

Implementation determinants influencing women's access, uptake, and use of an iron fortification intervention in Benin: a contextual inquiry research summary

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Background

Two billion people worldwide experience micronutrient deficiencies¹. Iron is one of the most common micronutrient deficiencies and can lead to **iron deficiency (ID)** and **iron deficiency anaemia (IDA)**². In Benin, iron deficiencies are highest in **women of reproductive age and lead to significant health and socioeconomic impacts**³. In attempts to tackle ID in women from the Djidja region of Benin, a field study was conducted using a nutrition intervention package that included: the Lucky Iron Fish (*Fish*), an iron fortification tool, and education on nutrition, ID/anaemia, and use of the *Fish* (via radio and phone messages, educational demonstrations, and training through Village Savings and Loans Association groups). The intervention successfully reduced anaemia. However, successful outcomes were not observed in all households.

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Purpose of the study

The purpose of this study is to conduct a retrospective analysis of the field trial in Benin to understand the individual and contextual factors that influenced success of the trial through an intersectional lens. Without an understanding of the determinants of implementation, interventions are likely to fail in real-world contexts⁴. In Benin, there is little knowledge on the barriers and facilitators that affect women's access, uptake, and use of community-based nutrition interventions, or on the intersecting factors that compound barriers and further influence women's health and nutrition equity. An improved understanding of the contextual and gender-based factors that influence implementation and intervention success will allow us to adapt implementation approaches for improved sustainability and reach.

Objectives and hypothesis:

To identify barriers influencing the success of the trial, **facilitators** that would make the interventions more accessible, and **characteristics** of women that could influence their health equity, and to frame these findings within a framework to inform future implementation strategies. We **hypothesise** that poor trial communication and engagement of community members outside of the trial's participants will emerge as a primary barrier. Further, we hypothesise that the establishment of relationships with community leaders, and empowerment of the community members to take ownership of the intervention, will be identified as facilitators.

Methods

Ethics

This secondary data analysis study was approved by the Carleton University Research Ethics Board (REB#119406). Participant data were received as anonymised aggregate data.



Study design

A randomised controlled trial (RCT) was conducted in Benin by Lucky Iron Life, CARE International Benin, and the University of Abomey Calavi. This trial evaluated the effectiveness of a novel intervention (the *Fish*, and nutrition education) in reducing anaemia among women of reproductive age. The trial was conducted over a six-month period in 2022 in 18 villages in Benin. Trial data were collected from a subgroup of women (n=240), who were randomly assigned to experimental (n=120) or control groups (n=120). The experimental group received the *Fish* and educational training sessions on nutrition, including iron deficiency, radio/phone messaging, and participation in groups focused on women's empowerment. The control group only received the education elements of the intervention and not the *Fish*. Primary outcome of the original trial assessed haemoglobin (Hb) levels collected through blood samples. Trial information can be found here: doi.org/10.5281/zenodo.14918929.

Contextual inquiry

Qualitative analysis

At endline of the trial (6 months), loss to follow-up interviews were conducted with women in the control and experimental groups to explore the reasons for attrition, and analysed using systematic thematic analysis (NVivo v14). Interview responses were coded in the following ways: Codes were used to identify sub-themes among the responses (e.g. rumours), these sub-themes were then grouped into major themes (e.g. trial misperceptions). Major themes were then grouped and organised into intervention-based barriers, blood sampling barriers, or facilitators. Themes, sub-themes (codes), key quotes, and the frequency (n) indicating how many times a code was assigned to the responses, were extracted. We used the PROGRESS-Plus framework⁵ to guide data extraction and report women's characteristics reported in the survey.

Mapping contextual factors to the Consolidated Framework for Implementation Research

To guide future implementation efforts, we reported barriers, facilitators, and intersecting factors within the updated Consolidated Framework for Implementation Research domains (CFIR)⁶. Contextual factors were matched to CFIR domains (outer setting, inner setting, individual, and implementation process domains)⁵. Factors that aligned with multiple CFIR domains were categorised to each domain to capture their complex influence.

