

Strengthening the breastfeeding ecosystem:

How digital health infrastructure can close
the gap between biology, care, and culture.



**A scientifically grounded blueprint
for supporting breastfeeding
within a digital health ecosystem**

About this collaboration

This white paper was developed following a dedicated Deep Dive session at the 2026 Human Milk Institute Symposium, convened to explore Digital Empowerment in Breastfeeding: Bridging Technology, Behavior, and Outcomes. Lactation colleagues from every corner of the world gathered in sunny La Jolla, California, arriving with different scientific backgrounds, languages, health systems, and community realities, yet a shared urgency to protect breastfeeding.

The motivation for the session was a shared observation: despite strong scientific evidence, committed professionals, and growing digital innovation, breastfeeding support too often remains misaligned with parents' lived realities. Clinicians, behavioral scientists, public-health experts, and industry contributors came together to examine how digital health can responsibly support breastfeeding across individual, systems, and sociocultural contexts. This paper reflects that interdisciplinary dialogue and the shared intent to advance scientifically grounded, human-centered approaches to breastfeeding support.



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UC San Diego
Human Milk Institute



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Contents

Introduction
Page 1

The 3-problem framework
Pages 2-6

The digital opportunity
Pages 7-14

Constraints of digital
Pages 15

The blueprint
Pages 16-17

Where to go from here
Pages 18-19

References
Pages 20-21





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Acknowledgements

Philips and Human Milk Institute would like to acknowledge the researchers who shared their work at the symposium deep dive session, featured as emerging innovations in this paper, and the session attendees who contributed to rich discussions on the topics addressed in this white paper. We acknowledge and appreciate the contributions of fellow leaders and attendees at the Human Milk Institute symposium, fellow clinicians and researchers and administrators committed to this work, and the families inspiring us all to build better breastfeeding solutions.

The researchers cited in this white paper as well as the session presenters and attendees have no financial or employment relationship with Philips. They received no compensation for the inclusion of their work in this document, nor did they receive financial support from Philips to conduct the research cited herein. The researcher's participation is reflected solely by their presentation of previously published work at the 2026 Human Milk Institute Symposium and by their published research. Their involvement does not imply any financial relationship with Philips.

Foreward:

Supporting breastfeeding in a digital world

We offer this as an invitation to the field: to move beyond isolated interventions and toward more connected, human-centered ecosystems that better align biology, care, and culture in support of families.

This white paper emerged from discussions convened during the Human Milk Institute Deep Dive on Digital Empowerment in Breastfeeding, which I had the privilege to lead.

Across disciplines and geographies, a common pattern became clear. Breastfeeding challenges are rarely driven by lack of motivation or information alone. Instead, they reflect misalignment between what breastfeeding biologically and emotionally requires, how care systems are structured, and the sociocultural environments in which feeding takes place. Digital tools are increasingly present within this landscape, yet are often developed or deployed without sufficient integration into clinical workflows, ethical considerations, or the constraints families face.

This paper reflects that interdisciplinary dialogue. Its intent is not to promote specific technologies or prescribe a model of care, but to offer a scientifically grounded framework for thinking about how digital health infrastructure can better align individual experience, health-system design, and sociocultural support. It is offered as an invitation to the field: to move beyond isolated interventions and toward more connected, human-centered ecosystems that better align biology, care, and culture in support of families.

The Human Milk Institute strongly and deeply believes that innovation lives at the intersection of disciplines. Our goal is to tear down siloes and bring together people with different but synergistic skills and perspectives to create real-world human-centered solutions. To be successful, solutions need to be implementable in existing systems and focus on parents' experiences and actual needs.

The annual Human Milk Institute Symposium is testament to these specific goals and objectives. All sessions combined span from molecular discoveries to local and global public health. Each individual session includes researchers, clinicians, educators, and community members who tackle a given topic from their own perspectives and with their unique expertise and experience. The deep dive session on Digital Empowerment in Breastfeeding is a fantastic example of this interdisciplinary and human-centered approach.

We are extremely grateful to Philips for co-organizing the session, to Nova Perinatal Research for summarizing and articulating the session, and to all the speakers and participants for sharing their ideas, views, and approaches. Only together will we be able to create solutions to transform infant and maternal health.



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Executive summary

Breastfeeding support is failing. This is not because parents lack motivation or lactation providers are not dedicated, but because environments are out of sync with what breastfeeding biologically and psychologically requires: timely help, continuous support, and cultural reinforcements. Despite strong evidence and global recommendations, early cessation is common, inequitable, and concentrated in the critical first postpartum weeks. This gap is not simply a matter of information deficits. It reflects a care system that is too episodic, too fragmented, and too poorly connected to meet the needs of early feeding. A stronger approach leverages infrastructure that can extend support across levels of need.

The problem

Breastfeeding outcomes emerge from structural misalignment across three levels: individual (fatigue, uncertainty), systems (fragmented care), and sociocultural (formula normalization, weak networks, and unsupportive norms). This creates gaps no single intervention can close. At the individual level, parents are asked to make high-stakes decisions while exhausted and emotionally taxed. At the system level, care is fragmented across prenatal, hospital, home, and workplace settings. At the sociocultural level, parents often encounter weak public support and norms that make breastfeeding harder to maintain.

The solution

Digital health infrastructure can extend, strengthen, and complement human care, not replace it:

- Individual: Real-time sensemaking + emotional support to reduce cognitive burden
- Systems: Connected data flow across clinic/home/work for proactive intervention
- Sociocultural: Peer communities + partner resources to normalize variability and sustain norms

In this model, digital health functions as an enabling infrastructure: it helps parents interpret, clinicians respond, and communities reinforce breastfeeding in real time.

Why it works

Digital tools are uniquely suited to breastfeeding because they can operate on the timescale that breastfeeding actually happens: during feeds, overnight, and across the first postpartum weeks. They also preserve continuity across transitions that often break support in practice, especially hospital discharge, follow-up care, and return to work. Just as importantly, they can scale emotional reassurance and practical interpretation without requiring every parent to wait for an in-person appointment.

