

# The Economics of Infant Feeding: A Learning Agenda

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## Executive Summary

What are the long-term consequences of different types of infant feeding? What influences parents' decisions about how to feed their children? Which market and social forces are at play in the market for infant nutrition? These are all questions that we, at the Larsson-Rosenquist Foundation Center for Economics of Breastfeeding (LRF CEB) at the University of Zurich, seek answers to.

The LRF CEB aims to contribute evidence on the economic aspects of infant nutrition. In addition to pursuing our own research, we aim to support early-career researchers by providing seed funding for novel projects on the economics of infant nutrition and early child development. The goal of this White Paper is to provide inspiration by laying out open, policy-relevant questions relating to the economics of infant nutrition, with a focus on breastfeeding.

With this document, we hope to stimulate research within the economics of infant nutrition. We highlight several open questions, generated as part of a workshop with experts in economics and epidemiology, which we deem to be economically interesting, policy-relevant and with high impact potential. These questions cover a range of topics, from improving our understanding of parents' beliefs about the returns to different modes of infant feeding, to uncovering the role of social image concerns in infant nutrition choices, to investigating what systematic market failures exist in the market for infant nutrition, and understanding the relationship between breastfeeding, gender equality and female empowerment. Importantly, these questions focus not only on children but also on parents, especially mothers, and the trade-offs involved in different infant feeding decisions.

We hope this White Paper provides inspiration for future work within this fascinating area. We have earmarked funds for external projects on the economics of infant nutrition and invite proposals for relevant research as part of our Project Development Fellowship call.

# 1 Introduction

In 2021, an estimated 134 million babies were born (United Nations, Department of Economic and Social Affairs, Population Division, 2022). Of those, approximately 3.7 million died before their first birthday and another 1.3 million prior to their fifth – concentrated mostly in less developed regions of the world. The first 1000 days of life have been proposed as a critical period of life, during which good nutrition can help to ensure a child not only survives but also thrives. The World Health Organisation (WHO) estimates that just under half of all under-five deaths are related to under-nutrition (World Health Organization, 2024).

There are many ways parents might choose to feed their infants, and most children will be breastfed for at least some time. The WHO recommends that infants be breastfed exclusively up until the age of six months, where exclusive breastfeeding means feeding infants nothing other than breast milk. After six months, they recommend infants be fed healthy, complementary foods while continuing to breastfeed up until the age of two years or even longer if desired. Despite this strong recommendation, exclusive breastfeeding during the first six months is not universally practiced, and there is large across-country variation (see Figure 1 and Zong *et al.* (2021)). What trade-offs do parents make when choosing how to feed their infants? What role do social and cultural factors play? Does the optimal way to feed infants differ by context?

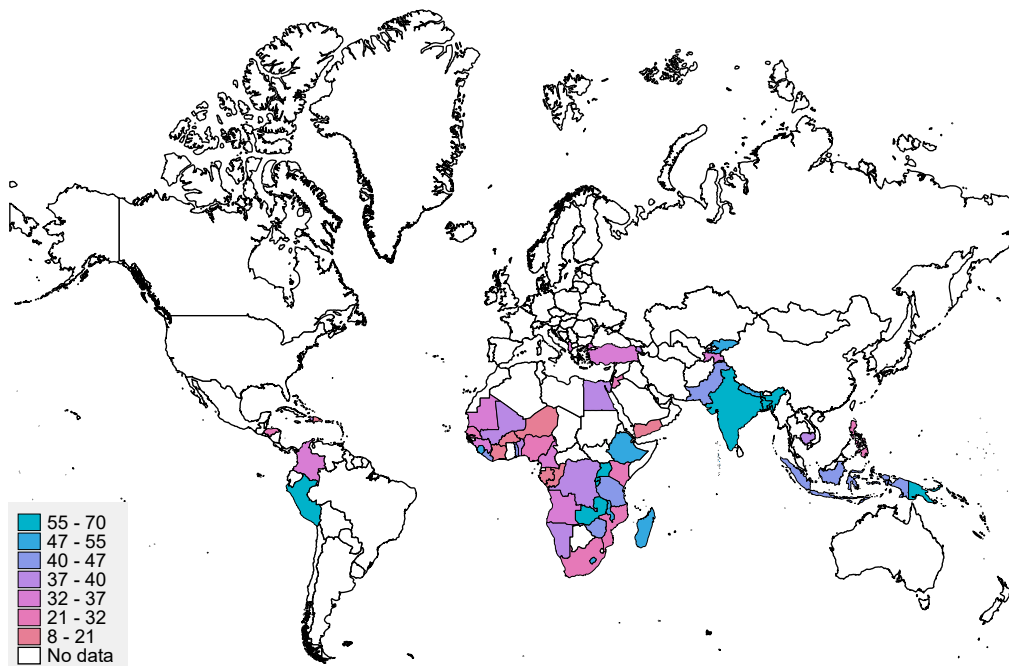


Figure 1: Prevalence (%) of exclusive breastfeeding among infants under six months of age in 56 low and middle income countries

Notes: Data from Demographic and Health Surveys (DHS; ICF (2004/2022)). Data shown is for the last year available for each country. Percent of infants fed only breast milk in last 24 hours, based on maternal 24 hour dietary recall.