Key results

Education on the intervention's benefits and the trial's purpose would have facilitated acceptance, uptake, use, and trust among women and community-leaders

Our analysis revealed barriers that prevented participation in the original trial and use of the intervention including: poor understanding of the trial's purpose and benefits, community-leaders' perceptions of the trial, and mistrust in implementing staff (Figure 1). We also found that education about the intervention and trial, in addition to nutrition education, would have facilitated participation and uptake (Figure 1). Continuous engagement with community leaders would have also increased their acceptance of the trial, and in turn women's participation, and fostered trust with the trial teams (Figure 1). However, these engagements were restricted due to the ongoing COVID-19 pandemic and associated mitigation measures. Understanding these community-specific barriers and facilitators is a critical first step in knowing how to adapt implementation strategies, improve participant agency, and effectiveness of interventions.

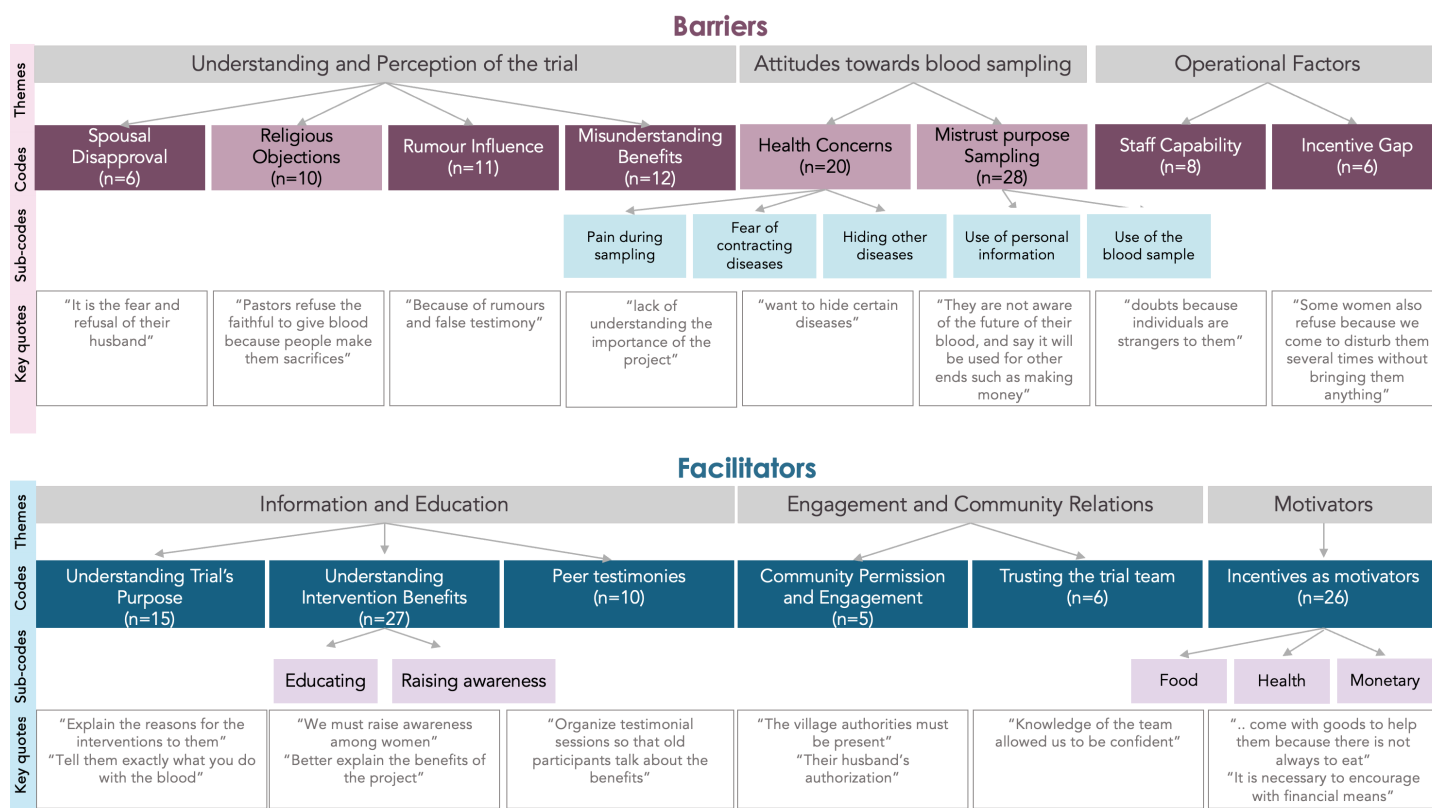


Figure 1. Barriers and facilitators that influenced access and use of the *Fish*, and participation in the trial for women in Beninese communities. Grey boxes = Overarching themes. Dark purple boxes = implementation barriers. Light purple boxes = sampling barriers. Blue boxes = facilitators. n = number of responses that code was assigned to.

