

Integrating Human-Centered Design and Social Science Research to Improve Service-Delivery and Empower Community Health Workers: Lessons from Project RISE

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Abstract

This article aims to communicate insights from a collaboration between human-centered designers and social science researchers. We report the insights from Project RISE (Rituals to Improve Service-delivery and Empower health workers), which employed a complex systems approach to understanding Accredited Social Health Activists' motivations and performance in Bihar, India. We describe the process of interdisciplinary integration between human-centered design and mixed-method social science research. We describe insights from each phase of Project RISE. In the Discover phase, we engaged in an expansive and inclusive ideation process informing the formulation of research questions and mixed methodology. Design-led synthesis transformed research findings into actionable, context-specific insights. In the Define phase, we integrated mixed methods rigor with the design process to identify opportunities instrumental in shaping the development of design drivers and solution concepts. We engaged in inclusive prototyping and open-source collaboration to prototype productive solutions in the Create phase. We detail the challenges encountered and the strategies to address them in each phase. Integrating human-centered design and social science research can tackle community health workers' complex challenges and create more productive public health solutions.

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Introduction

Global public health faces multifaceted challenges that demand innovative collaboration across various sectors.¹ Discrete social science disciplines provide valuable but limited perspectives and solutions, yet existing interdisciplinary initiatives often fall short of the integration required for cohesion.² There is a critical need for *true interdisciplinarity*—a comprehensive integration of knowledge, methods, and expertise from diverse fields—to move beyond fragmented approaches to address the complexities of health behaviors and challenges fully. Such interdisciplinarity involves the interaction and integration of multiple disciplines, not merely the additive juxtaposition of such disciplines.³ Achieving this synergy is inherently complex due to the need to effectively merge disparate informational frameworks, conceptual models, tools, and norms.⁴ Integrating methods from diverse fields like psychology, cognitive science, anthropology, public health, and demography with insights from policymakers and program implementers makes the development of holistic, evidence-based health solutions possible.⁵

Human-centered design places end users' needs, capabilities, and limitations at the core of the design process.⁶ It has emerged as a promising avenue to bridge interdisciplinary gaps. It offers a user-focused, iterative methodology that prioritizes active stakeholder participation and collaborative interdisciplinary teamwork to unravel and tackle complex health challenges.⁷ Utilizing human-centered design can transcend traditional disciplinary boundaries, fostering iterative and adaptable solutions informed by various academic insights.⁸ This approach equips public health researchers with a comprehensive framework to deeply understand and cater to their target user group's distinct needs and viewpoints. Human-centered design can ensure that research outcomes are valuable to the scientific community and resonate with and benefit the communities they aim to serve.⁹

Researchers in many human-centered design projects use qualitative research methods to generate insights into users' perspectives, needs, and behaviors; their analysis guides the development of user-centric products and services.¹⁰ An over-reliance on qualitative data in human-centered design can lead to insights that, while rich in narrative, may need more generalizability than quantitative data provides.¹¹ Qualitative research excels at uncovering the underlying motives and contexts of user behavior; however, without the balance of quantitative evidence, there is a risk of drawing conclusions that do not scale or apply across more extensive and diverse populations.¹² To truly understand complex issues and design sustainable, widely applicable solutions, human-centered design must integrate qualitative insights with quantitative validation, ensuring a comprehensive view that captures the depth of individual experiences and the breath of behavioral patterns.¹³ A mixed methods research design harnesses qualitative and quantitative data within a single research initiative.¹⁴ This methodological synergy yields a richer, more nuanced understanding of complex phenomena by drawing from the strengths of qualitative and quantitative research paradigms.¹⁵ Central to the success of this approach is the mutual complementarity of these diverse methods and anchoring the research within solid theoretical frameworks.¹⁶ Mixed methods research, encompassing a

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spectrum of parallel, sequential, or nested designs, offers a holistic approach to addressing intricate health challenges. In a parallel design, qualitative and quantitative data are collected concurrently and later merged for comprehensive insights. The sequential design collects and analyzes one data type before the other, refining the research approach based on initial findings. The nested design integrates one data type within a larger framework of the other, enhancing primary data with supplemental insights for depth and context.¹⁷ Specifically, the nested design integrates diverse research methods, fostering a two-way mutual learning loop to unearth novel insights under the guiding principles of the human-centered design framework.¹⁸

Implementing mixed methods research presents a set of unique challenges. A primary challenge is the integration of quantitative and qualitative data during analysis.¹⁹ Selecting suitable mixed methods is crucial; the research design must align with the study objectives and account for the complexity of the phenomena.²⁰ The meticulous planning for such studies necessitates deep expertise in mixed methods research design. Additionally, striking the right balance between qualitative and quantitative methods regarding emphasis and timing is crucial;²¹ it includes determining realistic expectations for each component and addressing methodological issues that arise from their combination.²² Practical hurdles, such as logistical issues, also emerge in this research paradigm, emphasizing the importance of adept planning and coordination for effective data integration.²³ Working in mixed methods research teams, especially with researchers anchored in qualitative or quantitative traditions, can be challenging due to different paradigmatic positions. Teams must work cohesively and adjust as knowledge and understanding are shared.²⁴ Despite facing challenges, when applied strategically, mixed methods research can serve as an essential instrument, enriching our comprehension of complex health situations and providing robustness in designing productive solutions to improve health outcomes.²⁵

Project RISE

This article elucidates the process and benefits of fostering productive interdisciplinary collaborations. It draws on the combined experiences and insights of human-centered design and social science researchers working on "Harnessing Ritual to Improve Service-Delivery and Empower Health Workers" (Project RISE) in Bihar, India. Project RISE sought to enhance service delivery and empower maternal and child health workers. Funded by the Bill & Melinda Gates Foundation's India office, the project brought together academic researchers from the Center for Applied Cognitive Science at The University of Texas at Austin, local public health and behavioral professionals from Project Concern International, India, human-centered designers from Scope Impact, and expert advisors. We describe processes and outputs generated from various phases of Project RISE using quantitative and qualitative methods from various social science disciplines and human-centered design. We present insights into social and behavioral change obstacles in maternal and child health and design frameworks and concepts.²⁶ This article also highlights the use of human-centered design

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- 24 Marguerite C. Sendall et al., "Participatory Action Research, Mixed Methods, and Research Teams: Learning from Philosophically Juxtaposed Methodologies for Optimal Research Outcomes," *BMC Medical Research Methodology* 18 (2018): article no. 176, <https://doi.org/10.1186/s12874-018-0636-1>.
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principles in designing user-centered studies incorporating the perspectives and experiences of their target user group.²⁷

Project RISE aimed to understand the Accredited Social Health Activists' (ASHA) motivation and performance and to propose solution prototypes to augment their efforts for improving maternal and child health outcomes. ASHAs are community health workers in India who help form a bridge between under-served or remote populations and the formal health system.²⁸ ASHAs play a pivotal role during the perinatal period, collaborating with various health providers and community influencers to support women from pregnancy through to childbirth.²⁹ Understanding the complex dynamics of ASHAs' engagement with their communities is crucial for program designers and policymakers in developing more sustainable and holistic strategies to augment ASHAs' effectiveness and improve health behaviors and service utilization of mothers and children in Bihar, India.³⁰ Project RISE adopted a complex systems approach to examine the multifaceted roles ASHAs play within the cultural health ecosystem.³¹ Our objective was to gain insights into their motivation and strategies for promoting behavior change in the community and then design solutions building on their strengths as women from the community with shared personal experiences and cultural knowledge.

Project RISE integrated rigorous social scientific research with human-centered design principles to devise robust solutions that were evidence-based and tailored to user needs. The multifaceted exploration including the community context of Project RISE made it imperative for us to adopt a research approach deeply rooted in understanding local beliefs, practices, and norms. Human-centered design in interdisciplinary health research projects offers a robust framework for developing interventions embedded in user needs, fostering collaborative innovation, and ensuring sustainable healthcare solutions.³² Its strength lies in its ability to bring together diverse focus on health equity, which was indispensable to meeting the project's objectives.³³ It facilitated including a broader range of stakeholders and expert insights, crucial for the project's expansive scope and the need for precise, expertise-driven solutions. By implementing the interdisciplinary collaborative principles of human-centered design, we brought together research and data experts, design teams, thematic specialists, and local partners to aid the local government.

In some health design projects, research sets the foundation guiding the human-centered design process.³⁴ However, with Project RISE, human-centered design emerged as the cohesive force, knitting together various project facets and facilitating a recurrent collaborative data analysis and synthesis method.³⁵ The structured and user-driven process of human-centered design helped integrate the social science research into the goals central to Project RISE.³⁶ We expanded the nested approach of mixed methods to promote the synergy between human-centered design and research. This approach allowed for a mutual reinforcement where human-centered design practices enriched research insights, and conversely, research findings enhanced the depth and direction of human-centered design processes.³⁷ This approach permitted a more vigorous grasp of the health challenges, leading to tailored, user-driven solutions. From the project's inception, human-centered design professionals were integrated into the research

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- 31 Harry Rutter et al., "The Need for a Complex Systems Model of Evidence for Public Health," *Lancet* 390, no. 10112 (2017): 2602–4, [https://doi.org/10.1016/S0140-6736\(17\)31267-9](https://doi.org/10.1016/S0140-6736(17)31267-9).
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- 39 Cristine H. Legare et al., "Perinatal Risk and the Cultural Ecology of Health in Bihar, India," *Philosophical Transactions of the Royal Society B: Biological Sciences*

discussions, later collaborating in designing and prototyping solutions. The project capitalized on the inherent user-focused ethos of human-centered design to pinpoint pertinent research queries and comprehend maternal and child health requisites from a ground-level perspective. This depth of understanding informed subsequent phases of the project, where human-centered design central to our approach played a key role. These methods focusing on stakeholder collaboration and iterative refinement, translated multiple data streams into practical insights and strategies to boost the performance and motivation of ASHAs. By involving ASHAs and community members in validating and refining our insights, we crafted solutions that were not only grounded in experience but also culturally resonant, thus empowering ASHAs with improved tools and techniques for their critical role.

