West Africa Bouillon Fortification Initiative
Burkina Faso Research Brief #1
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Bouillon Fortification in Burkina Faso: Modeled Evidence

Key Policy Messages Related to Bouillion Fortification for Burkina Faso

- The prevalence of micronutrient inadequacy is substantial for both women and young children in Burkina Faso.
- Current national food fortification programs marginally reduce vitamin A, iron, and folate inadequacies.
- Bouillon cubes are widely consumed throughout Burkina Faso, including by poor households in rural areas.
- Multiple micronutrient-fortified bouillon cubes can help reduce micronutrient inadequacies, but large dietary gaps will remain; improvements to existing programs and additional new programs will be needed.
- Designing and implementing a bouillon fortification program will require public- and private-sector investments.
- Premixes will represent the primary cost of programs and will depend on the choice of micronutrients in the premix.
- Technical and other challenges remain to produce commercially viable fortified bouillon cubes.
- Modeling techniques can provide evidence to help inform policy discussions around bouillon fortification program options.

Rationale and Objectives

Rationale: Micronutrient deficiencies impact health, growth, and development.[1] Bouillon is widely consumed, including among rural and poor populations,[1] and hence has the potential to deliver micronutrients to at-risk individuals.

Objectives: This research used national data from Burkina Faso to: (1) assess dietary inadequacy of iron, zinc, vitamin A, folate, and vitamin B12 among WRA and children 6-59 month of age; (2) model the contributions of existing large-scale food fortification (LSFF) programs to addressing micronutrient gaps; and (3) model the potential contributions of fortified bouillon to further meeting dietary requirements and to reducing child mortality. Fortification program costs and cost-effectiveness were also assessed.

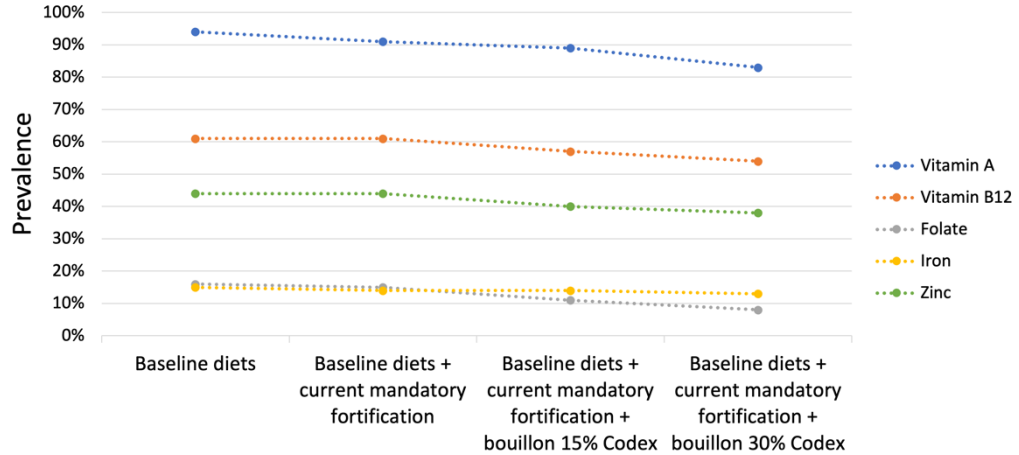
Methods

We used household food consumption data from the 2018/2019 Enquête Harmonisée sur les Conditions de Vie des Ménages[2] and the Micronutrient Intervention Modeling Project's nutritional benefits model (MINIMOD-SD) to estimate the prevalence of dietary micronutrient inadequacies and to model the contributions of various combinations of fortification programs to reducing inadequacies. The Lives Saved Tool (LiST)[3] was used to estimate the impacts of fortification on child mortality. The MINIMOD cost model[3] was used to estimate the start-up and operational cost of hypothetical bouillon programs over 10 years, separated by government costs, and industry costs, and premix costs.