## How economists can contribute

Economists are well equipped to answer the above questions. The economist's toolbox consists of a structured way of viewing the world, through models, theories, and the

application of rigorous econometric methods. It helps us to understand, among other things, why people behave the way they do and gives us a framework through which to investigate the causal effect of different exposures.

We can, for instance, model and map demand for different forms of infant nutrition and assess the sensitivity of demand to changes in price, income, and availability of substitutes. We can analyse how families allocate resources to maximise the health and wellbeing of their children, taking into account constraints like income and time. We can study how companies that produce infant nutrition products decide on production levels, pricing, and product innovation based on cost structures and market competition. We can investigate market failures and market concentration in the infant nutrition industry, and implications for pricing and consumer choice. We can harness behavioural economics to investigate how behavioural factors, such as social norms, perceptions of breastfeeding, information dissemination, and workplace constraints affect infant feeding decisions.

Economists can also contribute through application of rigorous econometric methods to better understand the causal effects of breastfeeding and other forms of infant nutrition. This is important because, despite a large literature showing associations of breastfeeding with positive outcomes among both children and their mothers (see e.g. Victora *et al.*, 2016) and Pérez-Escamilla *et al.* (2023) for reviews), few studies have been able to establish the *causal* effects of different forms of infant nutrition. This is in part due to limitations in the availability of high quality data to investigate breastfeeding exposure, and ethical concerns related to randomising exposure to breastfeeding in light of the large evidence-base suggesting its beneficial effects. While we do not doubt that breast milk has all the nutrients infants need during their first months of life and is the ideal nutrition, we believe that more needs to be understood about the trade-offs involved in different infant feeding decisions.

We believe that several open questions remain regarding the benefits and costs of breastfeeding, and how they might vary by context, as well as reasons *why* families make the infant feeding decisions they do. For instance, what does the balance of benefits and costs look like in places with access to potable water and without, or among mothers who are themselves malnourished? What happens as economies develop and women move towards working outside the home, in jobs where they cannot bring their infants along? Economists are well placed to help answer these questions and shed light upon the mechanisms driving families' infant feeding decisions, and the consequences thereof.

### **The Larsson-Rosenquist Foundation Center for Economics of Breastfeeding**

The Larsson-Rosenquist Foundation Center for Economics of Breastfeeding (LRF CEB) at the University of Zurich is dedicated to advancing research on the economic aspects of infant nutrition, with a focus on breastfeeding. The center's research focuses on understanding the social and market dynamics of breastfeeding and infant nutrition, with a particular emphasis on addressing issues relevant to low- and middle-income countries. Our vision is to build a holistic understanding of decision-making, market forces, and the cost-benefits associated with different modes of infant nutrition, to guide policy formation and interventions that improve the well-being of children, families, and society.

## Three Research Tracks

- ① **Effects of Breastfeeding:** Understanding the health and socioeconomic outcomes of breastfeeding for children, families, and society
- ② **Economic Decision-Making:** Studying infant nutrition decision-making dynamics through behavioural economics
- ③ **The Market for Infant Nutrition:** Examining the economic impact and market dynamics of the commercial infant formula industry.

The LRF CEB is generating knowledge about infant nutrition through three research tracks, which are aligned with several Sustainable Development Goals, including those related to health, education, economic growth, climate action, and life on land.

In addition to generating our own research, the Center also aims to support researchers interested in initiating research projects on the economics of infant nutrition and has earmarked funds for this purpose. With this document, we hope to inspire novel research on the economics of infant nutrition, and invite proposals for research on this exciting topic.

### A learning agenda for the economics of infant nutrition

In this report, we document key areas where we believe contributions from economics could have the greatest impact on knowledge about infant feeding behaviours and consequences, and the broader market for infant nutrition. These research priorities were determined at a brainstorming workshop hosted by the LRF CEB in January 2024, to which we invited participants with backgrounds in economics, epidemiology and development. This document is not intended to serve as an exhaustive summary of all evidence on breastfeeding and infant nutrition, but rather as an inspiration and, we hope, an impetus for novel research on this topic within the discipline of economics.

In what follows, we start by laying out the methodology used to establish the research priorities highlighted in this research agenda. We then present the research priorities in turn, documenting existing evidence and highlighting a selection of open research questions.