Project RISE also employed a *ritual lens*—rooted in anthropology and sociology—to systematically organize and interpret mixed methods data, focusing on the ASHA's motivation and her operational strategies within the community's cultural norms.³⁸ These rituals, defined as normative social conventions, play a pivotal role in healthcare, connecting behaviors to life events and bridging the gap between traditional medicine and biomedicine.³⁹ Each project phase maintained a commitment to academic expectations, producing research articles that drew from and expanded upon the various data streams and enriching the discourse in subsequent sections of this article. Furthermore, the project leveraged insights from human-centered design, anthropology, sociology, and psychology. Social science perspectives enriched the understanding of cultural norms and community structures, while human-centered design offered pragmatic methods for ideation and prototyping.⁴⁰ We used psychological insights to delve deeper into individual motivations and perceptions. By synthesizing knowledge from these diverse disciplines, Project RISE adopted a holistic approach, ensuring a nuanced understanding of the challenges and facilitating the creation of solutions tailored to specific community needs.

An Overview of the Various Phases of Project RISE

The objective of Project RISE was to address the complex challenges of enhancing ASHA service delivery and maternal and child health behaviors in Bihar, India. The project was methodically phased out from March 2018 to April 2021, with each phase generating specific outputs that contributed to the project's momentum and outcomes. The project unfolded in three main phases: Discover, Define, and Create, each with distinct steps, outcomes, and a flow of insights that informed subsequent steps (Figure 1).

Phase 1 — Discover (March 2018–October 2019)

The Discover phase marked the inception of Project RISE and the establishment of an advisory board comprised of thematic experts, researchers, and local government partners. We designed this phase to create synergy between social science researchers and designers. We undertook a comprehensive literature review and conducted field research to explore ASHAs in the complex cultural context of rural Bihar. Design research supported insight generation around critical areas for exploration, such as the role of rituals and traditional

Timeline and Phases of Project RISE

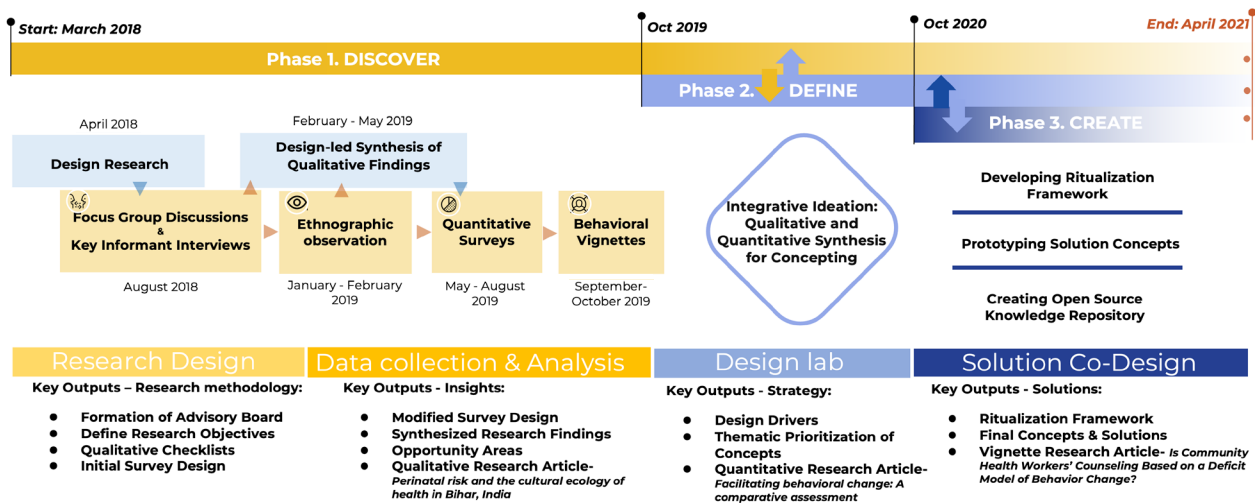


Figure 1
The synergy between design process and mixed method research in Project RISE.
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knowledge in pregnancy and the shared cultural practices between ASHAs and their communities. Design research led to a comprehensive qualitative investigation, which included 51 key informant interviews and 40 group discussions across two distinct regions of Bihar. The interviews involved diverse participants: ASHAs, other health workers, religious leaders, traditional midwives, and rural medical practitioners. In addition to these interviews, the group discussions were held separately with young mothers and their mothers-in-law, providing a broad perspective on the community's health practices and challenges. The ethnographic observations with eight ASHAs augmented these qualitative methods to better understand their work and life.

Meanwhile, a design-led synthesis of qualitative findings catalyzed a pivotal predesign meeting to review initial findings and adapt the quantitative survey instruments accordingly. These integrated efforts ensured that the surveys addressed the multifaceted roles of ASHAs as community and health system representatives. The subsequent quantitative survey involved 400 ASHAs and 1,200 mothers, aiming to broaden and validate the qualitative insights. The outcomes from the Discover phase formed a strong foundation for the project, guided by an advisory board that provided continuous strategic advice. This phase set the stage for the subsequent Define and Create phases, where we developed actionable strategies and solutions from the insights gained.

Phase 2—Define (October 2019–October 2020)

During the Define phase, the design and research teams of the project embarked on integrative ideation, synthesizing qualitative and quantitative insights through co-design. Key design drivers emerged, addressing ASHAs' unique challenges at the intersection of healthcare and community roles. Findings from the behavioral vignette study (with a subset of respondents interviewed in the quantitative survey) served as narrative tools that presented

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40 Parry Garff et al., "Analysis of Integrated Engineering and Social Science Approaches for Projects in Developing Communities," *International Journal for Service Learning in Engineering, Humanitarian Engineering and Social Entrepreneurship*, no. special issue (January 2014): 137–50, <https://doi.org/10.24908/IJSE.V010.5146>.

- 41 Oskar Burger et al., "Bridging the Gap between Service Extension and Cultural Facilitation among ASHAs" (draft report, from [bookdown.org](https://bookdown.org/oskarevolearn/rise/), updated January 12, 2022), <https://bookdown.org/oskarevolearn/rise/>.

various healthcare scenarios to ASHAs and recent mother respondents, illustrating the collective nature of health decision-making influenced by cultural, familial, and religious factors. Vignettes offered nuanced insights into the counseling approach of ASHAs and related expectations from the community that surveys alone could not provide. In the Define phase, the Design Lab became the venue for our interdisciplinary team and Advisory Board to engage in rigorous discussion sessions. These critical discussions honed a strategic pathway forward, solidifying the project's trajectory through actionable "How Might We" (HMW) statements and definitive design drivers. Throughout three collaborative workshops, local implementation experts contributed valuable insights, allowing the team to refine the design drivers in alignment with the lived realities of the community and prevailing policy frameworks. The phase culminated in a democratic selection of key design drivers and the thematic prioritization of concepts, such as resolving tensions that emerge due to an ASHA's role, a position often located between the health system and the community, and using traditional rituals to augment biomedical behaviors. The stage was thus set for the next phase of creative development with a focus on the most productive solutions, ensuring their relevance and integration into broader health initiatives.

Phase 3—Create (October 2020–April 2021)

In the culminating Create phase, Project RISE shifted from conceptualization to actualization, turning collaborative insights and theoretical models into concrete, culturally resonant solutions. This phase was marked by rigorous prototyping and iteration, including remote co-design sessions with ASHAs and community members. This prototyping and iteration allowed the team to challenge their assumptions and recalibrate strategies in response to user feedback and data analysis. One of the key outputs of this phase was the *ritualization framework*, a strategic tool to assist planners and designers in identifying four key elements: beneficiary access, behavior interconnections, influencer types, and motivations, to develop comprehensive behavior change strategies embedded into the community's cultural fabric (more details in the Insights from the Create Phase section). This framework underwent further scrutiny through feedback loops with community stakeholders, guiding the selection of the most promising solutions. Further, ten solution concepts were prototyped, iteratively refined, and encapsulated along with the outputs from the Discover and Define phases within an open-source knowledge repository.⁴¹ This repository was established not just as a collection of findings and solutions but also as a versatile guidebook tailored to meet the varying needs of stakeholders, including researchers, policymakers, and local health administrators working to address the challenges of community health workers, such as ASHAs.

Throughout all phases, the insights and findings flowed back and forth between the steps, as indicated by the arrows. Each phase drew upon the outputs from the previous one, ensuring a coherent and informed progression from research to actionable solutions. The phases emphasized the importance of a mixed methods approach that combines qualitative and quantitative data, stakeholder feedback, and an iterative design process.

- 42 Wilfreda E. Thurston and Bilkis Vissandjée, "An Ecological Model for Understanding Culture As a Determinant of Women's Health," *Critical Public Health* 15, no. 3 (2005): 229–42, <https://doi.org/10.1080/09581590500372121>.

Next, we systematically describe the insights generated when integrating human-centered design and mixed methods research through three pivotal phases of project RISE, each contributing uniquely to the project's overarching aim of enhancing community health outcomes. Commencing with the insights from the Discover phase, we discuss the use of ideation processes to inform and design our mixed methods research. This phase aimed to deploy design-led synthesis, harmonizing localized and complementary research methods to generate actionable, community-specific insights. Insights from the Define phase underscore the importance of methodological rigor within our design process. Here, we describe how our mixed methods research, steered by human-centered design, unearthed latent themes and opportunities. These foundational insights were vital in formulating design drivers and conceptual solutions. The narrative then progresses to the Create phase, where we illustrate the critical role of inclusive prototyping and open-source collaboration in realizing effective solutions. We introduce the practical application of our established insights and collaborative frameworks tailored to the nuanced needs of ASHAs and the communities with whom they engage. We also discussed the challenges encountered and the resolutions devised within each phase, providing a holistic view of our process.

Insights from Discover Phase

Expansive and Inclusive Ideation to Design Mixed Methods Research

In Project RISE, we reimagined ideation, traditionally a process for pinpointing opportunities and potential solutions within the human-centered design process. Our approach applied insights generated in the Discover phase to formulate research questions aimed at uncovering and addressing critical practice and academic knowledge gaps. We employed ideation principles such as divergent thinking to widen the scope of exploration and convergent thinking to focus and refine our research objectives. Additionally, we harnessed methods such as brainstorming, mind mapping, and scenario building to guide the development of innovative, solution-focused research methods that transcended conventional academic exploration. Through this evolved ideation process, we laid a robust foundation for the subsequent phases of Project RISE.