Results: Micronutrient inadequacies in Burkina Faso & programs to address them

Nationally, based on natural food sources alone, inadequacies in vitamin A (VA), vitamin B12, folate, iron, and zinc are common among children (**Figure 1**). Inadequacy is greatest for VA, vitamin B12, and zinc, while iron and folate are problematic but to a lesser extent. Wheat flour fortification (with folic acid and iron) marginally reduces folate inadequacy; refined oils

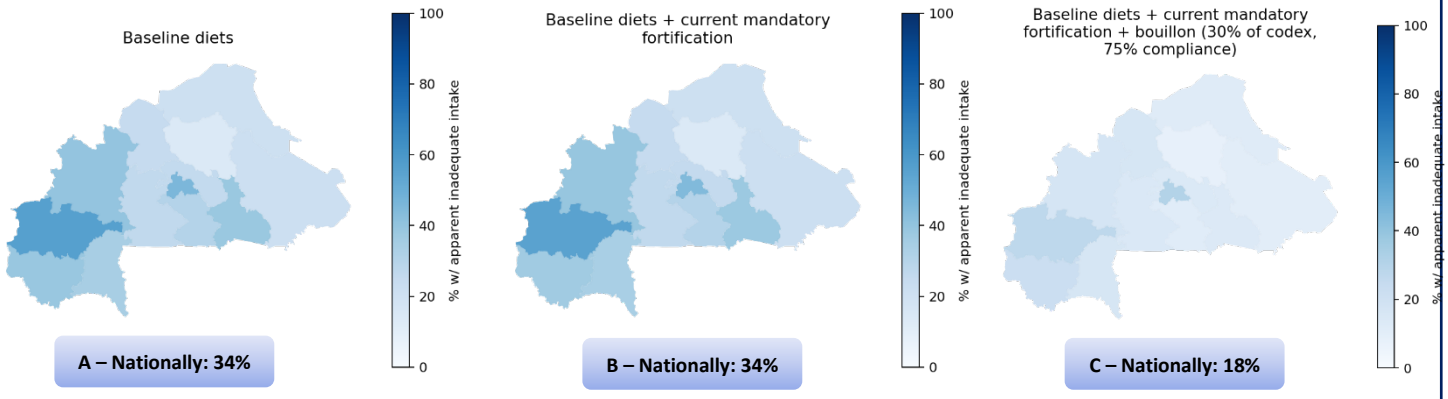
Figure 1: Prevalence of micronutrient inadequacies among young children, by group of intervention programs



fortification marginally addresses VA inadequacies. Bouillon fortification at a level equivalent to 30% of Codex Nutrient Reference Value in 2.5 grams bouillon would decrease inadequacies modestly among children in VA, vitamin B12, and folate, with minimal impacts on the less problematic iron and zinc inadequacies.

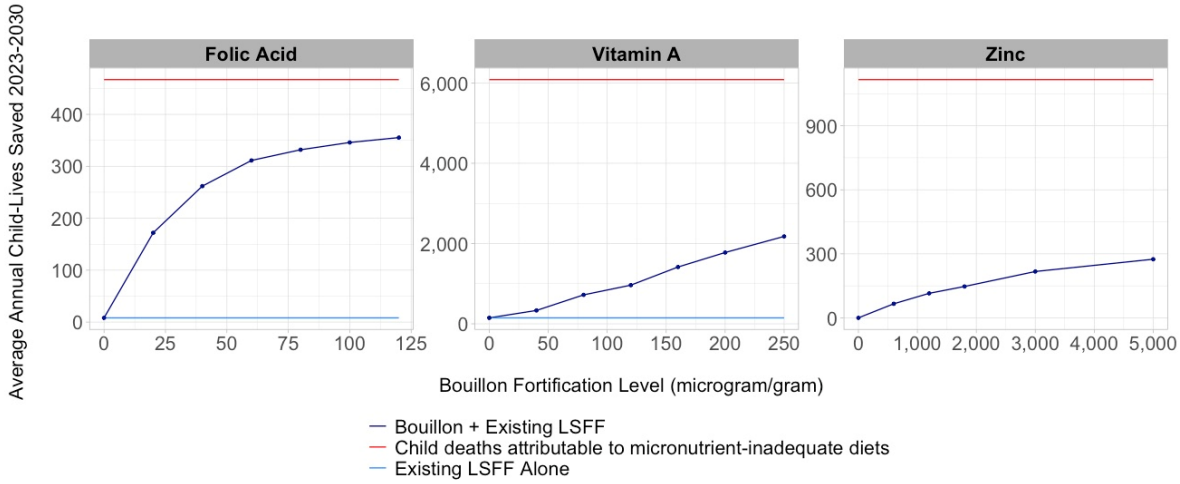
Regional variations exist in both inadequacy levels and the impacts of LSFF and potential bouillon fortification programs. For example, based on natural food intake alone, 34% of WRA nationally have dietary inadequacy of folate (**Figure 2A**), ranging from 56% in Hauts Bassins to 14% in Centre-Nord. Wheat flour fortification contributes very little to reducing national inadequacy (**Figure 2B**). Bouillon fortified at 30% of Codex Nutrient Reference Values (**Figure 2C**) would decrease national inadequacy to 18%, with similar subnational patterns of improvement.