## 2 Method

In January 2024, the LRF CEB hosted a workshop on "Economics of Breastfeeding? Opportunities, Challenges and Potential Ways Forward". The workshop brought together senior economists and an epidemiologist, all with extensive experience running randomised interventions and working on topics related to child development, health and gender, particularly within developing country contexts. The core focus of the workshop was brainstorming about research opportunities under the broad umbrella of the economics of breastfeeding and infant nutrition. A few participants had experience working on topics related to breastfeeding, but this was not a prerequisite for attending. Our aim was to identify economically interesting, policy-relevant questions with high impact potential.

After two days of presentations and brainstorming, participants were invited to share one to two research areas or questions that stood out to them as economically interesting, policy-relevant and with high impact potential. These form the basis for the research

priorities detailed below. As an additional exercise, following the workshop, participants were invited to rank the identified priorities.

### 3 Research priorities

In the following, we have organised the identified research priorities according to each of the three research tracks of the Center. For each, we provide a brief overview of what we know about the topic and a non-exhaustive list of open questions, highlighting where the research gaps exist. We encourage a focus on low and middle income countries due to the particular challenges parents in those countries face (poverty, lack of potable water, malnutrition), the potentially greater trade-offs between different forms of infant nutrition in those settings, and the greater impact potential, but we believe that the questions identified are applicable to all countries.

The effects of breastfeeding on *mothers* was a recurring theme, as was the importance of trade offs between breastfeeding and labour market participation. An important consideration that also came up was the extent to which different shocks and policies could be used to study both the determinants and outcomes of breastfeeding. Changes in policy regarding, for instance, time in hospital post-birth, the type and amount of post-natal support received, workplace policies to support breastfeeding, and changes in parental leave are all examples of such policies.

There was considerable overlap of ideas generated within the *Economic Decision-Making* and *Market for Infant Nutrition* tracks. This is because infant feeding decisions are likely governed by constraints (for instance lack of maternity leave protections) as well as beliefs about the returns to different modes of infant feeding, including infant formula. When discussing research priorities for both tracks, participants focused on drivers of infant feeding decisions and the importance of the trade-off between time spent breastfeeding and time spent on other activities, for instance working for pay. Within the *Economic Decision-Making* track below, we focus on questions related to decision-making about infant feeding, but where the central topic is not infant formula. Questions directly related to the market for infant nutrition are presented under the *Market for Infant Nutrition* track.

#### Three Challenges with Quantitative Research on Infant Nutrition

- ① **Data quality and availability:** High-quality, comprehensive data are often lacking, especially in low and middle-income countries. This limits the ability to draw accurate and generalisable conclusions.
- ② **Measurement errors:** Nutritional data frequently rely on maternal self-reports, which can be affected by recall bias and social desirability bias.
- ③ **Snapshot:** Many studies use 24-hour dietary recall data, which only provides a snapshot of feeding practices. This approach may not capture usual dietary patterns or the diversity of an infant's diet over time.

### 3.1 Effects of Breastfeeding

Several priority areas were identified when it comes to the causal effects of breastfeeding. What may come as a surprise is the extent to which the causal effects of breastfeeding on *mothers* was deemed an interesting and promising avenue for research.

- **The causal effects of breastfeeding on child outcomes.** There is a large literature showing positive associations of breastfeeding with several outcomes among both children and their mothers (see e.g. Victora *et al.* (2016) and Pérez-Escamilla *et al.* (2023) for reviews). Causal evidence is, however, minimal, and tends to point to limited effects of breastfeeding on child health (Kramer *et al.*, 2001, 2008), and measurable but noisy effects on cognitive development (Fitzsimons & Vera-Hernández, 2022; Kramer *et al.*, 2008; Yang *et al.*, 2018). We believe that context – including alternative sources of infant nutrition available and used (see e.g. Brenøe *et al.* (2020)) and safe access to drinking water (see e.g. Anttila-Hughes *et al.* (2018)) – is important to take into account when evaluating the effects of breastfeeding on child development.

#### Open questions:

- What are the causal effects of breastfeeding on child health, cognitive and non-cognitive outcomes?
  - What are the causal effects of breast milk-through-bottle-feeding on child development?
  - How do the effects of breastfeeding differ by context?
- **The importance of exclusive breastfeeding for 6 months.** Breast milk provides infants with all the nutrients they need in their first months of life. When consumed at the breast, it is safe, with little risk of being contaminated by pathogens, and is generally readily available. The WHO recommends exclusive breastfeeding until age 6 months, but to our knowledge, there is little evidence to support this exact duration (Kramer & Kakuma, 2012). Moreover, as we understand it, the importance of *exclusivity* is unclear and likely depends on the context, for instance it might be more important in settings with limited access to safe drinking water.