One of the primary outcomes of using insights in the Discover phase was our systematic approach to understanding the complex world of ASHAs using a systems perspective. This phase revealed the importance of adopting a "nested cultural ecology of health" framework to tackle our identified initial challenges (Figure 2).⁴² This approach broke down the multifaceted environment in which ASHAs operate into distinct layers. Starting from the innermost circle, we see "The ASHA and her Family," highlighting her personal life, family dynamics, and intimate challenges. Moving outwards, "The ASHA Beneficiaries" illustrates her professional relationships, emphasizing her pivotal role as a health advisor and the direct impact on those she assists. The next layer, "The ASHA's Community," showcases the broader community's interaction and perception of her, underlining the cultural

Cultural Ecology of Health Framework and Quadrant Approach to Understand ASHAs' Roles

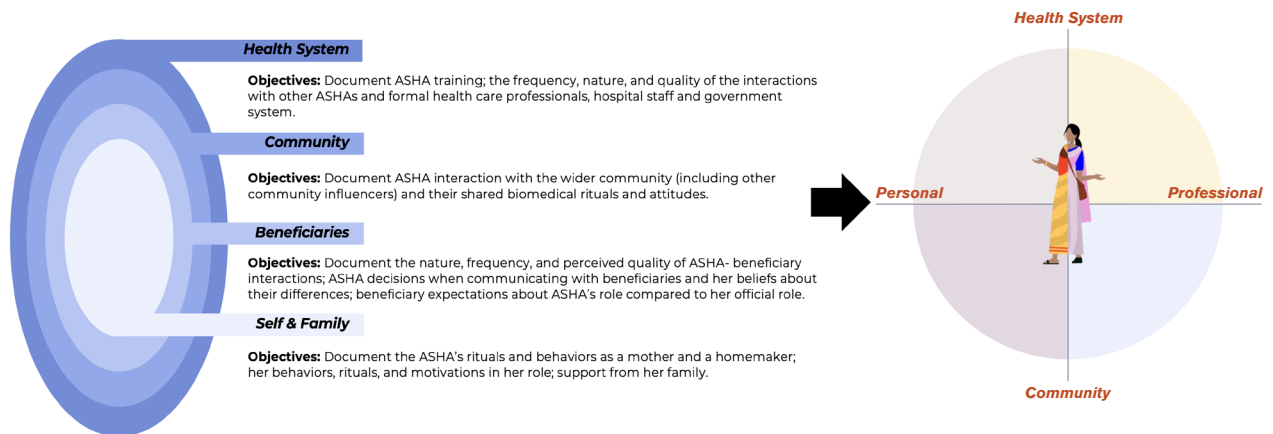


Figure 2
 The ASHA-centered framework has four spheres of interactions and emerging quadrants for exploration. © 2023 the authors.

dynamics, acceptance, and recognition of her role. Lastly, “The Health Care System,” the outermost circle, paints a picture of the structural challenges, her place within the larger healthcare framework, and potential bureaucratic obstacles.

The nested cultural ecology of health framework became the basis for organizing the mixed methods insights into the four quadrants (Figure 2). It maps the life of an ASHA across interconnected layers of influence and responsibility. The personal quadrant delves into the most intimate layer of self and family by exploring her individual ambitions and the delicate equilibrium she maintains between her familial roles and her professional identity. The second layer of beneficiaries is embedded within the professional quadrant, where ASHA's responsibilities, the barriers she confronts, and her engagement with the medical community are laid out. Progressing outward, the community quadrant encompasses her social persona, examining the interplay of community perception and her quest for societal recognition—a critical aspect of her cultural environment. The outermost layer, the health system quadrant, encapsulates her formal integration into the healthcare framework, addressing her training, resource dynamics, and the formalities of her role. This quadrant approach, embedded within the nested cultural ecology, offers a holistic perspective on the ASHA's experience, articulating the complex web of personal, professional, community, and systemic factors that define her role in healthcare.

Beyond just understanding these layers, our focus was on inclusivity. We recognized that to understand the details of ASHAs' experiences deeply, we needed to include insights from every level. Inclusivity in our research did not just mean the inclusion of diverse participants but also ensuring that we considered each layer's unique challenges and perspectives. This holistic and inclusive approach helped us better comprehend the relationships, interactions, and dynamics between the layers, leading to more informed and practical research outcomes.

43 James Smith, "Parasitic and Parachute Research in Global Health," *Lancet Global Health* 6, no. 8 (2018): e838, [https://doi.org/10.1016/S2214-109X\(18\)30315-2](https://doi.org/10.1016/S2214-109X(18)30315-2).

44 Legare et al., "Perinatal Risk and the Cultural Ecology."

Design-Led Synthesis of Localized Complementary Research

In Project RISE, our commitment to a localized research approach was paramount. We aimed to ensure that the community's lived realities and results from our data provided convergent insights. This emphasis extended beyond mere data collection locations. It involved a research design and a research team composition adept at delving into and understanding the contextual and cultural nuances. Ideations of research questions in the Discover phase led to designing relevant research methods. The on-the-ground knowledge and programmatic expertise of a local agency affiliated with the government enriched these methods. A common pitfall in transnational projects is the "parachute research" practice, where external researchers, often less aware of the local context, design studies, collect and interpret data, and draw conclusions with relatively little involvement from the community.⁴³ Project RISE consciously sidestepped this approach by collaborating with local researchers and experts and emphasizing the need to build trust, understand local dynamics, and ensure that the information gathered was genuine and context-aware. Their extensive experience in community health was instrumental in creating research tools tailored for in-depth exploration. Moreover, their facilitation was crucial in executing comprehensive field research, allowing us to capture a spectrum of perspectives that ranged from individual household dynamics to broader community health practices.

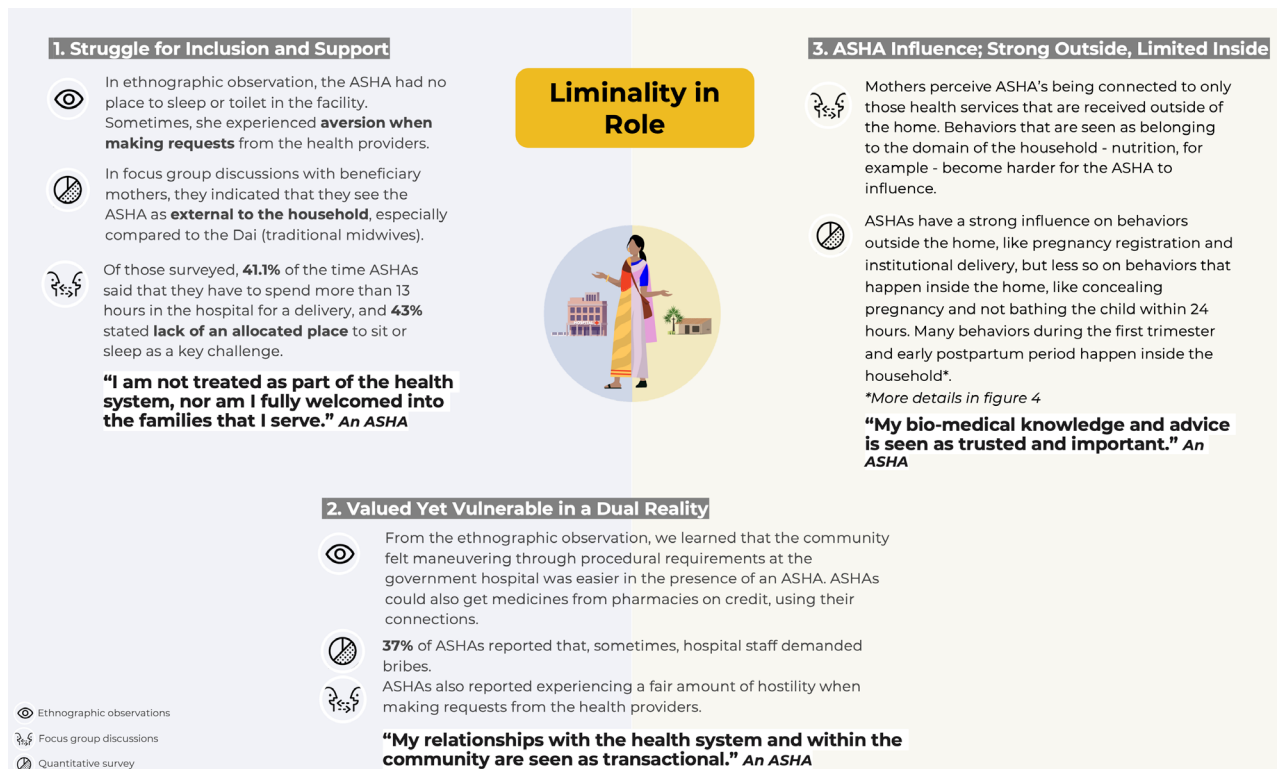
Project RISE used a mixed methods approach to develop a comprehensive understanding of ASHAs' roles and their influence during the perinatal period (from the beginning of pregnancy to a month after birth) by first employing qualitative methods such as focus group discussions, in-depth interviews, and ethnographic observations. We chose these methods strategically to probe deeply into the subject's nuances, which played a critical role in the project's design phase and the development of the quantitative survey. The qualitative data was pivotal in fostering open dialogue and deriving insights from the health beliefs, rituals, and practices encountered during the perinatal period. When examining perinatal health practices, the emphasis on risk avoidance during pregnancy is clear. Among young mothers, we identified 155 biomedical and traditional practices; 88% of these were risk-averting, while 44% focused on health promotion. Conversely, for older mothers, out of 206 identified practices, 86% were risk-averting and 49% promoted health. There is a notable shift in adherence to biomedical recommendations during the different phases surrounding childbirth. During pregnancy, alignment with these recommendations is more pronounced. However, post-childbirth, there was a significant increase in practices that contradict medical advice. In the case of young mothers, while only 1 out of 155 practices during pregnancy was in contradiction, the postpartum period showed 36 out of 151 practices deviating from medical advice.⁴⁴ We augmented this foundation by conducting a quantitative survey to identify and elucidate behaviors. This survey had one of two possible results. In one case, it led to convergent findings that reinforced the qualitative insights. On the other, it led to divergent results that highlighted discrepancies. These discrepancies challenged initial perceptions and revealed the spread of certain behaviors. The survey with ASHAs and their mother clients helped in quantifying the complex dynamic

- 45 Bjørn Thomassen, "The Uses and Meaning of Liminality," *International Political Anthropology* 2, no. 1 (2009): 5–28, <http://www.politicalanthropology.org/>.
- 46 Francisco Martínez, "Liminality and the Modern: Living through the in-between; Breaking Boundaries: Varieties of Liminality," *European Journal of Cultural and Political Sociology* 2 (2015): 371–75, <https://doi.org/10.1080/23254823.2015.1134231>; Sierk Ybema, Nie Beech, and Nick Ellis, "Transitional and Perpetual Liminality: An Identity Practice Perspective," *Anthropology Southern Africa* 34, no. 1-2 (2011): 21–29, <https://doi.org/10.1080/232323256.2011.11500005>.