Figure 2: Prevalence of folate inadequacy among WRA; various model scenarios



Reductions in folate inadequacy among WRA, and in VA and zinc inadequacies among children, can lead to reductions in child mortality.[3] **Figure 3** illustrates the potential number of lives saved among preschool children at different levels of fortification of bouillon (independently) with folic acid, VA, and zinc, respectively. The red line in each figure shows child deaths attributable to dietary inadequacy of each micronutrient. The lower blue line shows child-lives saved by existing

Figure 3: Lives saved by different levels of bouillon fortification among children 6-59 months in Burkina Faso



LSFF programs (none includes zinc). Bouillon fortification with any of these micronutrients could save children's lives, although folic acid and VA fortification would be more effective than zinc.

Results: Bouillon fortification program costs and cost-effectiveness

Public-sector and private-sector investments will be required to design, launch, and manage bouillon fortification programs.[4] Planning costs are substantial for government (**Figure 4A**), while equipment investments are the main cost driver for industry (**Figure 4B**). Operational costs for government for bouillon fortification programs (**Figure 4C**) are mainly comprised of training/retraining, social marketing, and factory and household monitoring. Operational costs for industry (**Figure 4D**), on the other hand, are dominated by the management of premix flows (purchasing, shipping, storing, etc.) and by the fortification process internally (fortification and QA/QC activities). Once operational in year 3 of the model simulation period, the annual cost of the flow of premix required by a program designed to meet 30% of Codex NRVs for all five micronutrients for adults consuming 2.5g of bouillon per day is ~$2.41m, or ~$0.001 per 2.5 gram serving.

Figure 4A: Hypothetical bouillon fortification program: start-up costs, by cost category, Government

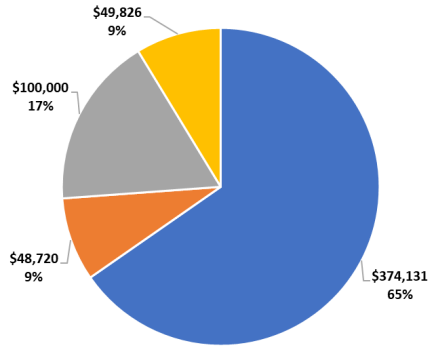


Figure 4B: Hypothetical bouillon fortification program: start-up costs, by cost category, Factories

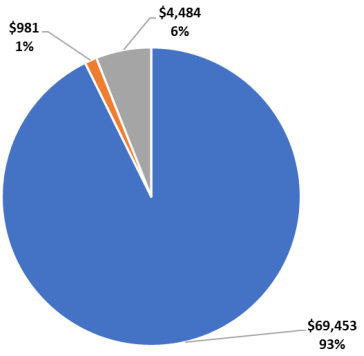


Figure 4D: Hypothetical bouillon fortification program: non-premix operational costs, by cost category, Factories

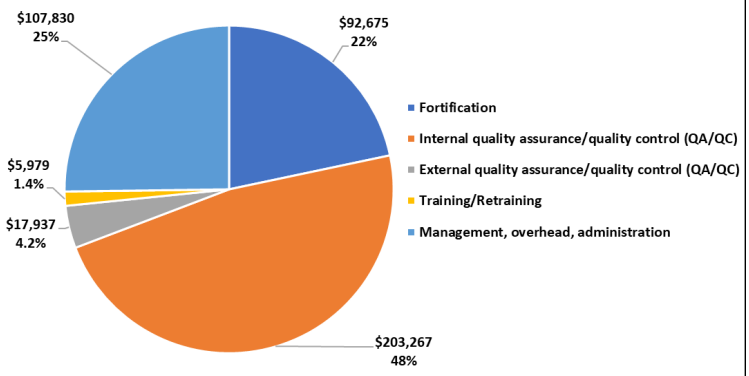


Figure 4C: Hypothetical bouillon fortification program: non-premix operational costs, by cost category, Government