The blueprint

Stakeholders must build multicomponent ecosystems prioritizing human oversight, workflow integration, equity, and trust. Digital health succeeds when it strengthens rather than replaces human support, making care timely, connected, and human-centered. The key challenge is not whether digital health can help, but whether it is designed to align with real parental needs, real clinical workflows, and real social conditions.

The path forward

Starting with this blueprint, digital infrastructure can align breastfeeding intentions with actual outcomes using this multilevel framework to convert parental intent and public support into sustained breastfeeding, with the potential to prevent 820,000+ annual child deaths and reduce healthcare and economic burdens.

Introduction

Breastfeeding is one of the most well-established ways to improve population health. It reduces infant mortality and morbidity across infectious, immunologic, metabolic, and neurodevelopmental domains and is associated with reduced risk of breast and ovarian cancers, type 2 diabetes, and cardiovascular disease for parents (Victora et al., 2016).

Global guidance is consistent: infants should be exclusively breastfed for the first six months of life, with continued breastfeeding alongside complementary foods for up to two years and beyond (World Health Organization; Meek & Noble, 2022). Breastfeeding initiation rates are high across most settings (e.g., 85.7% in the United States (CDC, 2025), and above 90% in several high-income countries) but around 60% of women do not breastfeed as long as desired (Odom et al., 2013). Global breastfeeding rates remain well below targets and breastfeeding rates are actively decreasing in some areas (e.g., even high resource areas like The Netherlands (Bouwmeester & Staal, 2024)).

Earlier-than-intended cessation of exclusive breastfeeding frequently occurs within the first months postpartum, during a critical window when lactation is being established and maternal mental health is especially vulnerable to the nuances of lactation (Islam et al., 2021). This early cessation reflects a failure of infrastructure where care for individuals, systems surrounding parents, and sociocultural context are not adequately providing what is required to sustain breastfeeding (Rollins et al., 2016). The result is not only suboptimal health outcomes but also downstream effects on population health, healthcare utilization, family wellbeing, parental mental health, and economic burden (Bartick et al., 2017; Rollins et al., 2016). These effects are not felt equally: disparities in breastfeeding initiation and continuation persist across income, race and employment conditions (Moret-Tatay et al., 2025; Vilar-Compte et al., 2021).

This paper introduces a framework with three intersecting levels (individual, systems, and sociocultural) to explain why breastfeeding outcomes are suboptimal despite strong evidence, consistent recommendations, and high parental intention. Across each level, and at the interfaces between them, we identify the specific mechanism we call misalignment: the mismatch between what breastfeeding biologically and behaviorally requires and what the surrounding environment actually provides.

We then examine how digital health infrastructure can serve as a mechanism for alignment, not by replacing human-led lactation care, but by extending it: moving support from episodic to continuous, from siloed to connected, from generic to personalized, and from passive endorsement to active reinforcement. We share both the well-established evidence and emerging examples of how digital infrastructure can complement and strengthen human-to-human care by extending clinical and community support, reducing cognitive load, and improving continuity, not replacing clinical judgment or hands-on lactation care.

We end with a blueprint: a proposed path forward for all breastfeeding stakeholders mapping how digital-enabled breastfeeding support is more likely to succeed when it is built as a continuous, connected, and socioculturally supported ecosystem that strengthens, not replaces, human-led care and connection.



Increasing
breastfeeding
could prevent
more than 820,000
child deaths
annually

1. The 3-level framework

Ending breastfeeding earlier than intended reflects a failure of infrastructure where **individual** care, **systems** surrounding families, and **sociocultural** context are not adequately providing what is required to sustain breastfeeding. Parents experience these multilevel breakdowns first in the early postpartum period, where breastfeeding unfolds under conditions of fatigue, uncertainty, and high emotional and cognitive load.

1.1 Challenges at the individual level

At the individual level, breastfeeding parents must manage high-stakes issues under conditions of sleep deprivation, physical recovery, and high emotional sensitivity, often without timely support. Under these conditions, small issues such as discomfort, latch difficulty, or infant fussiness can escalate rapidly. Most mothers report substantial breastfeeding difficulties, especially in the first month (Gianni et al., 2019), yet on-demand 24/7 access to human-to-human lactation support is unrealistic. Time spent in the hospital is decreasing in many settings, leaving parents to navigate common challenges like inability to latch and sore, wounded nipples at home without access to support, leading to preventable pain (e.g., in Denmark, Monberg Feenstra et al., 2018). Around the world, the individual care received for breastfeeding is not optimal: less than half of mothers in Nigeria reported satisfaction with breastfeeding care (47.7%, Abel Alao et al., 2024). In Ireland, care is described as “rushed and rough” (Lawlor et al., 2023). Mothers in the US receiving support through the national Women, Infants, and Children program described that education and support was inadequate, often presented in a hostile manner, and did not include referrals to available resources (Cross-Barnet et al., 2012). Parents had challenges receiving timely care when needed between appointments, not only from systems constraints but also from the emotional burden of not knowing the appropriate time to reach out for help (in the Netherlands, Hermans et al., 2025). This mismatch between “breast is best” messaging and inadequate support contributes to a psychobiological cycle of increased anxiety, stress, and birth trauma symptoms (Grattan, London, & Bueno, 2024).

Self-efficacy and health literacy are two strong predictors of breastfeeding persistence (Dennis & Faux, 1999), and specifically increased self-efficacy is a mechanism underlying the relationship between health literacy and health promoting behaviors in postpartum women (Chen et al., 2025). A 2025 systematic review and meta-analysis of 26 RCTs (n = 3,677) found that targeted interventions significantly increased breastfeeding self-efficacy post-intervention and improved breastfeeding success (Tanriverdi et al., 2025). Having inadequate health literacy is a significant predictor of early breastfeeding cessation (Valero-Chillerón et al., 2022). Though many sociodemographic factors impact wellbeing during the perinatal journey, maternal health literacy is one of the most significant, and also modifiable, factors influencing wellbeing (Kara, 2025). This may be explained by emotions and psychological pathways like joyfulness and elevated support, which predict health literacy and are also associated with health behaviors (Spelt et al., 2026). Yet support for self-efficacy and health literacy is rarely available in ways that match the temporal and emotional intensity of the breastfeeding journey: parents are often expected to identify problems, interpret infant behavior, decide whether variation is normal, and seek help under conditions poorly suited to effective decision making. The result is predictable: families often do not receive the right care at the right time, and support often arrives only after manageable challenges escalate.