Figure 3
Liminality in ASHA's roles with associated strengths and challenges through mixed methods research synthesis. © 2023 the authors.

of ASHAs' roles and their impact on perinatal health practices in Bihar, India. By aligning and contrasting these data streams, Project RISE could harness the detailed explanatory power of qualitative data with the broad, statistical perspective of quantitative analysis, ensuring a well-rounded and substantiated understanding of the complex dynamics at play.

The first macro insight highlighted the complexities of ASHAs' roles, using design-led synthesis to explore their lived experiences. It showed the intersection of their identities as mothers and community members with their professional responsibilities (summarized in Figure 3). The concept of liminality, which captures the "in-between" transitional state, is profoundly relevant to ASHAs as they navigate the intersection of biomedical and traditional healthcare systems in India.⁴⁵ This liminality underlines the complexity of their roles and the ambiguities they manage daily, serving not just as service providers but also as cultural interpreters and social change agents within their communities.⁴⁶ Despite their essential role on the front lines of healthcare, ASHAs often grapple with feelings of exclusion from the health system they support, struggling for recognition and integration (Point 1, Figure 3). This marginalization renders them vulnerable, with their crucial contributions sometimes overlooked and their authority questioned (Point 2, Figure 3). ASHAs navigate a delicate balance between honoring community traditions and advocating for biomedical practices, embodying a vital dual role fraught with the complexities of bridging two sometimes disparate worlds. Communities



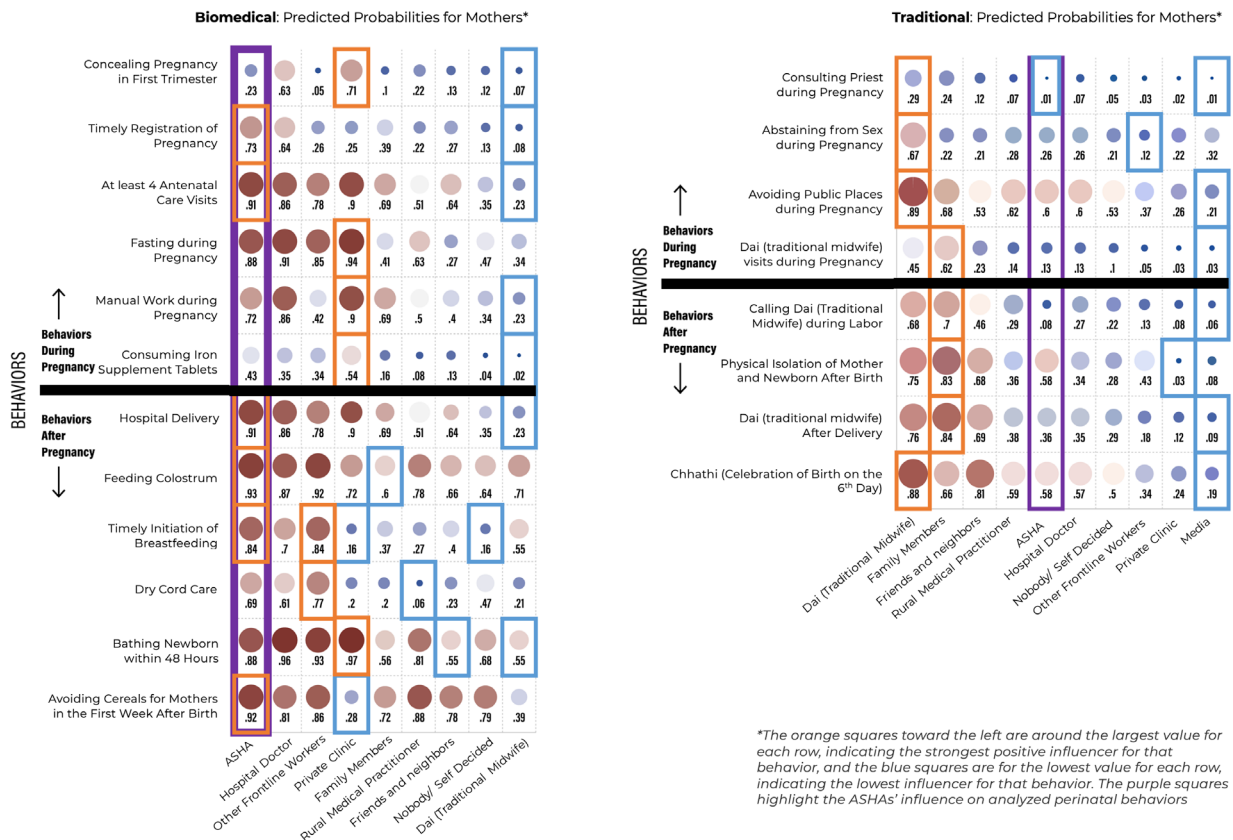


Figure 4
The strengths of ASHA and Dai (traditional midwife) as influencers of biomedical and traditional behaviors for recent mothers.
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acknowledge and are open to the health practices ASHAs promote, signifying their impact on health behavior. Nonetheless, ASHAs encounter challenges at the intersection of biomedical advice and entrenched socio-cultural practices, sometimes limiting their influence during critical health moments (Point 3, Figure 3). In perinatal health, “influencers” comprise a network of individuals shaping health decisions, spanning family members, community leaders, traditional caregivers, and government and private healthcare providers. Among these, ASHAs are recognized as the most influential sources of biomedical information, earning the confidence and focus of the communities they serve. They have the highest probability of being selected as influencers of biomedical behaviors that occur externally to the household, such as antenatal check-ups and immunizations, as depicted in the left graph of Figure 4. Conversely, within the domestic sphere, the influence is shared between ASHAs and Dais (traditional midwives), with the latter playing a substantial role in inside-home perinatal practices, particularly those steeped in tradition, as shown in the right graph of Figure 4.

The second macro insight uncovered through the mixed methods synthesis is a complex support network within which ASHAs operate. This support system is essential to their efficacy as community health workers (summarized in Figure 5). ASHAs’ professional efficacy is contingent upon

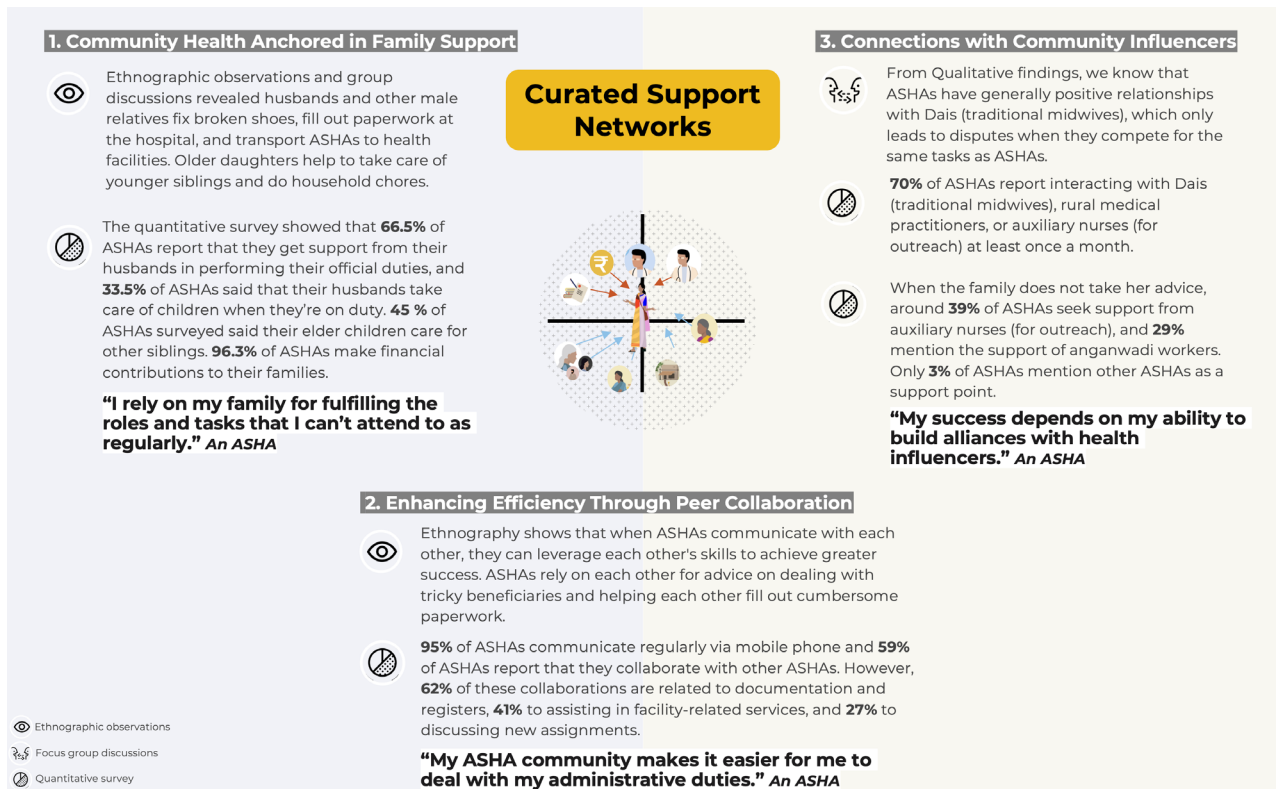


Figure 5
 The support network of health influencers around ASHAs through mixed methods research synthesis. © 2023 the authors.

family support. ASHAs intricately balance their professional roles with familial responsibilities, relying on informal yet vital support from family members who often engage in tasks that enable them to perform their community health duties. Family support remains largely unacknowledged and varies greatly depending on family dynamics and the value placed on the ASHA's work within the family unit (Point 1, Figure 5). Peer collaboration also emerges as a cornerstone, with ASHAs frequently engaging with other ASHAs to seek and share advice, particularly on administrative challenges such as incentive delivery and record-keeping. However, this unregulated communication seldom leads to collaborative efforts, indicating a gap in formal support structures for more comprehensive peer-to-peer assistance (Point 2, Figure 5). Without formal systems, ASHAs also establish relationships with local health influencers like Dais, Anganwadi workers, and auxiliary nurses (for outreach), which are essential for navigating the health and community systems (Point 3, Figure 5). ASHAs, thus, operate within a dynamic ecosystem, anchoring their community health mission in a network that spans familial support, peer interaction, and traditional health liaisons. Each strand of this network is vital, providing the composite strength necessary for ASHAs to fulfill their complex and critical role in public health.