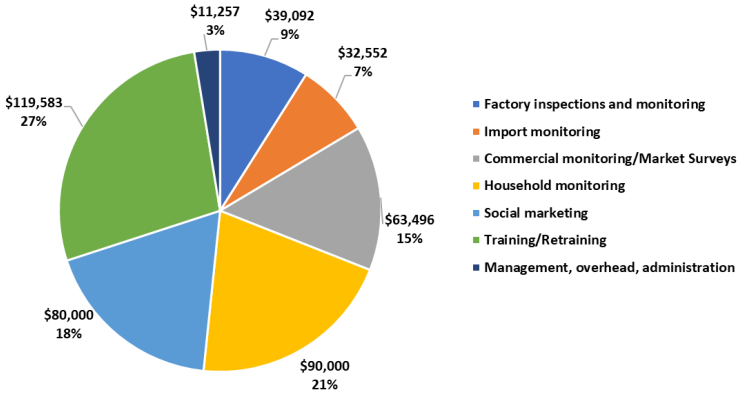
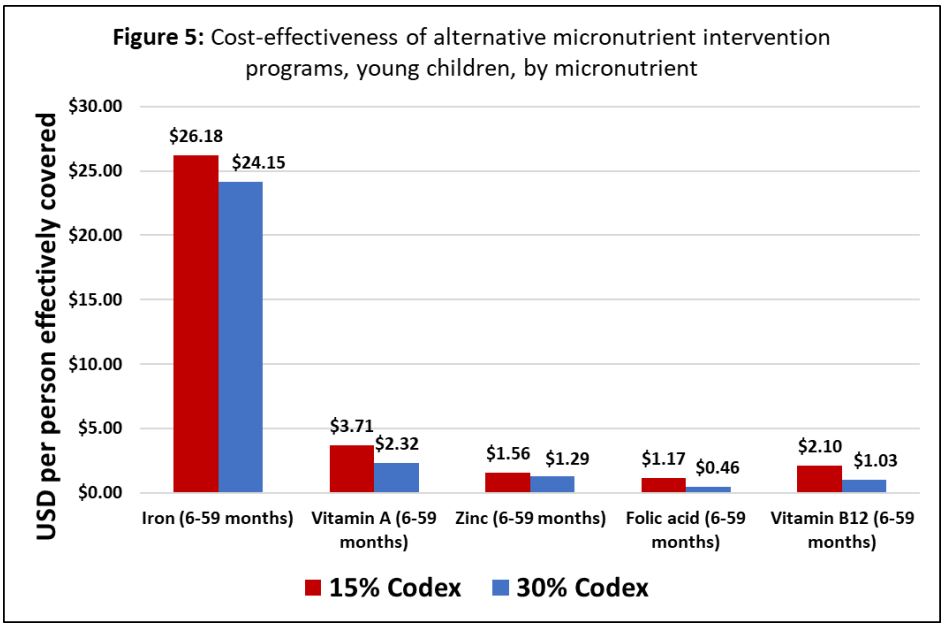


Figure 5 reports the cost-effectiveness of bouillon fortification for each of the micronutrients included in this study. Fortificant costs and (especially) absorption make iron the least efficient. VA is more cost-effective, with zinc, folic acid, and B12 being the most efficient in terms of reducing dietary inadequacy per dollar invested.



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Further information

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[2] Burkina Faso 2018/2019 Enquête Harmonisée sur les Conditions de Vie des Ménages. (n.d.).

[3] Thompson, L., et al. (2024). The Impacts of Bouillon Fortification on Child Mortality: The Cases of Burkina Faso, Nigeria, and Senegal. *Annals of the New York Academy of Sciences*, Special Issue on Bouillon Fortification. forthcoming

[4] Vosti, S.A., et al. (2024.) The Cost-effectiveness of Adding Multi-fortified Bouillon to Existing Large-scale Food Fortification Programs: The Cases of Burkina Faso, Nigeria, and Senegal. *Annals of the New York Academy of Sciences*, Special Issue on Bouillon Fortification. forthcoming