61% of women with low health literacy do not initiate breastfeeding

1.2 Challenges at the systems level

Breastfeeding depends on continuity across prenatal care, delivery, postpartum follow-up, home life, work, and community settings, but most systems are not organized to provide that continuity within or across settings. Parents experience systems as fragmented and inconsistent.

The core systems problem is fragmented continuity across care settings, leaving parents feeling “left behind” when care suddenly ends or shifts from one system to another (Hermans et al., 2025). Support is fragmented across settings, care often resets at each transition, and parents receive variable guidance depending on where they are in the system and which provider they see. The result is a structural mismatch between what breastfeeding requires and what care systems are designed to deliver.

Systems challenges:

Breastfeeding requires ongoing, connected support, yet care is delivered in fragmented episodes.

A major part of the problem is uneven professional continuity. Training can improve breastfeeding knowledge and practice, and also improves attitudes toward breastfeeding (Wang et al., 2023), but it is not delivered consistently. The WHO and the Pan American Health Organization reported in 2025 that only one in five countries trains physicians and nurses in infant feeding, leaving many providers without adequate preparation to identify or address common breastfeeding problems (WHO, 2025). Midwives play a key role in postpartum care, but their ability to provide effective breastfeeding support is often constrained by high workload leading to care delays (Mattock et al., 2025). As a result of these constraints, parents often receive different levels and styles of support depending on which provider they see and how well that provider has been prepared to deliver breastfeeding care (Hermans et al., 2025).

A second systems problem is the lack of data continuity. Individual healthcare information often does not transfer well across settings, so decision-making resets at each encounter. In a qualitative systematic review of ten studies from the UK, Australia, Sweden, Denmark, and Northern Ireland (n = 128 mothers 40 partners), a common theme was not feeling listened to because they were forced to repeat information to different providers (Hermans et al., 2025). These breaks create inflection points, especially between the clinic and the home: clinicians have little visibility into what families experience between visits, even though that is where many breastfeeding challenges arise. This fragmentation is a key reason breastfeeding support remains episodic rather than continuous.

A third systems problem is the lack of informational continuity. Women receive variable and sometimes conflicting guidance from different professionals, which increases confusion and undermines confidence (Williamson et al., 2012; Leeming et al., 2013). This is especially important because clinicians may not realize how much their advice diverges, or how difficult it can be for parents to reconcile conflicting recommendations under pressure. In practice, the problem is not simply that information exists, but that it is not organized into a consistent, shared care pathway. The system is therefore designed around isolated encounters, while breastfeeding requires coordinated, cumulative support.

Together, these failures mean that breastfeeding support is not delivered as a connected process. Instead, it is fragmented into episodes, with information, responsibility, and decision-making all shifting from one setting to the next. That structure makes it difficult for families to receive timely, coherent help, and it leaves many of the most common breastfeeding problems to be managed alone or after they have already escalated.

Infrastructure, not devices

Innovative devices can be useful, but they do not solve breastfeeding support on their own. The real opportunity is not more devices; it is connected infrastructure that can transmit information, trigger action, and connect families to timely support. When digital signals are integrated into care pathways, they can reduce the burden on parents to interpret data alone and help clinicians respond before small problems escalate.



This principle is already visible in other areas of maternal care. Remote glucose monitoring for gestational diabetes can flag out-of-range values, share information with care teams, and support timely follow-up without requiring an in-person visit. In breastfeeding, the same logic applies: smart infant monitors, app-based trackers, and connected pumps are most valuable when they are linked to guidance, triage, and escalation pathways. Devices should be entry points, not endpoints.

Breast pumps illustrate this distinction clearly. Pumps can support milk removal, protect supply, and help parents manage return to work or separation from their infant. But they do not replace direct breastfeeding support, infant assessment, or help with latch, positioning, milk transfer, and pain. A pump cannot determine why feeding is difficult or how maternal, infant, and environmental factors are interacting in real time. Their value depends on the system around them.

The central lesson is that devices are not substitutes for systems. Their impact depends on whether they are embedded in an ecosystem that supports confidence, interpretation, and reassurance.

1.3 Challenges at the sociocultural level

Sociocultural conditions create a powerful third layer of misalignment for breastfeeding: even when individuals are motivated and clinical care is available, norms, networks, and visibility determine whether breastfeeding feels feasible, legitimate, and worth defending in daily life.

Social norms, family and peer networks, public accommodation, and representation of breastfeeding in media and community environments shape the feasibility and persistence of breastfeeding independently of clinical factors. Sociocultural factors shape breastfeeding through two primary pathways: 1) direct effects on parental experience, and 2) indirect effects via norms that shape the breastfeeding environment through the behavior of stakeholders: partners, employers, business owners, policymakers, community members.

Sociocultural context can determine whether parents feel isolated or supported, whether they feel confident feeding in public, and whether they understand and are able to face the challenges of breastfeeding (Thomson et al., 2022). Comfort breastfeeding in public is one direct way that sociocultural context shapes breastfeeding: in a review of 71 studies (n = 17,000 mothers), many mothers felt unable to breastfeed in public with women reporting fear of judgment, discomfort, and the need to modify or conceal feeding practices (Grant et al., 2022). Conversely, bottle feeding and use of commercial milk formulas is rated as attractive and as a status symbol in many places of the world, with commercial milk formula portrayed as a solution to infant health and development challenges (Rollins et al., 2023).

Social support from the broader social ecosystem predicts higher breastfeeding self-efficacy and success (Can et al., 2025), and online communities are increasingly a source of social support. While digital social support settings can be supportive, there are concerns of credibility, accuracy of information, and lack of clarity with regard to professional (or trained peer) moderation (Morse & Brown, 2022).