The third macro that emerged from synthesizing mixed methods revealed a dynamic, organic, and individualized customization in ASHAs' approach

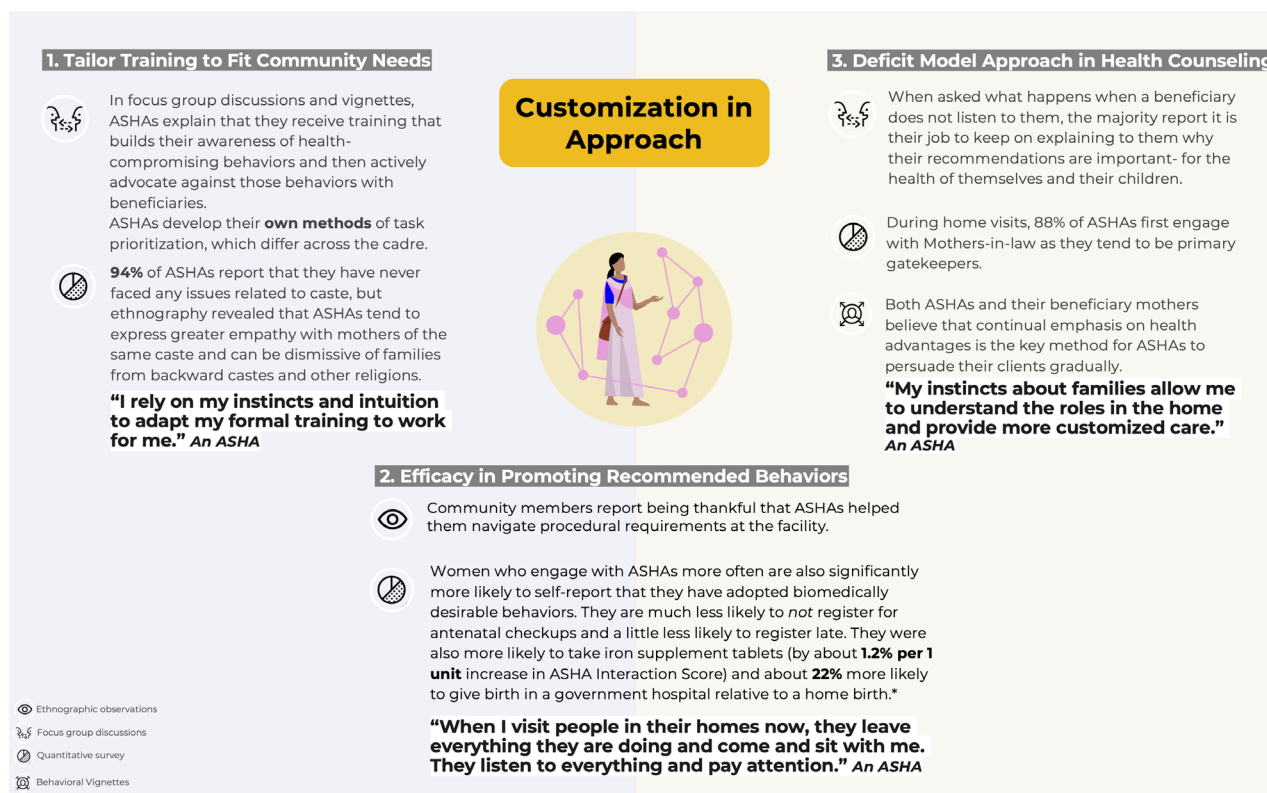


Figure 6
Adaptive strategies in ASHA's community health counseling through mixed methods research synthesis. © 2023 the authors.

to their community health work (summarized in Figure 6). Each ASHA, uniquely responding to her context, adapts her training to meet diverse challenges, prioritize tasks effectively, and build critical relationships within the community (Point 1, Figure 6). This adaptability is essential, yet it operates without robust formal support, sometimes reinforcing subjective biases based on caste, community, or behavior and driven by incentive structures and normative expectations. ASHAs rely on their deep understanding of the socio-cultural milieu to devise communication strategies, enabling them to engage effectively with community members and navigate complex family relationships (Point 2, Figure 6). They are skilled in identifying and convincing household decision-makers who may resist new health practices, using soft skills and empathy that go beyond their formal training. This flexibility is crucial for ASHAs, allowing them to bridge the gaps left by standardized protocols and ensure the successful implementation of health initiatives (Point 3, Figure 6). Deficit models prioritize knowledge transfer and neglect the broader need for systemic support, and the empowerment of ASHAs constrains the effectiveness of ASHAs' customized counseling.⁴⁷

The synthesis helped us further link the coexistence of traditional and biomedical health systems to the roles and motivations of various influencers, uncovering four crucial elements for understanding behavioral patterns in health interventions. At the core is the factor of motivations, where ASHAs

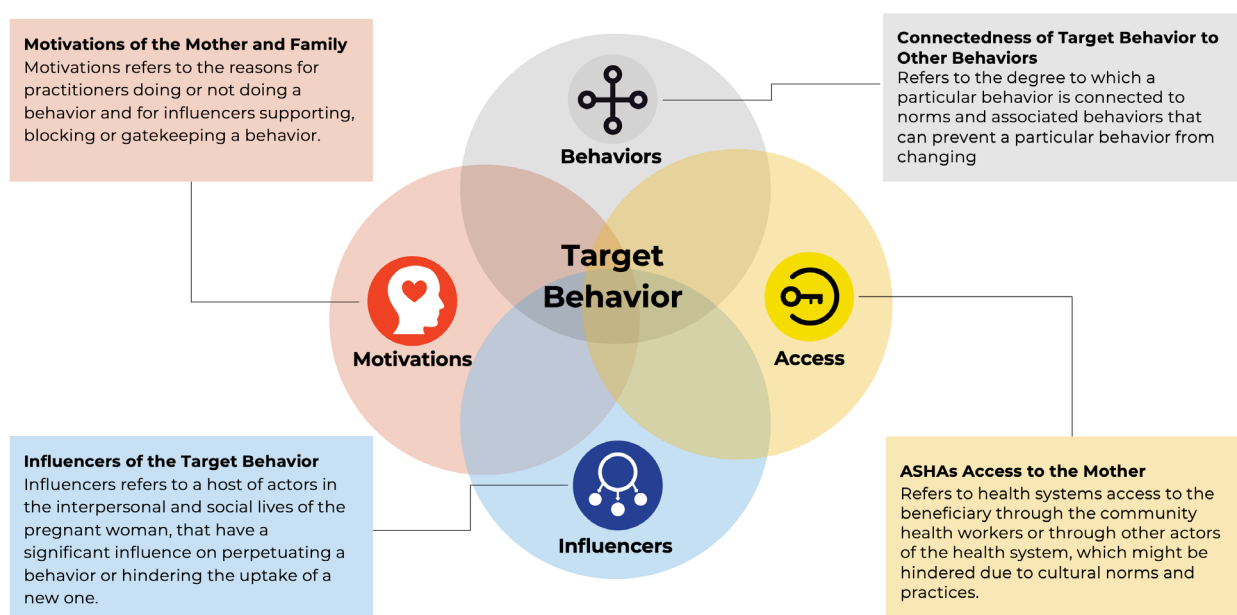
47 Molly J. Simis et al., "The Lure of Rationality: Why Does the Deficit Model Persist in Science Communication?" *Public Understanding of Science* 25, no. 4 (2016): 400–414, <https://doi.org/10.1177/0963662516629749>.

draw on community ties to shape health messaging that aligns with local motivations. Empowering the ASHA in this domain is critical to enable them to contrive impactful communications. ASHAs, with their broad community engagement, are well-placed to navigate and leverage these relationships to reinforce or shift perinatal health behaviors. Training ASHAs to understand and navigate challenges rooted in social norms is essential for effective cultural facilitation and behavior change. The factor of access emphasizes the varying degrees of ASHAs' reach in the community, often shaped by cultural norms. ASHAs must optimize their influence when present and collaborate with other influencers, like traditional midwives, to maintain a continuum of care during less accessible phases. A significant output of Project RISE was the consolidated connectedness approach. We developed this to enhance the structural and instructional conventions of the ASHA program. Our goal was to improve the role of ASHAs as cultural facilitators, optimizing behavior change solutions by building on the strengths of ASHAs as a kind of connective tissue between the health system and the community (Figure 7).

Project RISE emphasized the importance of cultural sensitivity, focusing on meaningful insights rather than just data accumulation. Human-centered design helped translate qualitative and quantitative findings related to critical traditional and biomedical health practices, their motivations, influencers, and ASHAs' access to influence these behaviors into actionable insights. This comprehensive synthesis informed the development of nuanced, culturally attuned templates for solution conceptualization in the Define phase.

Figure 7
The four overlapping factors identified by Project RISE map the cultural ecology surrounding behaviors and facilitate behavior change. © 2023 the authors.

Four Overlapping Factors Shaping Behavior



Process Challenges and Resolutions in the Discover Phase

Addressing the process challenges in the Discover phase of Project RISE required a multifaceted approach. Discrepancies in stakeholder expectations surfaced early, particularly as we attempted to align scientific research with a human-centered design ethos. To bridge these gaps, we led discussion sessions, which were essential in harmonizing the various domain-specific terminologies and methods. These interactive sessions served as a conduit for stakeholders to gain insights into the collective goals and diverse techniques, smoothing the path toward a unified vision.