Women in Benin experience unique and diverse intersecting factors

Barriers and facilitators alone paint an inadequate understanding of contextual factors that may affect implementation success, but also often reflect social and structural inequities experienced. Recognising women in Benin experience unique and diverse intersecting factors that make up their individual identities and that compound barriers, we explored the intersecting factors from 138 women who completed the endline trial surveys. Women's factors that may stratify health opportunities include access to money or credit (e.g. some women had access whereas others did not) (Figure 2). Another factor was social capital, where women in Benin with higher social capital participated in community activities more than those who had lower social capital (Figure 2). Other characteristics that may stratify health opportunities included matrimonial situation and ages (Figure 2).

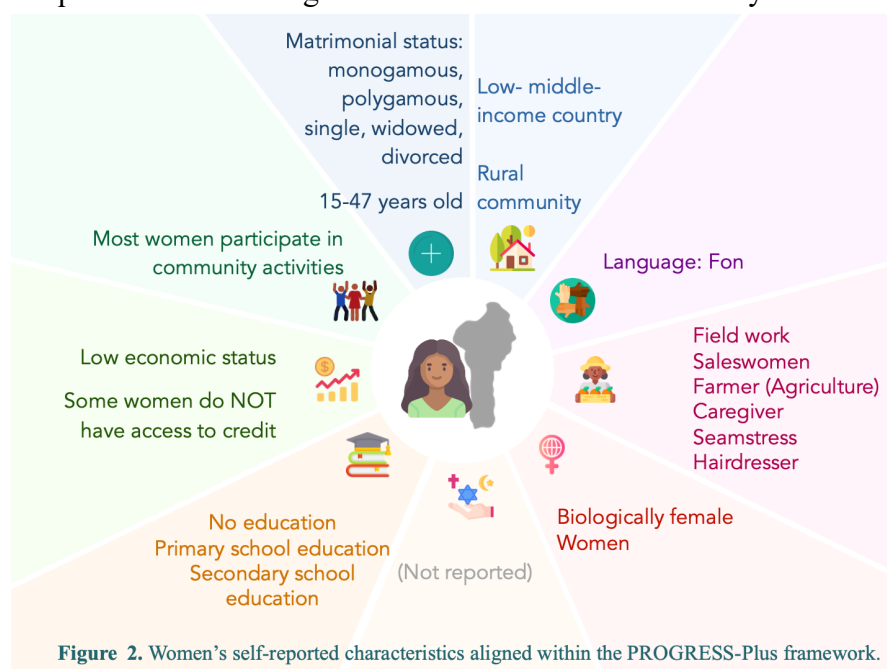


Figure 2. Women's self-reported characteristics aligned within the PROGRESS-Plus framework.

Contextual factors exist within multiple levels of influence to successful implementation

To gain a deeper understanding of the findings across multiple levels of influence, we categorised barriers, facilitators, and women's characteristics into the updated CFIR domains (Figure 3). The CFIR domains include outer setting, inner setting, individuals, and the implementation process. The *outer setting* captures community factors related to local attitudes, local conditions, and societal pressure. The *inner setting* captures factors related to physical infrastructure, relational connections, communications, culture, access to knowledge, and tension for change. The *individuals* domain captures factors related to roles and characteristics of individuals in communities. Lastly, the *implementation process* domain captures factors directly related to the implementation approaches.