#### Open questions:

- How important is exclusive breastfeeding?
  - How important is the duration of exclusive breastfeeding?
- **Causal effects of breastfeeding on mothers.** For mothers, breastfeeding is associated with a lower incidence of breast cancer and may be protective against ovarian cancer and type 2 diabetes (see Victora *et al.* (2016) for a review). Evidence on other maternal outcomes, particularly economic ones, is, however, scarce. The literature to date has moreover tended to focus on the health *benefits* of breastfeeding, and the costs quantified tend to be those associated with *not* breastfeeding. Few studies consider the potential costs to mothers and their families of choosing to breastfeed (Mahoney *et al.*, 2023; Rippeyoung & Noonan, 2012). Such costs could include, for instance, financial costs of ensuring a balanced maternal diet, nutritional supplements and equipment to pump, as well as earnings lost due to not working, less time for caring for other children, lack of sleep, etc. and may be relatively higher

for lower income individuals (Mahoney *et al.*, 2023). Rippeyoung & Noonan (2012) provide descriptive evidence that mothers who breastfeed for six months or more face larger earnings penalties than mothers who breastfeed for a shorter duration or not at all, and these persist at least until five years after the birth of their child.

#### Open questions:

- What is the *causal* effect of infant feeding decisions on mother’s labour force participation and income trajectory?
  - How does breastfeeding affect mothers’ sleep and productivity?
  - Does breastfeeding increase the likelihood that a mother delays her return to work after childbearing?
  - What are the potential costs of these decisions?
- **Breastfeeding, gender equality and female empowerment.** Another under-explored theme is the role of breastfeeding for gender equality and female empowerment (Rippeyoung & Noonan, 2012). It is important to understand the extent to which (pushing for) breastfeeding might be good or bad for female empowerment and gender equality, and whether this differs between high- and low-income countries. It could be, for instance, that lactating women are given greater status within the household, increasing their bargaining power and role in household decision-making. It could be, however, that when (exclusive) breastfeeding is pushed for, mothers are relegated to the home, emphasising their comparative advantage in household production, which in most contexts has a lower status than production outside of the household. Understanding the relationship between breastfeeding, female empowerment, gender equality and economic development is critical for designing policy tools that could be used to mitigate any trade offs between female empowerment and breastfeeding.

#### Open questions:

- What is the relationship between breastfeeding, female empowerment and gender equality? To what extent is it context-dependent?
- **Breastfeeding and the role of fathers.** There exists a small but growing literature on the role of fathers in supporting breastfeeding (Al Namir *et al.*, 2017). To our knowledge, no evidence exists, however, on the causal effect of infant feeding decisions on the role of fathers. A recent qualitative study among fathers in Ireland found that fathers felt they missed out on bonding with their breastfed infant (Bennett *et al.*, 2016). There is some evidence that greater access to paternity leave has an impact on children’s later life attitudes and behaviours (Farré *et al.*, 2022) and girls’ math skills (Mikkelsen & Peter, 2022). This then begs the question of what the causal effect of the role of fathers in infant feeding is on child outcomes.

#### Open questions:

- What is the causal effect of infant feeding decisions on the role of fathers?
- What is the causal effect of father’s involvement in infant feeding on child outcomes?

- **Breastfeeding and desire for sexual activity.** A recent systematic review found no evidence of an association between breastfeeding and dyspareunia, sexual dysfunction or vaginal dryness (Cattani *et al.*, 2022). This finding is, however based on only observational studies, so there is arguably still room for contribution here.

**Open questions:**

- If there is a correlation between breastfeeding and desire for sexual activity, does this generate an increased risk for marriage breakup or extra-marital sex?
  - What are the consequences of this, for instance in areas with high HIV prevalence?
- **Breastfeeding and mothers’ decision-making.** The hormones oxytocin and prolactin are both released by the maternal pituitary gland while an infant suckles (World Health Organization, 2009). Prolactin is necessary for milk production and secretion, and oxytocin makes the milk flow. Both hormones appear to have a relaxing effect on mothers, and oxytocin may promote bonding between the mother and child. In behavioural experiments, oxytocin has been found to increase trust, and may play a role in promoting broader social cognition (Herbert, 2020).

**Open questions:**

- What are the effects of breastfeeding on mothers’ decision-making immediately after breastfeeding?
- Do these effects differ by time of day and/or time post-partum?

## 3.2 Economic Decision-Making

Several factors influence parents’ decisions about how to feed their infants (Baker *et al.*, 2023; Rollins *et al.*, 2016). These may include the cultural context, social norms, peers, family members, healthcare providers, medical circumstances of the birth, local institutions, the mother’s labour market attachment, advertisements from infant formula companies, previous infant feeding experiences, etc. As economists, we are particularly well equipped to understand and investigate the trade-offs parents make when choosing how to feed their child. The need to better understand the trade-offs between labour market participation and breastfeeding and ways to mitigate these trade-offs, as well as beliefs about the returns to different modes of infant feeding, were highlighted as a research priorities by workshop participants.