The complexity of integrating a mixed methods approach, with its array of methodological intricacies, presented a significant hurdle. Our multidisciplinary team's diverse skill sets and knowledge required deliberate coordination to craft a cohesive research strategy. To address the challenge, we conducted targeted brainstorming sessions in India with a team of researchers, designers, and local experts, which helped align our focus areas with our qualitative and survey objectives. Establishing unified research methods among international partners was also pivotal, so the Texas-based team and local collaborators engaged in joint fieldwork during the qualitative phase. They engaged in shared analysis to synthesize initial findings, setting a precedent for the remaining phases of the research. Specifically, for the qualitative methods, our objective was to document the extensive range of rituals and practices adopted by pregnant women and their families and to understand the underlying reasons for these traditions. We aimed to explore the extent to which these practices were in harmony with the approaches of the ASHAs and the broader community. As we progressed to developing qualitative surveys, the design team emphasized the need to delve into additional facets of the ASHAs' lives. These facets included examining the dynamics within their families, the nature of their interactions with peers and supervisors, and the burden of their responsibilities. These expanded inquiries were crucial in constructing a holistic understanding of the ASHAs' professional and personal landscapes, ensuring our tools were comprehensive and sensitive to the intricacies of their roles.

Insights from Define Phase

Applying Methodological Rigor in the Design Process to Identify Latent Themes and Opportunities

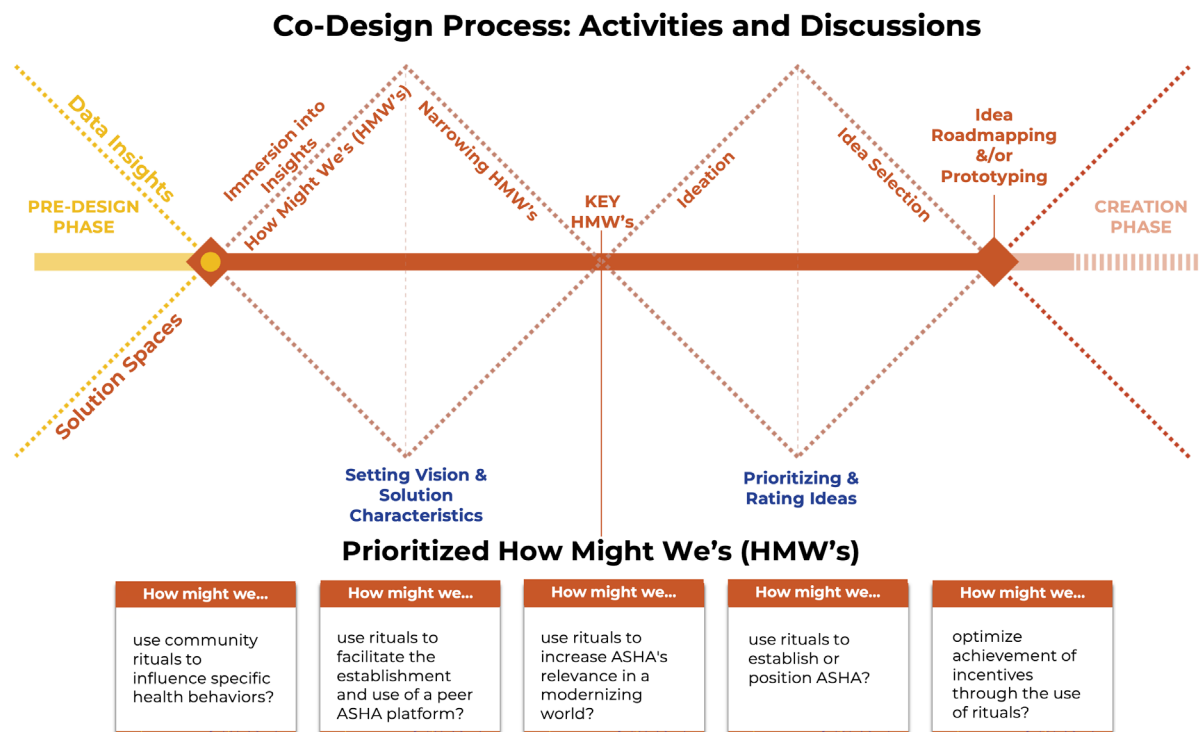
The Define phase of Project RISE marked a pivotal transition, where the fusion of methodological rigor and human-centered design principles led to identifying emerging themes and opportunities. In this phase, our team engaged in integrative ideation, meticulously weaving together qualitative and quantitative insights to uncover latent themes and emerging opportunities. This collaborative process harnessed the power of co-design to crystallize the unique challenges faced by ASHAs into coherent design drivers. These drivers were rooted in the deep understanding of ASHAs' dual roles within healthcare and community settings, spotlighting their nuanced needs.

Through co-design sessions with researchers, designers, local partner agencies, and advisors during the Define phase, we immersed ourselves in

macro insights to formulate and prioritize “How Might We” (HMW) questions to explore potential solutions (see Figure 8). This process culminated in idea road mapping to prototype selected ideas. The process was iterative, with the prioritized HMW questions as a focal point for developing actionable solutions. These questions revolve around using community rituals to influence health behaviors, facilitating a peer ASHA platform, increasing ASHA’s relevance in the modern world, establishing the position of ASHA, and optimizing the achievement of incentives through rituals. This approach allowed us to devise design drivers to capture the intricacies of ASHAs’ experiences, highlighting the often underappreciated significance of their liminal roles in motivating their performance and shaping their perceptions (Figure 9). Our design drivers revealed that to empower ASHAs and enhance health outcomes, interventions must support their liminal positions in their communities. These drivers propose actionable solutions like building more robust support networks, offering training for improved ASHAs’ influenceability, and empowering them to utilize cultural insights for behavior change. Each driver is rooted in deep insights into ASHA experiences, crafted to alleviate specific tensions, optimizing their performance and impact within their communities. By recognizing the ASHAs’ intermediary roles and challenges that arise in their cultural and social landscapes, we can foster a more supportive environment that amplifies the ASHAs’ impact as cultural facilitators for community health.

The formation of design drivers led to the need to comprehend better how ASHAs balance between programmatic guidelines and their personal beliefs

Figure 8
A depiction of the activities and discussions during the co-design sessions. © 2023 the authors.



Design Drivers to Resolve Tensions in ASHA's Liminal Role

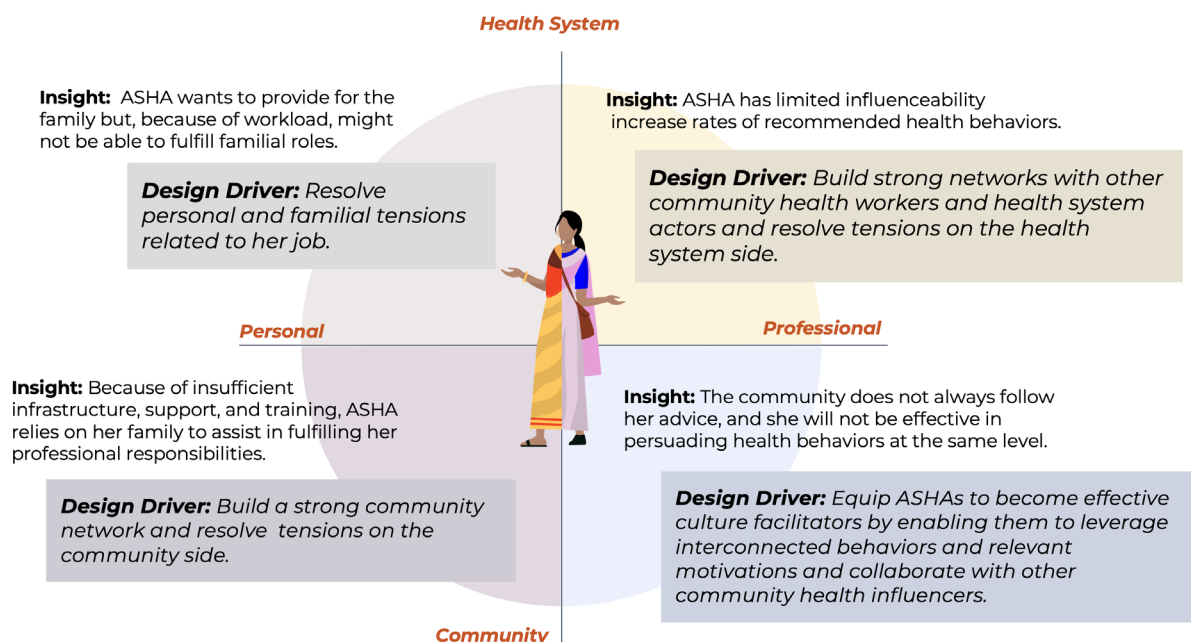


Figure 9
Design drivers formed based on the mixed-methods insights to improve ASHA motivation and efficacy. © 2023 the authors.

when counseling women. For this, we conducted a behavioral vignette study. These vignettes presented ASHAs with situations illustrating either adherence or non-adherence to biomedical guidelines, allowing us to gauge how they interpret these scenarios and subsequently influence their clients' health decisions. Their reactions helped gauge the relationship between their understanding of these scenarios and their chosen persuasion techniques.

The findings revealed a discrepancy. In our analysis of behavioral vignettes, ASHAs were more likely to invoke health and biology explanations when the mother character adhered to ASHA's recommendations. The data showed that the probability of ASHAs citing a health-biology rationale was 9.67 times greater when the vignette's mother character adhered to biomedical advice compared to when she did not. Alternatively, ASHAs were 3.21 times more likely to attribute character's non-compliance to social dynamics. Furthermore, when contrasting responses between ASHAs and the mother respondents for vignettes depicting biomedically inconsistent behavior, ASHAs were substantially more likely to attribute maternal choices to external factors than mother respondents; they were 2.24 times more likely to cite social dynamics and 3.47 times more likely to cite a lack of knowledge as influencing factors. In contrast, if a mother's decision deviated from the ASHA's guidance, explanations rooted in social dynamics were 3.21 times more probable. The data show agreement between the anticipated reasons for advice rejection and the persuasive arguments ASHAs suggested. However, despite prioritizing maternal and child health, persuasion attempts often overlook the social dynamics influencing