Sociocultural norms shape the environments created by partners, employers, businesses, and policymakers (Rollins et al., 2016; Miranda et al., 2025). Workplace conditions, including limited time, space, and flexibility, are consistently associated with earlier breastfeeding cessation (Vilar-Compte et al., 2021). Formula feeding is also more visible and normalized across retail and media environments: analyses of mainstream media found that bottle feeding was depicted more frequently than breastfeeding, reinforcing formula as the cultural default in everyday life (Henderson et al., 2000).

Finally, the erosion of community-based living further reduces access to practical, experience-based guidance, leaving many parents undersupported. Analyses of communities living in close kin groups confirms the importance of intergenerational living and grandmothers for breastfeeding support (Scelza & Hinde, 2019).

Modern breastfeeding mismatch: Human infant feeding evolved in environments where care was shared, breastfeeding was visible, and practical support came from nearby family and community networks. Many parents today begin breastfeeding in much narrower social worlds: smaller households, less intergenerational support, fewer day-to-day examples of breastfeeding, and weaker community infrastructure.

1.4 Misalignment as mechanism

Breastfeeding outcomes are not determined within any single layer. They emerge from the degree of alignment between individual needs, system responses, and sociocultural conditions.

At the individual-systems interface, parents experience fast-moving, high-stakes problems while systems respond slowly, episodically, and on institutional schedules rather than biological ones.

At the systems-sociocultural interface, health services often assume that breastfeeding is supported beyond clinical walls, but workplace and social conditions frequently make recommended care plans difficult or impossible to sustain.

At the individual-sociocultural interface, parents encounter environments in which breastfeeding is portrayed and perceived publicly in a way that conflicts with their desires to breastfeed.



Cross-level misalignment: Healthcare and workplace

Returning to work is a transition where breastfeeding commonly breaks down, with demands of feeding being misaligned with the lived constraints of return to work, pumping, time poverty, and fragmented caregiving (Vilar-Compte et al., 2021). Parents at all career levels experience lack of breastfeeding support while returning to work (e.g., universities in the Netherlands characterized by inappropriate and inaccessible lactation accommodations, a lack of communication and information-provision, and inflexible working hours and unadjusted workloads, Hentges & Pilot, 2021), yet the effects are most pronounced for lower socioeconomic status workers, who have the least protections for breastfeeding while at work and who often aren't protected by factors like social support (Smart et al., 2026).

The opportunity is not more digital products, but rather improved alignment across individuals, systems, and sociocultural context.



2. The digital health opportunity

Breastfeeding support is often insufficient not because parents lack motivation or clinicians lack commitment, but because what breastfeeding biologically requires is out of sync with what individuals receive, what systems deliver, and what sociocultural environments reinforce. The opportunity digital health presents is the ability to extend support onto the timescale and into the settings where breastfeeding actually happens: during feeds, overnight, between appointments, across the transition home, in the community, and in the transition back to work.

Digital tools are uniquely positioned to support feeding trajectories over time rather than in isolated moments. They can help identify patterns early, maintain continuity across home and clinic, and connect parents to support when in-person care is unavailable or fragmented (Blackmore et al., 2022; Iamchareon et al., 2025). Emerging evidence suggests that digital tools may improve outcomes not only through information delivery, but by strengthening perceived support, reducing emotional burden, and making guidance easier to interpret and use in real time (Spelt et al., 2026).

Three features make digital health especially relevant to this problem:

- 1** Digital tools can operate on biological rather than institutional timescales: they are available at 3 a.m., during a difficult feed, and at the moments when breastfeeding problems often escalate before formal care is reachable.
- 2** Digital infrastructure can maintain continuity across the breastfeeding journey by allowing information, care plans, and support to travel with families from clinic to home to work instead of resetting at each transition.
- 3** Digital environments can connect parents to a broader support network, reducing isolation and extending practical reinforcement beyond the clinic.

2.1 Individual level opportunities

At the individual level, the opportunity is to shift from static education and delayed care to real-time, adaptive, and personalized support.

The widespread adoption of smartphones created new opportunities for flexible, on-demand health education (Cumiskey, 2011). Virtual lactation services allow healthcare providers to reach families in real time, and support models of proactive care, shown in a meta analysis with 13 studies ($n = 4,564$) to be more effective than both standard care and reactive telelactation (Iamchareon & Maneesriwongul, 2025). Telelactation models that maintain contact across the postpartum period improve exclusive breastfeeding duration, demonstrating that sustained engagement, not isolated appointments, is central to impact (Iamchareon et al., 2025). These tools also support equity: access to on-demand telelactation improved breastfeeding continuation for Black parents in the US (Uscher-Pines et al., 2025).

Digital interventions help parents through both cognitive and emotional pathways. In a meta analysis of 15 RCTs ($n = 4,366$), mobile health interventions increased self-efficacy and also improved attitudes toward breastfeeding (Qian et al., 2021). In a randomized controlled trial of telelactation versus static education, telelactation significantly improved breastfeeding satisfaction (DeYoreo et al., 2025). Emotionally, app use has been shown to support a more positive emotional state, including increased joyfulness (Spelt et al., 2026). These examples are consistent with the idea that digital tools are most useful when they reduce cognitive and emotional burden. The core opportunity is therefore not more information, but better-timed, and more positive emotionally aligned support across the feeding journey.

Extending clinical care in times of immediate need

Emerging innovation: AI support for triaging nipple damage

De Souza et al. (2024) tested a vision-based algorithm that classifies nipple damage, mastitis, engorgement, and other breast conditions from simple phone photos, achieving high accuracy in distinguishing healthy from unhealthy tissue. Used alongside telelactation, this kind of AI triage could help lactation consultants rapidly identify urgent nipple and breast problems, prioritize callbacks, and get parents to the right level of care before pain leads to early cessation.



Pregnancy+ in action

Supporting breastfeeding via emotional pathways

Pregnancy+ by Philips offers a concrete example of how digital tools may support the individual-level conditions that shape later breastfeeding success. In a cross-sectional study of 998 pregnant and early postpartum women in the United States, Pregnancy+ users showed higher engagement and higher critical health literacy than users of other pregnancy apps and non-users (Spelt et al., 2026). Bayesian network modeling suggested that digital engagement was not linked to health literacy through a direct “information effect,” but rather it was higher perceived support and greater joyfulness as the proposed mechanisms underlying the relationship. Pregnancy+ users were also more likely to cite pregnancy apps as valuable information sources than users of other apps (Spelt et al., 2026).