- **Breastfeeding and the labour market.** The theme for the 2023 World Breastfeeding Week was “Let’s make breastfeeding at work, work”, recognising that many women have to, or want to, return to paid work after having a child. Worldwide, nearly 42% of women participate in the labour force (Vilar-Compte *et al.*, 2021). Working mothers might face a high opportunity cost of time and constraints on their ability to breastfeed during work hours (Chatterji & Frick, 2005; Rippeyoung & Noonan, 2012). Mothers exposed to (longer) parental leave have been found to breastfeed for longer in Canada (Baker & Milligan, 2008), California (Huang & Yang, 2015) and Germany (Kottwitz *et al.*, 2016). To our knowledge, no rigorous studies of the effect of parental leave policies on infant feeding decisions have been carried out in developing countries.



A small literature investigates workplace policies to promote breastfeeding, but most studies are from high income countries and higher quality evidence is needed (Vilar-Compte *et al.*, 2021). Del Bono & Pronzato (2024) find that women with access to breastfeeding facilities at work breastfeed for longer and that infants whose mothers had access to such facilities are sick less during the first six months of life. They also find that higher educated women take shorter maternity leaves when they have access to workplace breastfeeding facilities. In the United States, Hauck *et al.* (2020) find that breastfeeding rates increase in states that enact workplace breastfeeding legislation, compared to those that do not. Alexia Delfino and Stefano Fiorin, two workshop participants, are currently collecting data from a field experiment that encourages the creation of lactation rooms in schools in Kenya to investigate the impact of lactation room availability on breastfeeding and longer-run labour market outcomes (Delfino & Fiorin, 2024).

### Open questions:

- What is the trade-off between labour market participation and breastfeeding? Does it differ between high and low income countries?
  - Has the recent increase in opportunities to work from home, especially in high income countries, affected the trade-off between paid work and breastfeeding? Have parents' infant feeding decisions changed as a result?
  - Do workplace policies to promote breastfeeding “work”?
  - What are the long-run effects of workplace breastfeeding policies on mothers, children and firms?
  - How can we design workplace breastfeeding policies for the informal sector?
- **Beliefs about the returns to different modes of infant feeding.** Beliefs about the returns to different modes of feeding are likely important drivers of infant feeding decisions. Indeed, Bhalotra *et al.* (2020) find that it is beliefs about the returns to breastfeeding, as opposed to differences in preferences over child outcomes, that drive differences in exclusive breastfeeding behaviours in Pakistan. The authors conclude that future research should focus on understanding drivers of women's beliefs about expected returns to early-life investments like breastfeeding.

Of note, Bhalotra *et al.* (2020) only elicit beliefs about exclusive breastfeeding versus not, and cannot shed light on beliefs about specific modes of infant feeding or factors driving those beliefs. Different infant foods might fill different roles as supplements or substitutes for breast milk in different cultures. In one ethnographic study in Nairobi, Kenya, for instance, mothers viewed infant formula as a superfood, but not as something equivalent to breast milk (Van Esterik & Elliott, 1986). A mother might additionally choose to supplement her own breast milk with formula if she comes from a culture that views a chubby baby as a healthy baby and and if she believes her own milk supply is not enough (Hawley *et al.*, 2015; Odeniyi *et al.*, 2020). Moreover, if a mother gives birth in a maternity ward sponsored by a formula company, is provided with infant formula samples upon hospital discharge, or sees formula packaging with a smart-looking child on it, she may be more inclined to believe in the importance of infant formula (Rollins *et al.*, 2023).

### Open questions:

- What beliefs about the returns to breastfeeding and infant formula exist and do these vary geographically and according to cultural and/or social norms?
  - How are beliefs about the returns to different modes of infant feeding formed and shaped?
- **Role models and infant feeding.** Role models can have important effects on behaviour (see e.g. Breda *et al.*, 2023; Porter & Serra, 2020) and such effects do not need to be driven by explicit role model interventions. Riley (2022) for instance finds that students, particularly females, randomised to see a movie with a female role model, performed better on their exams and were more likely to stay in education. Olivetti *et al.* (2020) find that the labour supply of young women is affected by the labour force participation of their high school friends' mothers, controlling for their own mother's labour supply. Specific to infant feeding decisions, qualitative evidence suggests that role models can have an important influence on infant feeding decisions (see Roll & Cheater (2016) for a review). In Mali, Bicchieri *et al.* (2022) moreover find that beliefs about the prevalence of exclusive breastfeeding in one's community affect mothers' own feeding behaviours. For instance, the children of mothers who believe most individuals in their community exclusively breastfeed are more likely to be exclusively breastfed during their first six months of life.