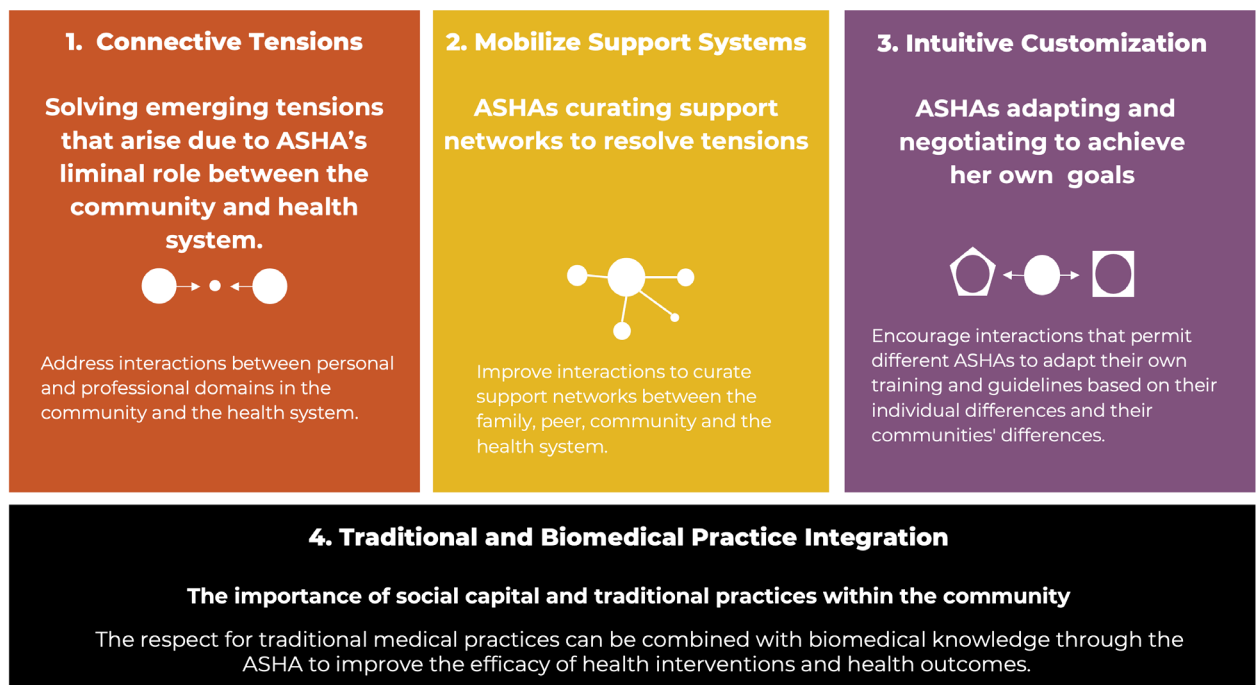
48 Simis et al., "Lure of Rationality."

advice refusal. When we triangulated the insights with their training structure, we realized this issue to be at the level of the ASHA program, which largely follows a "deficit model" in training, suggesting the primary method to persuade those hesitant about medical advice is to educate them about medical science.⁴⁸ This oversight suggested a need for social considerations to be better integrated into ASHAs' persuasive strategies to reflect the multifaceted nature of clients' decisions into our design drivers.

We used co-design sessions and inputs from behavioral vignettes during the Define phase to further map prioritized design drivers into actionable opportunities for solution conceptualization (Figure 10). The identified four strategic opportunities for ASHAs addressed the tension between their personal and professional roles, creating support networks within the community and health systems, allowing ASHAs to tailor their methods to their community's needs, and blending traditional practices with biomedical knowledge to improve health interventions and outcomes. The mapping allowed us to understand how to leverage interconnected behaviors, social norms, and traditional practices to develop more intuitive and holistic strategies for change. This approach fostered the creation of tools that allowed ASHAs to blend their deep community ties and maternal experiences into effective advocacy for behavioral change. We then prototyped and iterated selected concepts in the Create phase, each designed with shared and complementary ritualization mechanisms. We crafted these mechanisms to work together, enhancing the uptake and sustained adoption of recommended

Figure 10
The four opportunity areas to guide solution conceptualization. © 2023 the authors.

Opportunity Areas to Guide Solution Conceptualization



health behaviors over time, reflecting a deep understanding of the community's cultural and social fabric.

Process Challenges and Resolutions in the Define Phase

During the Define phase of Project RISE, we encountered the multifaceted challenge of synthesizing and presenting research data in an actionable way for design and implementation. The task was to clean, analyze, and generate findings that were not only accurate but also accessible and relevant for design applications. Expertise in data management, analytics, and visualization became paramount. Our skilled research team was well-equipped in these areas, yet we found a need for a more substantial alignment with the design team's requirements during these crucial steps. Meta-inference, integrating insights from both quantitative and qualitative research, introduced complex challenges, especially when results appeared conflicting or counterintuitive.

To address this, we organized joint analysis workshops, facilitating a collaborative space where researchers and designers could make sense of the data. We realized the necessity of each team understanding the other's approach; hence, we conducted cross-disciplinary training sessions. We designed these sessions to acquaint designers with research methods and researchers with design methods, ensuring a unified approach to problem-solving. Additionally, recognizing the vital role of clear communication, we created a standardized lexicon tailored to research and design needs. The collaboration integrated domain-specific terminologies and methods from human-centered design and social sciences, ensuring they were transparent and intelligible across diverse teams while incorporating local context nuances. We drafted comprehensive guidelines for presenting findings in a manner that was intuitive for designers, thereby bridging any gaps in understanding. We synthesized complex data into visual representations and user personas, crafted narratives to contextualize findings, and conducted interactive workshops that bridged academic narratives with practical design language. This approach optimized the translation of research into design and ensured that the resulting design drivers and concepts were grounded in solid evidence and clear, actionable insights.

Insights from the Create Phase

Inclusive Prototyping and Open-Source Collaboration for Efficacious Solutions

In the Create phase, Project RISE focused on ensuring that our solutions were impactful in their immediate context and retained the potential for broader application. By blending human-centered design with solid research, we developed strategies that could be applied to new communities while maintaining their effectiveness. Insights from mixed methods informed these solutions, designed to align with the communities' specific cultural and contextual realities. This phase marked a shift from conceptualization to actualization, with intensive prototyping and iteration to validate the design outputs with stakeholders and end users.

Solution concepts based on opportunity areas and design drivers emerging from the Define phase were presented to a diverse group, including researchers, field implementers, and end-users, facilitating iterative refinement. We held co-design sessions with ASHAs and their community, allowing us to refine our approaches based on direct feedback and detailed data analysis. These sessions ensured that our solutions were theoretically sound, practically viable, and responsive to these communities' real-world needs and challenges. Feedback shared by mothers helped instill a sense of ownership within the community. Importantly, we integrated local rituals to reinforce existing motivations, making our health recommendations more palatable and contextually apt. This strategy ensured that our solutions genuinely mirrored the experiences and challenges of ASHAs, delivering impactful and tailored interventions to real-world scenarios.

In the previous phase, we identified the need to address ASHA's intermediary role tensions between the health system and the community, leading to several design recommendations. Addressing personal and familial strains resulting from ASHA's duties is vital. Enhancing ASHA's connections with community leaders can alleviate internal tensions, foster trust, and pave the way for effective messaging. Building robust ties with other community health workers and stakeholders can mitigate health system-related strains, fostering peer support and a deeper understanding of the behavioral change elements in ASHA's responsibilities. Our insights underscore the transformation of ASHAs from mere service extenders to cultural facilitators. Achieving cultural facilitation requires leveraging the connectedness and lived experiences of ASHAs to navigate liminality-related challenges and optimize their beneficiary access. Co-design sessions led by ASHAs, including their supervisors and other health actors, were organized to implement these recommendations. The focus was on discerning health behaviors that ASHAs can influence by blending biomedical actions with community rituals. The aim was to co-design new concepts through a ritualistic perspective, merging biomedically advised actions with traditional practices.

The design team drew from research findings and collaborative design meetings to formulate a ritualization strategy framework to identify the elements influencing behavior change. These elements are relevant to designing and assessing interventions (Figure 11). The framework utilized the four critical areas, influencers, behaviors, access, and motivations, identified through the data synthesis (Figure 7). ASHAs vary in their influence on health behaviors, sometimes leading and other times being part of a broader group of influencers. Understanding the mix of biomedical and traditional practices is crucial for ASHAs to guide perinatal care effectively. The framework facilitates the development of strategies for changing behavior, which necessitates a thorough comprehension of a complex network of interrelated factors such as influencers, motivations, obstacles, and even timing. In Figure 11, we begin from the left side, outlining the factors contributing to behavior change and identifying leverage pathways centered around the four factors. Moving to the right, we devise interventions founded on interconnected pathways, aligning with ASHA motivations

Conceptual Flow for Ritualization of Behaviors

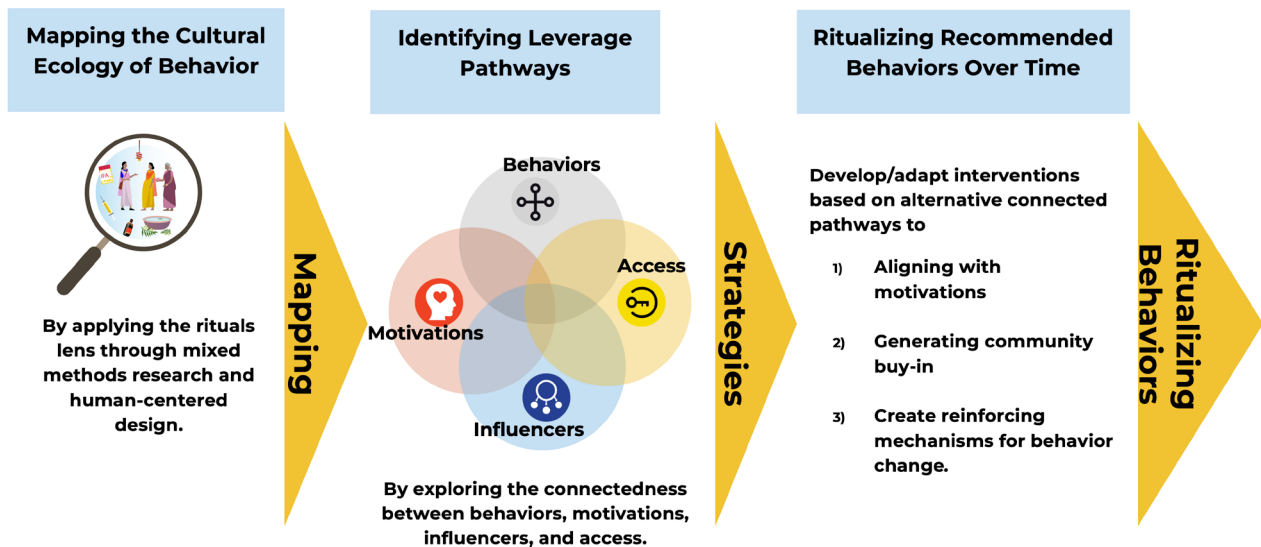


Figure 11
The ritualization framework helps resolve the unique tensions due to ASHA's liminal role.
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to foster community support and establish reinforcing behavior change mechanisms. One of the key insights from our mixed methods research is the interconnectivity and overlap between complex cultural phenomena like rituals, beliefs, practices, habits, and behaviors, which are crucial to understanding how health behaviors are formed and influenced. By examining these connections, solutions can come from minor adjustments or changing seemingly unrelated rituals. Leveraging ritual constitutes a more straightforward strategy that actively adapts or connects a ritual to a particular health behavior. The collaborative design process also investigated the potential for rituals to ease ASHAs' strain due to their intermediary role in bridging the health system and the community. These suggestions also came directly from ASHAs and were further developed as solutions to gather feedback from community members and ASHAs from other catchment areas.