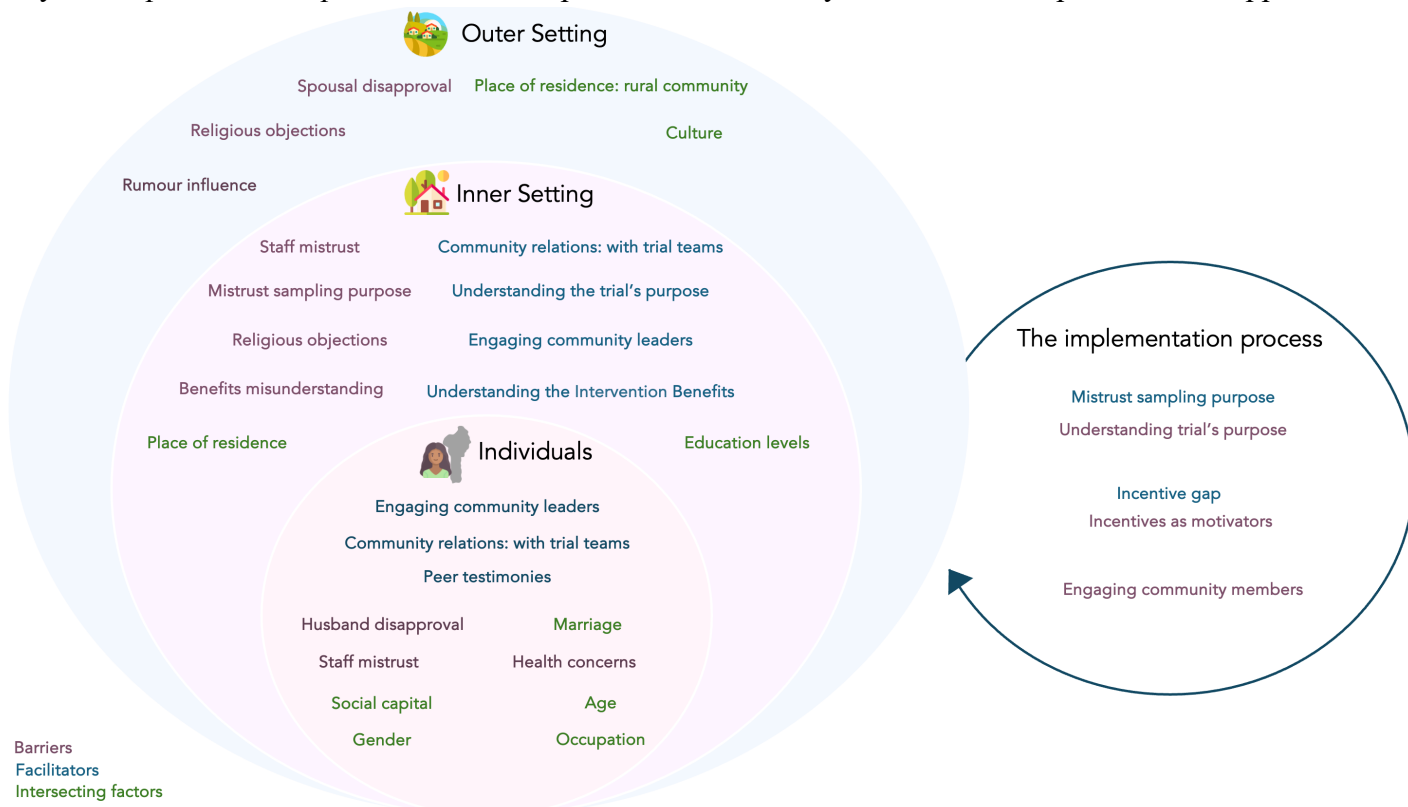


Figure 3. Contextual factors mapped into the updated Consolidated Framework for Implementation Research (CFIR) domains. Figure adapted from The Centre for Implementation.

Conclusions

We identified and analysed contextual factors that influenced the success of implementing a nutrition intervention package (the *Lucky Iron Fish* and nutrition education) to treat and prevent ID and anaemia in women in Benin. We found that the **major barriers included** a lack of understanding of the trial and intervention benefits, and a lack of relationships with trial staff. **Major facilitators included** education on the intervention's purpose and benefits from peers, and continuous engagement of community leaders. To understand how barriers, facilitators, and women's characteristics interact to influence implementation, these results were framed findings within the CFIR framework.



With ongoing work by our team, these findings will inform more effective implementation strategies that are centred around women's equity and empowerment, and adapted to the context in Benin. Next steps are to co-design implementation strategies with key interest-holders (including people with lived/living experience in communities), informed by the barriers, facilitators, and women's characteristics identified in this analysis.

For more information

For more information of the original field trial in Benin: doi.org/10.5281/zenodo.14918929.

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