#### Open questions:

- How do role models (e.g. family members, friends, colleagues, TV personalities) affect demand for different types of infant feeding?
  - How could role models be used for infant nutrition policy?
- **Breastfeeding, fertility and culture.** Breastfeeding is widely used as a method to prevent conception, particularly in countries with limited access to other forms of contraception. Breastfeeding behaviours have, moreover, been found to be correlated with cultural preference for boys in both India and Egypt (Chakravarty, 2015; Jayachandran & Kuziemko, 2011).

#### Open questions:

- What other social and cultural characteristics and incentives are correlated with breastfeeding behaviours?
- What incentives do different social and cultural norms create and how do these influence breastfeeding decisions?

### 3.3 The Market for Infant Nutrition

Commercial infant formula is expensive. According to our calculations, *exclusive* formula feeding would cost between about 12% and 45% of the average monthly salary in both Nigeria and India.<sup>1</sup> Given the cost of formula, and the abundance of health messaging

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<sup>1</sup>The prices per 400 gram container of popular infant formula brands in Nigeria currently cost a minimum of 5,500 Naira on Konga, a large Nigerian e-commerce platform, with prices rising to over 9000 Naira. The average salary in Nigeria differs by sector and region but ranges from about 145,000 to 552,000 Naira per month (Paylab, 2024a). In India, prices of popular infant formula brands on Amazon range from about 600 to 1000 Rupees per 400 gram container, and average salaries range from about 16,000 to 57,000 Rupees per month, depending on sector and region (Paylab, 2024b). Infants aged 0-6 months need

about the benefits of breastfeeding, why do parents buy it? How much of it do they buy and is it used as a supplement or a complement to breastfeeding? Within this research track, mapping and estimating demand for infant formula, and a better understanding social image concerns involved in infant feeding decisions were highlighted as research priorities.

- **Estimating demand for infant formula.** We are aware of very little research that has sought to estimate the demand function for infant formula. One way to do this is using supply shocks. In a working paper, Li *et al.* (2023) use Nielsen Homescan Panel data to investigate how formula demand responded to price increases brought on by the shortage of infant formula in the United States in 2022. An alternative approach would be to investigate the relationship between market power and infant formula prices, and use variations in market power in different world regions over time.

#### Open questions:

- What is the demand function for infant formula?
- **Mapping demand for infant formula.** To better understand how to develop and target interventions geared towards infant nutrition, we believe it is important to understand the extent to which demand for infant formula and other forms of infant nutrition varies geographically. This could be across urban and rural areas, or different socioeconomic groups and cultures. In low and middle income countries, infant formula consumption is positively correlated with both household wealth and country-level GDP (Neves *et al.*, 2020). In contrast, in high-income countries, higher socioeconomic status mothers tend to breastfeed more (see e.g., Flacking *et al.*, 2007; Heck *et al.*, 2006), highlighting the potential role of different constraints and norms in determining infant feeding behaviours. Analyses often account for the urban versus rural status of a locality, but few studies actually investigate the role of urbanisation in infant feeding decisions. Using Demographic and Health Survey data, Smith *et al.* (2005) find that urban mothers are, on average, more likely to initiate breastfeeding within one day of birth, presumably because they are more likely to have an institutional birth. Duration of breastfeeding is, however, shorter among urban mothers. The direction of the relationship between urbanicity and exclusive breastfeeding moreover differs around the world. In Andhra Pradesh, a recent cross-sectional study found no association between village urbanicity and early termination of exclusive breastfeeding (before age 6 months) (Oakley *et al.*, 2017).

Of note, for infants who are not exclusively breastfed, the other foods making up their caloric intake do not necessarily include infant formula (see Figure 2). The types of complementary foods (and demand for them), including infant formula, are likely influenced by many factors including financial constraints and culture. In Kenya, for instance, Van Esterik & Elliott (1986) find that breast milk is viewed as only one part of the infant's meal and therefore tends to be supplemented with other foods, the quality of which can vary greatly.

#### Open questions:

- How do infant feeding patterns vary worldwide?

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on average about 115 grams of infant formula daily if they are being exclusively formula fed.