We illustrate the practical application of the ritualization framework with a solution concept, the homecoming ritual, demonstrating how this framework guided the development of culturally resonant solutions (Figure 12). The homecoming ritual involves the family, Dais, and the ASHA of the relevant area when the mother returns home post-delivery. It promotes biomedically endorsed behaviors while discouraging harmful ones. We developed this solution based on the opportunity area identified during the Define phase. In this phase, ASHAs require specialized training on optimal collaboration strategies with other community influencers, including family members and Dais. This proposed solution targets an area of immense concern and potential influence, specifically the first few days at home following childbirth (the early weeks of the neonatal period). It aids

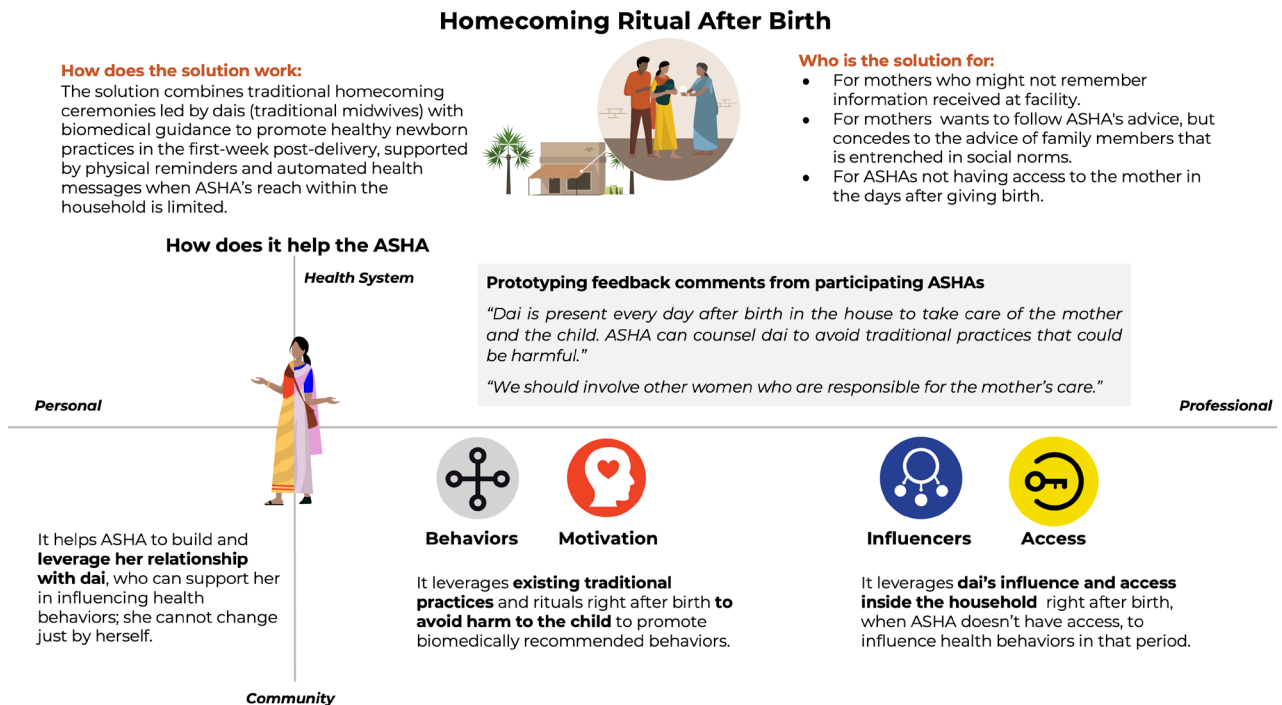


Figure 12

An early concept of creating a new homecoming ritual after delivery to promote biomedically recommended behaviors.

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in achieving harmony among different belief systems by uniting the ASHA, Dai, and family. The ritualization framework is an effort to envision ASHAs in an enhanced role and view as information providers and cultural facilitators for promoting behavior change in the community. By acknowledging their layered identity and knowledge, ASHAs can utilize community ties to address cultural healthcare challenges, elevating health outcomes.

A pivotal objective of Project RISE was to foster more effective collaboration among researchers, implementers, and end-users by creating an open-source knowledge repository for transparently sharing research and design methods, findings, and solutions. This resource serves as an open-access compendium, providing more than just insights—it functions as a comprehensive guide for various user needs.⁴⁹ It is tailored for diverse users, addressing the specific needs of skimmers, swimmers, and divers—those seeking a quick overview, a moderate dive, or a deep understanding, respectively.⁵⁰ Serving as a dynamic platform, it encouraged interdisciplinary contributions from experts in various fields. This hub broadens access to critical information and fosters a culture of shared learning and cooperative innovation, furthering the integration of diverse academic domains and practical expertise in public health endeavors.

Process Challenges and Resolutions in the Create Phase

During the Create phase of Project RISE, we encountered and navigated a series of substantial challenges exacerbated by the Covid-19 pandemic. The

⁴⁹ Burger et al., "Bridging the Gap."

⁵⁰ For example, see <https://landslidecreative.com/wp-content/uploads/2016/09/landslide-creative-skimmers-swimmers-divers-infographic.pdf>.

restrictions and uncertainties of the pandemic era posed significant communication barriers. Engaging community members remotely demanded innovative strategies, as direct, tangible benefits of solutions were less apparent. Resource limitations within the communities further compounded these difficulties; scarcities of time, materials, and access to technology hindered our ability to prototype as robustly as we had planned. The iterative nature of our design process, a normally invigorating space for innovation, became a test of endurance. Both our participants and our design team experienced fatigue due to the continuous cycles of testing and redesign, which were stretched further by the constraints of remote interactions. This fatigue risked diluting the quality of the feedback and the collective engagement with the project.

Faced with the communication challenges brought on by the pandemic, we pivoted to virtual platforms for community engagement, leveraging video calls and messaging applications to bridge the distance. To address the diminished capacity for physical prototyping, we utilized digital tools that allowed for virtual simulations of our designs, fostering continued collaborative iterations. Recognizing the resource constraints of our community members, we adopted flexible scheduling and employed visual aids to streamline communication, ensuring that our messages were clear and accessible. We also tried to alleviate the fatigue experienced by both participants and our design team from the prolonged cycles of testing and redesign by instituting shorter, purpose-driven testing sessions interspersed with breaks to maintain focus and enthusiasm. We also restructured feedback mechanisms to be interactive, incorporating gamification to keep engagement quality high. These strategic adaptations were crucial in maintaining the project momentum and the quality of collaborative input during the pandemic era of unprecedented challenges.

Conclusion

Project RISE represents a cutting-edge fusion of human-centered design with mixed-methods research to examine and influence factors affecting ASHA motivation and efficacy in health service delivery. Our mission was to uncover and address the multitude of personal, familial, professional, and communal influences that shape the ASHA's work, thereby improving health behaviors and access within communities. This endeavor has illuminated the promising capacity of human-centered design to shape research inquiries deeply rooted in the cultural and psychological landscapes of the target communities.

In the Discover phase, we initiated a comprehensive inquiry through design research, leveraging the extensive expertise of our collaborators and advisors. Engaging in in-depth discussions with ASHAs helped to shape and refine our initial research questions and methods, setting a solid foundation for the project. This foundational stage involved a strategic application of relevant qualitative and quantitative methods steered by design-driven synthesis and shared feedback, unraveling the cultural and societal intricacies that influence ASHA's roles and health practices.

In the Define phase, our team refined our approach, translating research findings into actionable design drivers. We achieved this by synthesizing

qualitative and quantitative data and transforming our data into strategic “How Might We” questions. This process enabled us to reshape research insights into clearly defined opportunity areas, with behavioral vignettes providing further guidance on devising concepts.

Progressing to the Create phase, these foundational insights and collaborative efforts culminated in developing practical and innovative solutions concepts. Throughout each phase, the combined strengths of human-centered design and mixed methods research informed our strategy, enabling us to develop sustainable health solutions that are acutely attuned to the needs and complexities of Bihar’s community health context.

This article presents the learnings from integrating human-centered design and mixed social science research methods. It consolidates the lessons learned to showcase the compelling synergy achievable through strategic convergence. The narrative begins with expansive and inclusive ideation processes that form the bedrock of our research questions, employing mixed methods for multidimensional analysis. We underscore the significance of adopting localized complementary research methods, pivotal in unearthing context-specific insights that resonate with the community’s unique fabric. The design-guided research methods are showcased in their capacity to reveal latent themes and potential areas for intervention. At the same time, their integration with the human-centered design process is pivotal in crafting multi-layered solutions. We discuss the nuanced challenges we encountered and the strategies deployed to navigate these complexities. We also highlight the transformative power of open-source collaboration, which democratizes knowledge and amplifies the potential for developing scalable and impactful solutions. By weaving together human-centered design with the empirical rigor of social science research, the article articulates a vision for addressing the intricate challenges that community health workers face, aiming to foster the creation of effective and sustainable health solutions.

In conclusion, the confluence of human-centered design and mixed methods research presents a robust framework for health research. The empathetic core of human-centered design prioritizes individual perspectives, while mixed methods offer a holistic view of complex scenarios. This integrated approach aids in understanding nuanced challenges and devising impactful and sustainable solutions. Our journey with Project RISE underscores the immense value of interdisciplinary collaboration in health research. By drawing on diverse expertise and methods, we can design interventions that resonate with the realities of communities, thereby forging a path toward improved public health outcomes.

Declaration of Interest

There are no conflicts of interest involved in this article.

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