In the context of breastfeeding support, this is the relevant mechanism: digital tools may improve readiness, confidence, and help-seeking not only by providing information, but by making parents feel more supported, less overloaded, and better able to interpret and act on what they are experiencing. Because this study is cross-sectional, it cannot establish causality, but it offers a useful model for how emotionally supportive digital design may strengthen the individual pathway into breastfeeding-related health literacy and self-efficacy.

**Perceived support +
Positive emotional state**

→ Higher health literacy

→ Breastfeeding readiness



App use appeared to work through two indirect pathways: by strengthening feelings of support and by improving emotional state, which were then associated with higher health literacy and, to a lesser extent, healthier behaviors. Pregnancy apps may function less as simple content-delivery platforms and more as psychological support systems that reduce emotional burden and make information easier to retain and use.

Digital at scale:

Pregnancy+ supporting breastfeeding parents in Michigan

The Michigan Pregnancy+ collaboration shows how digital platforms can function as public health infrastructure. By integrating state resources directly into the app through push notifications, in-app guides, and a centralized resource hub, Michigan Department of Public Health can reach parents in real time, outside of clinical settings. From 2022–2025, the program reached over 82,000 families, including more than 32,000 Medicaid-eligible individuals. Content was viewed more than 2.25 million times, over 21,000 referrals were made to state programs, and nearly 3,000 individuals were connected to home visiting services. This model shifts the burden away from parents navigating fragmented systems. Instead, resources are delivered proactively, increasing awareness (80%), program visibility (69% increase), and uptake (50% engagement with services). The implication is clear: digital tools can scale not just information, but connection to care. For breastfeeding support, this creates a pathway to link families with existing services earlier and more consistently, improving continuity across the postpartum period.

Michigan Case Study

We help MDHHS effectively reach Michigan families, including those enrolled in Medicaid or who are uninsured during their pregnancy.

From June 2022 – to December 2025, we have:



82,979

Michigan families reached through Pregnancy+



32,085

Medicaid-eligible pregnant individuals identified on Pregnancy+



>2.25M

times MDHHS content was seen in the Pregnancy+ app



21,238

times individuals were referred to Michigan programs and resources



2,947

individuals referred to the Home Visiting Program

80%

of moms found Pregnancy+ has helped them become more aware of the resources available to them in Michigan

69%

Increase in awareness of Home visiting programs.

And a reduction of **70% of moms not aware of any resources** (from 22.1% to 6.8%)

92%

of moms indicated to be likely to make use of the resources identified in the Pregnancy+ app

50%

have already made use of 1 or more resources from MDHHS after learning about them in the Pregnancy+ app, with over half saying they are also planning to use these resources later.

2.2 Systems level opportunities

At the systems level, the opportunity is to move from fragmented, episodic care to connected, continuous care pathways. Digital infrastructure can link information across home, clinic, and workplace environments, allowing care, data, and decision-making to travel with families, improving visibility into conditions between visits and across settings.

Digital systems that allow families to log feeding patterns, flag concerns, and transmit data in near-real time create the conditions for earlier identification of risk and more timely, targeted intervention. A stronger digital model would therefore reduce fragmentation in three ways. First, it can preserve data continuity by making prior feeding patterns, clinical concerns, and care recommendations visible across settings instead of forcing each provider to start from scratch. Second, it can improve informational continuity by reducing contradictory guidance and anchoring support to a shared record and care plan, addressing a longstanding problem in breastfeeding care in which families receive inconsistent messages from different professionals (Williamson et al., 2012; Leeming et al., 2013). Third, it can strengthen professional continuity by clarifying who is responsible for follow-up, escalation, and reassessment, so parents do not feel like they have to repeat information (Hermans et al., 2025).

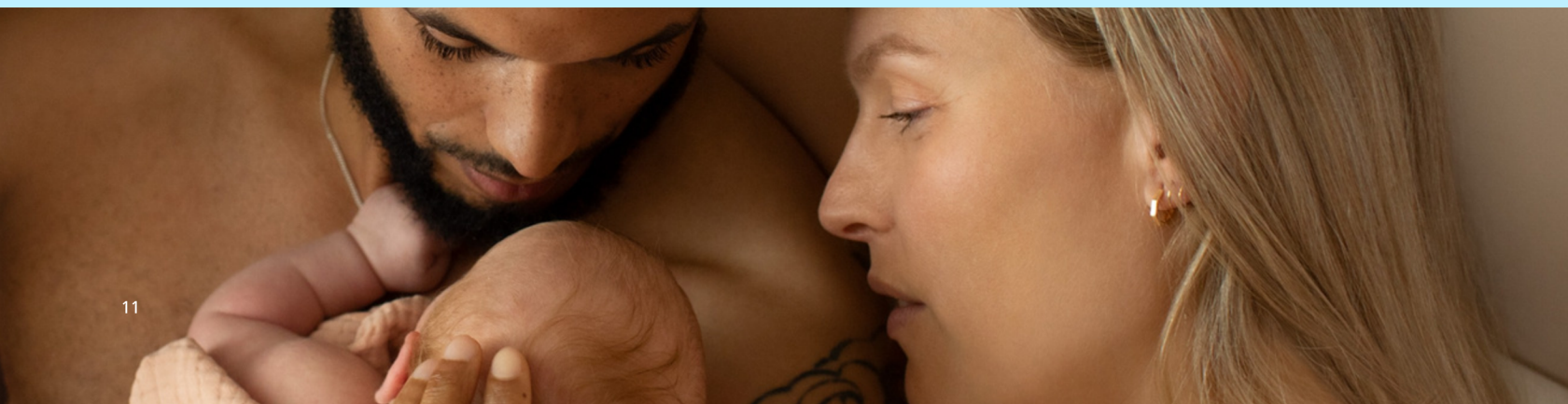
Visibility outside the clinic

Emerging innovation: Machine-learning predicting risk of early cessation

New digital phenotyping approaches use data from smart breast pumps, infant feeding apps, wearable maternal sensors, EHR postpartum visits, and lactation consultation records to create a continuous picture of families' lives outside the clinic. By passively capturing feeding patterns, maternal sleep, activity, and mood, these systems can surface early risk signals for breastfeeding cessation long before a crisis visit or emergency wean.