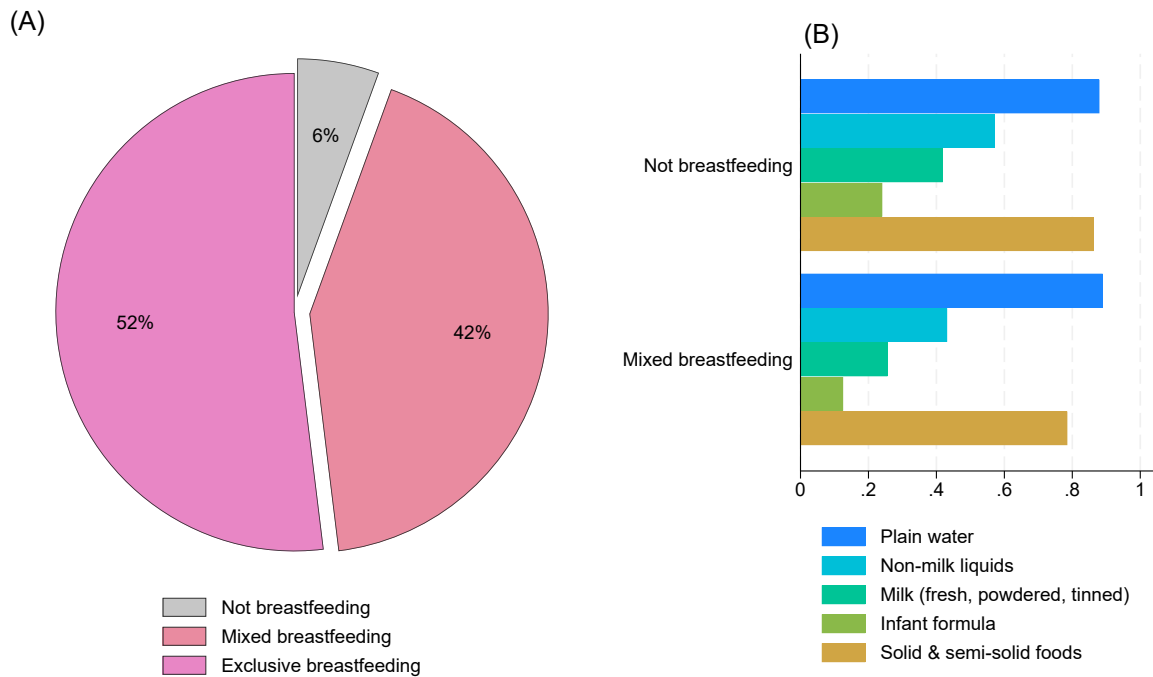


Figure 2: Un-weighted prevalence (%) of no-, mixed-, and exclusive breastfeeding (A) and alternative foods consumed (B) among infants under six months of age in 56 low and middle income countries

Notes: Data from Demographic and Health Surveys (DHS; ICF (2004/2022)). Based on maternal 24 hour dietary recall for the youngest children in the household (N = 120,751).

- How does demand for infant formula vary geographically, across socioeconomic groups and cultures?
- What does infant nutrition look like in different regions of the world?
- **Social norms and the market for infant nutrition.** Social norms can be thought of as unwritten rules or understandings that shape behaviours within a community. These can, for instance, be norms about the labour market participation of women or specific norms about infant feeding, for instance regarding breastfeeding in public or pre-lacteal feeds.

We might expect higher rates of infant formula use among groups with strong female labour market participation norms. Such a relationship could, however, be mitigated by, for instance, paid parental leave policies (such as in the Nordic countries where both the rate of breastfeeding and female labour market participation are high). One can also imagine specific norms about infant formula use. For instance, if a mother is part of a group where others approve of or expect use of infant formula, she might be more likely to use it as well. In contrast, in societies where there is a strong breastfeeding norm, mothers may be less likely to use it and feel shame if they don't (or can't) conform to the breastfeeding norm. Could both of these situations be described as some sort of "product market trap" (Bursztyn *et al.*, 2023) whereby, despite deriving negative utility from conforming to the norm, mothers do anyways because the utility they would derive from not conforming would be even more negative, given that others conform?

Norms need not be specifically about breastfeeding or infant formula to have a potential effect on the market for infant nutrition. Some cultures, for instance, believe that colostrum, the first milk released post-partum, is unhygienic and should be discarded (Rollins *et al.*, 2016). According to Western medical practitioners, however, colostrum is highly nutritious and important for promoting the infant's immune development (Uruakpa *et al.*, 2002). Evidence suggests that delayed initiation of breastfeeding (more than one hour after birth) is associated with a greater probability of not exclusively breastfeeding and not breastfeeding at all at both one and three months (World Health Organization, 2017), though not six months (Mena-Tudela *et al.*, 2023), post-partum. It could thus be that norms and traditions, for instance around pre-lacteal feeds, affect breastfeeding “success” and consequently demand for breast milk substitutes.

