Findings.