Built on methods first proven in hepatic encephalopathy, where continuous smartphone and wearable data plus machine-learning models detect early cognitive decline, Jejo Koola's work at UC San Diego shows that the same pipeline can be adapted to lactation care. Continuous sensing and neural-network models can analyze complex, multimodal time-series data to predict which families are drifting toward feeding difficulties, exhaustion, or mood changes, enabling just-in-time outreach and tailored support.

For health systems, this emerging innovation creates a scalable "telemetry layer" for breastfeeding, integrating home-generated data streams into clinical workflows and shared care plans. Over time, these tools could allow teams to move from reactive, visit-based troubleshooting to proactive, personalized care pathways that improve breastfeeding duration, reduce disparities, and align support with what families are actually experiencing between visits.



2.3 Sociocultural opportunities

At the sociocultural level, the opportunity is to rebuild the social conditions that make breastfeeding feel visible, normal, and collectively supported.

Many parents begin breastfeeding in environments where breastfeeding is rarely seen, practical knowledge is thin, and support is inconsistent across family, workplace, and public settings. Digital environments can help counter that isolation by making breastfeeding more visible, connecting parents to others with relevant lived experience, and widening the circle of people who understand what breastfeeding requires. Internet-based breastfeeding peer support provides information, reassurance, belonging, and normalization, helping parents recalibrate expectations when lived experience does not match idealized narratives. Digital platforms can also reinforce supportive norms by making variability more visible, normalizing help-seeking, and extending practical understanding to partners, relatives, and other community members whose attitudes shape what is feasible in daily life (Morse & Brown, 2022). Digital infrastructure can also help isolated parents who have lost their “village” feel connected to others across time and space. In an analysis of data from 122 studies, breastfeeding was associated with cultural values of collectivism (rather than individualism), as well as more feminine values (Rajkumar, 2023) pointing to the inherently communal nature of breastfeeding that could be leveraged through increased connection via digital networks.

The strongest opportunity is not digital community on its own, but digital environments that reinforce confidence, belonging, realistic expectations, and collective effort.

Rebuilding constellations of support

Emerging innovation: The human milky way

An emerging innovation, The Human Milky Way platform, shows how digital platforms can connect breastfeeding families across time and space by making individual effort visible at the collective level. By aggregating shared metrics, such as total hours latched or ounces of milk donated, Founder Michelle Nirumandrad created The Human Milky Way as a digital constellation of support to transform private feeding into a visible, cumulative social contribution. Shared metrics and geolocation signals create a sense of working toward a collective goal of improved population health, planetary protection, and economic benefit through breastfeeding. This creates a different kind of support: not just advice or reassurance, but a sense of participating in a larger community effort.

Without consistent cultural reinforcement, lactation becomes isolated rather than socially supported. Until breastfeeding is socially visible and structurally protected and promoted, individual efforts will continue to conflict with the broader environment.

2.4 Cross-level alignment

Digital health is not simply a new channel for delivering existing interventions. It is an opportunity to redesign how breastfeeding care is structured and delivered. The evidence does not support standalone tools, but rather multicomponent, continuous, and connected ecosystems.

The central opportunity is alignment across the three levels (individual, systems, sociocultural). A 2025 systematic review of 90 randomized trials (n = 49,597) by the United States Preventive Services Task Force found consistent benefit from multicomponent breastfeeding interventions across diverse populations (Patnode et al., 2025). This supports a multilevel explanatory framework where it is not only improvements within each level but also improved alignment across levels that offers the most comprehensive opportunity to improve breastfeeding.

At the bridge between the individual-systems level, digital tools enable real-time, bidirectional exchange between lived experience and clinical response, reducing reliance on parents to self-diagnose and navigate care under strain.

At the bridge between the systems-sociocultural level, digital pathways can integrate workplace, policy, and community context into care delivery, improving feasibility and continuity across transitions.

At the bridge between the individual-sociocultural level, digital communities and content ecosystems can strengthen confidence, normalize variability, and reinforce persistence through shared experience. The strongest evidence supports interventions that combine access, continuity, interpretation, and social reinforcement, rather than isolated features.

Empowering informed milk production

Emerging innovation: Understanding milk supply with wearable data

Nyquist and the Gladstone team aim to provide a foundation for data-driven personalized support through longitudinal research on the impacts of stress, sleep, exercise, menstruation, and time away from baby on lactation outcomes including exclusivity and achieving breastfeeding goals using wearable devices. They monitor heart rate, sleep, respiratory rate, and temperature using an Oura ring and collect weekly survey information on the lactation experience for one year starting as early as one month postpartum. While studies on the impacts of each of these individual factors on lactation success exist, information on how they interact with each other as well as different impacts across the lactation journey and across different individuals is lacking. Access to this information will inform providers in supporting families and will provide individuals with answers to complex questions about their own milk supply. In the long term, this data can be used to train models to provide personalized feedback on how daily activities, such as an upcoming period or a night of poor sleep, might impact milk production in the coming days and weeks. This information would allow individuals to learn about how their body responds to changes, prepare when needed for milk production fluctuations, and recover their supply when they would like to in a way that best suits their physiology.

Complexities of digital health: Data overload

There may be a downside to the near-constant data that digital health offers: Breastfeeding self-efficacy is lowest among those most engaged in tracking and highest among those least engaged with it (Sawalha & Karnowski, 2022).

Ethical considerations: Combating the cycle of data overload

1. Digital personalized education

Infant feeding apps and online communities can provide families with personalized information to guide breastfeeding decisions, yet are unregulated and may lack credibility. Personalization raises concerns about user autonomy and trustworthiness.



2. Information dependence

Data tracking can build confidence, and also quickly create dependence or cloud judgment. Rather than learning infant cues, parents can be dependent on trackers, compromising natural supply and demand.