#### Open questions:

- How do social norms affect the functioning of the formula market?
- Which norms and traditions are important determinants of infant feeding choices?
- **Infant formula as a status good.** Infant formula is often used as an example of a status good due to the higher prevalence of its use among higher socioeconomic status families in certain contexts (e.g. some developing countries). Marketing campaigns have historically, and still to this day, portray formula as the choice of affluent, successful and sophisticated families (Green *et al.*, 2021; World Health Organization and others, 2022). Formula packaging is, moreover, designed to suggest exclusivity (World Health Organization, 2020; World Health Organization and others, 2022). To our knowledge, no research has sought to formally investigate the role of infant formula as a status good and the extent to which social (and self) image concerns drive demand for infant formula and/or the choice to breastfeed. Understanding the role of social and self image concerns could help inform interventions targeting infant nutrition and development.

#### Open questions:

- To what extent is infant formula seen and used as a status symbol?
- To what extent do self and social image concerns drive infant feeding decisions?
- **Heterogeneity of goods on the formula market.** A recent report made headline news documenting how several Nestlé baby food products contain added sugars in developing countries, whereas in Europe they do not (Gaberell *et al.*, 2024). This raises the question of just how much heterogeneity there is in the market for infant nutrition.

The *Codex Alimentarius*<sup>2</sup> standard for infant formula sets out safety, quality and compositional requirements for infant formula and forms the basis for many national and regional regulations.<sup>3</sup> The quality and composition of products marketed as

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<sup>2</sup>The *Codex Alimentarius* is a set of codes of practice, guidelines and voluntary standards for food production, safety and composition (Arendt, 2018).

<sup>3</sup>The *Standard for Follow-up Formula for Older Infants and Products for Young Children* was recently revised and adopted in November 2023 and lays out composition and labelling requirements for formula

infant formula should thus be similar across brands, regardless of price and packaging. There are, however, some regional differences. For instance, the European Union (EU) and United States (US) regulations differ slightly with regards to added sugars, iron content and addition of docosahexaenoic acid (DHA). These differences have, in part, led some US parents to seek out European formula<sup>4</sup>.

In part in response to restrictions on direct advertising of infant formula, as well as to foster brand loyalty, most infant formula manufacturers now offer a suite of products for different ages, despite such products not being necessary for older children (Rollins *et al.*, 2023). They also offer products to address specific needs, for instance trouble sleeping. Because infant formula is counted as a food product rather than a medicine, producers are not required to back up claims about its benefits and specific components with the same amount of scientific rigour as for pharmaceuticals (Baker *et al.*, 2021; Hughes *et al.*, 2017).

### Open questions:

- How homogeneous are the goods on the formula market and what is the quality of the goods available?
- How much do consumers understand about infant formula contents and how much do they value certain components and characteristics? <sup>5</sup>
- **Systematic market failures in the market for infant nutrition.** Six companies hold more than 60% of the global market share and in most regions, except China, the market is dominated by just one or two firms (Baker *et al.*, 2021). There is also incomplete information about the benefits of infant formula versus breastfeeding, compounded by intensive marketing on the part of infant formula providers. The incentives of policy-makers are moreover potentially contradictory in some cases. For instance, in the US, approximately half of infant formula consumed is provided by the government as part of the Special Supplemental Nutrition Program for Women, Infants, and Children (Baker *et al.*, 2016; Kent, 2006).<sup>6</sup> Manufacturers bid for the right to be the sole provider of formula to individual state's WIC participants – and do this at a considerable discount on the retail price. While this competitive bidding system may be cost effective (Carlson *et al.*, 2017), it may also introduce brand loyalty and contribute to inflated retail prices (Kent, 2006), which may in turn lead to market failures. Another example comes from China where government subsidies aimed at encouraging the development of the domestic infant formula industry may also contribute to increased infant formula consumption. The large tax revenues generated by formula sales there may also contribute to government incentives to promote market growth (Baker *et al.*, 2016).

### Open questions:

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used from the sixth month of life. We focus on infant formula here.

<sup>4</sup>See <https://www.nytimes.com/wirecutter/blog/us-parents-european-baby-formula/>

<sup>5</sup>Note that the World Health Organisation recently commissioned a multi-country report on women's perceptions of marketing messages about infant formula and how exposure to these messages relates to their perceptions of the products.(World Health Organization and others, 2022).

<sup>6</sup>See <https://www.ers.usda.gov/data-products/chart-gallery/gallery/chart-detail/?chartId=103970>

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- What are the systematic market failures in the market for infant nutrition? Do they differ between high and low and middle income countries?

## 4 Conclusion

With this White Paper we have attempted to document novel research questions within the economics of infant nutrition and breastfeeding. We have focused on questions we deem policy-relevant and with high impact potential, but acknowledge that this is not an exhaustive list. We invite readers to peruse the reference list and hope to have stimulated some new ideas.

We recognise that the constraints faced by parents are likely very different in high versus low and middle income countries, and the research priorities will likely differ as such. We believe that the questions identified above can be relevant to both high and low and middle income settings, but encourage a focus on low and middle income areas as we believe these are the areas where most impact can be achieved.

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