3. Digital privacy and surveillance

There is an unmet need to transmit data across different life settings, yet this also carries the risk of privacy concerns when the lines between home, work, and healthcare are blurred.

Digital breastfeeding care should be designed as a layered ecosystem spanning individual, systems, and sociocultural contexts, striving for consensual, transparent, ethical, and equitable implementation within and across all levels.

3. Constraints of digital

Digital interventions can improve outcomes such as knowledge, engagement, and perceived support, but they do not consistently improve breastfeeding duration beyond breastfeeding exclusivity in the early postpartum period. Effectiveness depends on timing, integration, and alignment with the realities of feeding, care pathways, and social context.

Constraints of digital infrastructure

Alongside ample benefits, there are a range of serious risks that come with digital tools and systems for supporting breastfeeding during the perinatal journey, including lack of effective behavior change, lack of inclusion across identities and settings, and lack of accurate health advice or ability to triage.

Digital engagement is associated with emotions, and it is potentially through the improved emotional well-being and feelings of support that digital infrastructure is able to shape individual health behavior (e.g., Spelt et al., 2026). Yet engagement is often uneven and does not reliably translate into behavior change. Trials and reviews show that app-based interventions can improve attitudes, perceived usefulness, or early exclusive breastfeeding while not improving longer-term breastfeeding outcomes (Lewkowicz et al., 2020; Ziebart et al., 2024).

Digital health tools and systems risk replicating the inequitable systems they aim to replace. In a systematic review of maternal health apps, Tucker and colleagues found that current commercially available apps do not provide adequate information, are not racially inclusive, and are not accessible (Tucker et al., 2021). Outside of apps, some devices improve feasibility in specific settings, such as wearable pumps in professional environments, but may not generalize to populations with other constraints (Colbenson et al., 2022).

AI introduces a new category of risk. A 2026 structured assessment found that ChatGPT undertriaged 52% of health cases, sometimes delaying urgent care (Ramaswamy et al., 2026). Evaluations of LLM-based breastfeeding chatbots also found meaningful gaps, including answers that were confusing (Kacer, 2025) and misinterpretation of questions (Kantovitz et al., 2025).

Privacy and data governance are central constraints for digital breastfeeding support systems. These tools often rely on continuous, highly sensitive data streams, including behavioral patterns, physiological signals, images, and maternal and infant health information collected in real-world settings. In a systematic review of privacy policies of 17 wearable tech manufacturers, high risk ratings were noted for transparency reporting and vulnerability disclosure (Doherty et al., 2025).



4. The blueprint

Individual **roots**: real-time, interpretive, and personalized care

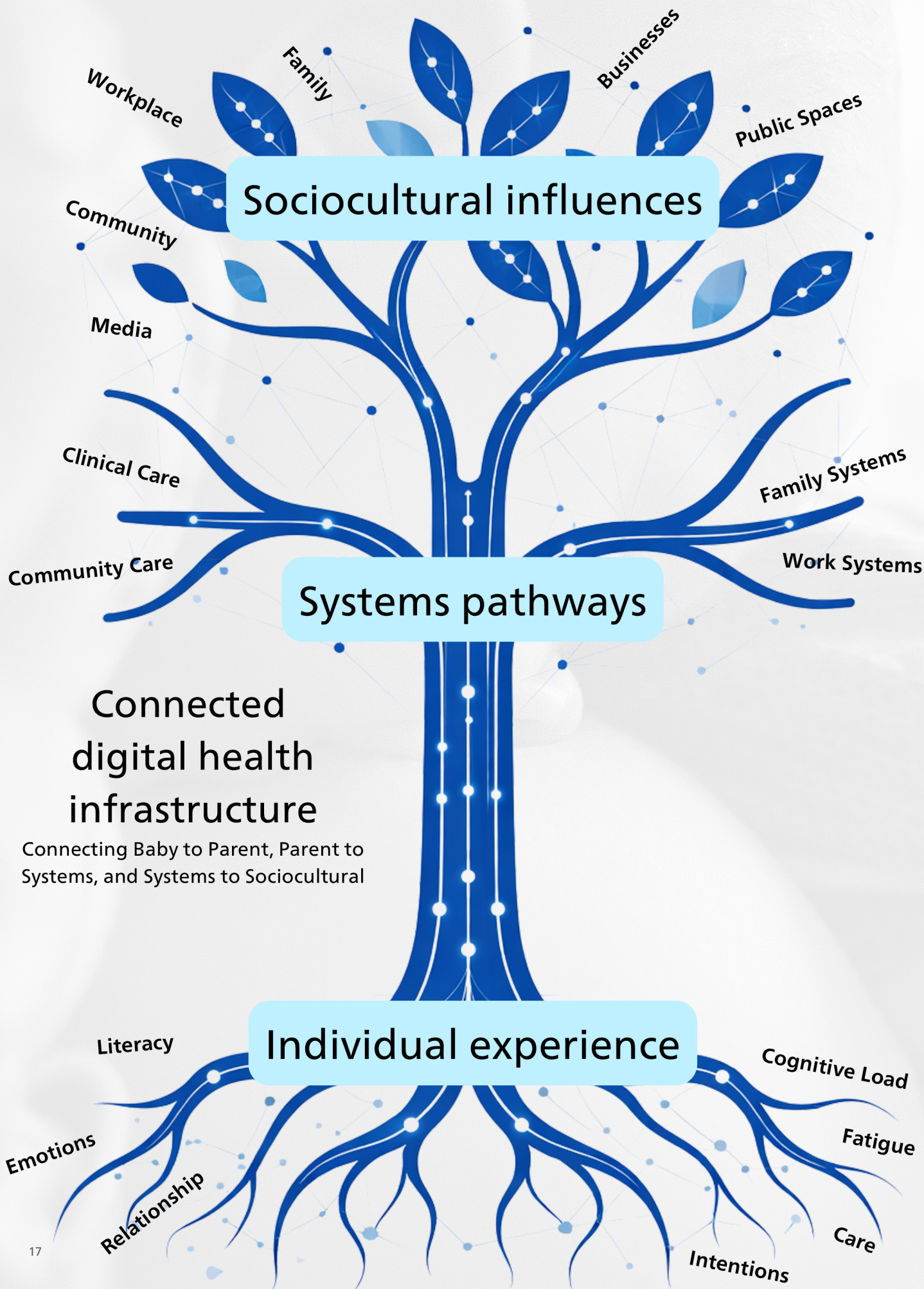
At the foundation of the blueprint is the individual experience of breastfeeding. Digital care should be designed to provide timely, adaptive support during moments of discomfort, uncertainty, and decision-making, when risk of cessation is highest. This requires more than static education. Effective systems should combine real-time access to support, interpretive guidance, and personalization across feeding stage, goals, and context, with the aim of strengthening confidence, capability, and continuity over time. Digital tools should also extend provider capacity by supporting triage, education, and decision-making without replacing clinical care, with AI used in bounded, human-supervised roles such as classification, prediction, and support for personalized guidance.

System **branches**: continuity, visibility, and coordinated response

At the systems level, the blueprint is organized around continuity infrastructure: breastfeeding support should not reset across prenatal care, birth hospitalization, postpartum follow-up, home, and return to work. Feeding history, unresolved concerns, and care plans should travel with families across each transition. This requires shared data that reduce conflicting advice, clear responsibility for follow-up and warm handoffs across providers, and visibility into what happens between visits, where many breastfeeding problems emerge but clinicians currently have limited insight into lived conditions at home or at work. The design question is not how much data can be collected, but what information, delivered when, enables a specific clinical response, because disconnected data streams add burden without improving care.

Sociocultural **leaves**: visibility, representation, and collective support

At the sociocultural level, the blueprint should be designed to make breastfeeding more visible, more realistic, and more collectively supported. Digital environments shape norms and expectations at scale, so they should represent breastfeeding in ways that normalize variation, reduce isolation, and make help-seeking feel legitimate. This includes not only peer connection, but wider social understanding: tools should extend support beyond the breastfeeding parent to partners, families, employers, and community networks whose responses shape what is feasible in daily life. The goal is not only to create digital spaces, but to build environments that reinforce shared responsibility for breastfeeding rather than leaving it as a private individual burden.



5. Where to go from here

Breastfeeding support will improve only when digital tools are deployed as part of a coordinated ecosystem rather than as isolated products or services. The next step is aligned action across the stakeholders who shape how breastfeeding support is delivered, financed, normalized, and sustained.

Stakeholder	Priority actions	Why it matters
Clinicians and lactation professionals	Integrate telelactation, messaging, and digital follow-up into routine care; shift from episodic visits to continuous support; prioritize early postpartum outreach; use digital tools to extend capacity without replacing relational care.	Breastfeeding problems often escalate between visits, so timely, continuous support is essential to prevent manageable challenges from becoming reasons for cessation.
Healthcare systems and administrators	Invest in infrastructure that supports continuity across prenatal, postpartum, home, and workplace transitions; prioritize interoperability and data flow; redesign workflows around remote support and responsive follow-up; measure success beyond visit volume.	Fragmented systems force families to carry information and navigate care alone; continuity infrastructure makes support more timely, coordinated, and usable.
Employers and workplace leaders	Align workplace conditions with the biological realities of breastfeeding by providing time, space, and flexibility; support return-to-work transitions; treat breastfeeding as a workforce and equity issue rather than an individual accommodation.	Many breastfeeding plans fail not in clinics but at work, where inflexible conditions make recommended care difficult or impossible to sustain.
Payers and insurance providers	Expand reimbursement for telelactation, digital support, and longitudinal care pathways; prioritize early preventive engagement; incentivize multicomponent breastfeeding support models.	Payment models shape what kinds of care are feasible; reimbursing continuous and preventive support helps shift care upstream before problems escalate.
Digital health and device companies	Build products as part of connected ecosystems rather than standalone solutions; prioritize interpretation, timing, and integration over raw data generation; design for equity, accessibility, transparency, privacy, and human-centered use.	Digital tools add value only when they reduce burden, support action, and fit real care pathways rather than generating more isolated data or decisions for parents to manage alone.
Public health and policy leaders	Align policy across healthcare, labor, and community systems; invest in equitable digital infrastructure; amplify realistic and diverse representations of breastfeeding; frame breastfeeding as a collective responsibility.	Breastfeeding outcomes are shaped by policy, infrastructure, and norms, not only by individual motivation or clinical advice.
Community leaders and social platforms	Create visible, supportive breastfeeding cultures; elevate diverse lived experiences; reduce stigma; bridge clinical guidance with real-world practice; use digital communities to reinforce support and belonging.	Social environments shape what feels normal, possible, and supported; visible and credible community reinforcement can reduce isolation and strengthen persistence.

The opportunity is not to digitize breastfeeding support as it exists today, but to redesign it as a continuous, connected, and collectively supported system.

Impact: Ending early cessation

The blueprint works only if the individual, systems, and sociocultural layers are designed to function together rather than as separate features. Its purpose is to convert information into coordinated action, reduce the burden on parents to interpret and navigate care alone, and align digital support with real human workflows, trust, and support. The goal is not more tools, but a connected ecosystem that makes timely breastfeeding support easier to deliver and easier to use.

At scale, this model is expected to reduce early breastfeeding cessation, improve population health outcomes, and reduce downstream healthcare burden. Breastfeeding continuation is associated with improved health and developmental outcomes across the life course, reinforcing the importance of sustained feeding beyond initiation (Victora et al., 2016). Well-designed digital ecosystems have the potential to reduce inequities in access to effective care, as shown in subgroup-specific improvements in telelactation trials (Uscher-Pines et al., 2025). These effects also align with broader public health and social goals, as breastfeeding outcomes are linked to structural, social, and healthcare systems rather than isolated behaviors (Miranda et al., 2025).

The blueprint is a model for aligning individual needs, system responses, and sociocultural conditions. By combining continuity, access, interpretation, and social reinforcement, rather than isolated features or channels, we have the collective potential to help infants and parents globally, survive and thrive.



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