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Short communication

BOUILLON FORTIFICATION IN WEST AFRICA: A PRAGMATIC, EVIDENCE-BASED POLICY PERSPECTIVE

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ABSTRACT

Persistent micronutrient inadequacies in West Africa (WA), coupled with limited coverage of existing fortification programs, have prompted consideration of bouillon cubes as a potential vehicle for micronutrient delivery. This paper argues that the current evidence supports a pragmatic, evidence-based approach to bouillon fortification rather than its dismissal. Emerging evidence from modeling studies and community-based research supports the potential for bouillon fortification to reduce micronutrient inadequacies and their consequences, such as the risk of child mortality. Initial conference-abstract findings from a doubly-masked randomized controlled trial in northern Ghana indicate that 9 months of household use of a 6-micronutrient-fortified bouillon reduced moderate-to-severe anemia among non-pregnant, non-lactating women of reproductive age and iron deficiency (inflammation-adjusted ferritin $<12\mu\text{g/L}$) in pre-school aged children. Several alleged risks of bouillon cubes related to monosodium glutamate, emulsifiers, and ultra-processing are largely extrapolated from experimental conditions that do not reflect typical bouillon consumption. Sodium intake remains a legitimate concern. Available data indicate that bouillon is one of several contributors to sodium intake and can be addressed within a broader sodium-reduction strategy consistent with the World Health Organization (WHO) target of a 30% relative reduction in population sodium intake. Structured, stakeholder-driven processes in multiple countries in WA show that evidence on micronutrient needs, program costs, and sodium intake can be integrated into existing decision-making frameworks to guide bouillon fortification standards and monitoring arrangements. Appropriately regulated bouillon fortification to improve micronutrient intake is consistent with other “harm-reduction” interventions that use suboptimal but widely consumed food vehicles to deliver public health benefits while also reducing associated health risks, such as promotion of salt iodization to address iodine deficiency disorders alongside population sodium intake reduction efforts. Available evidence supports leveraging bouillon cubes, already deeply embedded in daily food preparation, to address micronutrient inadequacies, in parallel with broader food-system transformation and sodium-reduction efforts.

Key words: bouillon fortification; bouillon debate; West Africa; micronutrient deficiency; anemia; iron deficiency; sodium reduction; harm reduction; nutrition policy

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The Context

Global Burden of Disease analyses show that nutritional deficiencies and other nutrition-related conditions remain major contributors to mortality in sub-Saharan Africa [1], with similar patterns in WA, yet the systemic changes to food systems required to address these problems will take time [2]. Fortification of staples can improve micronutrient intake, but coverage challenges have hampered the success of flour and oil fortification programs [3]. Bouillon is a potential fortification vehicle in WA given its high household penetration and consumption within the region [4-6]. A recent Viewpoint by Laillou *et al.* [7] examined the suitability of bouillon cubes as a micronutrient fortification vehicle. While the nutritional quality of fortification vehicles warrants careful consideration, the available evidence supports a more nuanced, pragmatic approach to using bouillon to address urgent micronutrient gaps. This Short Communication aims to summarize emerging evidence relevant to the bouillon fortification debate, respond to key concerns raised in the Viewpoint [7], and propose pragmatic ways forward.

Evidence on the impact of fortified bouillon and further research needs

Laillou *et al.* [7] note the promising reach and projected cost-effectiveness of bouillon fortification; additional evidence is emerging regarding the potential impacts on micronutrient deficiencies and their consequences. Modeling studies linking estimates of dietary adequacy with the Lives Saved Tool suggest that bouillon fortification could avert ~2-4% of annual under-five deaths in Senegal, Burkina Faso, and Nigeria, assuming that 75% of bouillon was fortified with vitamin A, zinc, and folic acid to provide 30% of the Codex Nutrient Reference Values per 2.5 g daily serving of bouillon (based on estimated adult consumption), while factoring in population size and cause-of-death structure, adequacy of nutrient intake from other sources such as existing fortification programs, and bouillon consumption levels [8]. In northern Ghana, a bouillon formulation containing 6 micronutrients was acceptable to women and their households [9]. Published conference abstracts from a completed 9-month randomized, doubly-masked controlled trial in northern Ghana indicate that household use of this multiple micronutrient-fortified bouillon was associated with a 42% reduction in the prevalence of moderate-to-severe anemia among non-pregnant, non-lactating women of reproductive age (prevalence ratio (PR): 0.58; 95% CI: 0.36, 0.95) [10], and a 15% reduction in the prevalence of iron deficiency (ferritin <12µg/L) in pre-school aged children (PR: 0.85; 95% CI: 0.76, 0.96) [11]. Full trial results, including those on other outcomes, are pending peer-reviewed publication. Further research is needed regarding the effectiveness of different micronutrient concentrations among populations with different baseline micronutrient status, and the impacts over a longer duration.

Supposed “perils” of bouillon as a fortification vehicle

Laillou *et al.* [7] raise several concerns about bouillon as a fortification vehicle; however, the supporting evidence is largely an extrapolation from experimental conditions that do not reflect typical human exposure through bouillon consumption. For example, the narrative review cited to suggest that monosodium glutamate (MSG) in fortified bouillon could contribute to obesity [12] drew primarily on high, non-physiological doses in animal models and inconsistent human findings. Extending these results to the low amounts of MSG used to flavour fortified bouillon goes beyond what the underlying studies can support.

A similar issue arises with emulsifiers. Most commercial bouillon cubes use soy lecithin, while some include mono- and diglycerides. The study cited by Laillou *et al.* [13] examined carboxymethylcellulose (CMC), carrageenans, glycerol monolaurate, and polysorbate-80, with the largest effects observed among participants consuming high doses of CMC (15 g/day for 14 days) compared with emulsifier-free diets. Differences in emulsifier type, dose, and exposure context limit the relevance of these findings for evaluating the implications of bouillon fortification at typical consumption levels.

Concerns regarding the high salt content of bouillon are more directly relevant, particularly in light of the WHO target of a 30% relative reduction in population sodium intake [14]. Bouillon was found to contribute ~15% of total adult sodium intake in national surveys in Burkina Faso [15] and Senegal [16]. In northern Ghana [17], 35% of children aged 2-5 y and 50% of women aged 15-49 y exceeded recommended limits even when excluding salt from bouillon and food prepared outside the home, with bouillon contributing <25% of total household salt consumption. These data allow national authorities to situate bouillon appropriately within a multi-source sodium-reduction strategy, rather than treating it in isolation.

Finally, bouillon has been widely used in WA for decades and is likely to remain part of local food cultures irrespective of fortification decisions. There is no evidence that its fortification will lead to increased consumption, although this question can be addressed empirically. Bouillon fortification and sodium-reduction strategies can reasonably proceed in parallel, as has been established for salt iodization programs [18].

The reasonable ways forward: focus on evidence-based solutions

Addressing micronutrient inadequacies in WA would benefit from a pragmatic approach to bouillon fortification that balances potential micronutrient gains with attention to sodium intake. Industry initiatives to reformulate bouillon with reduced sodium using direct salt reduction, mineral substitution, and flavour enhancement technologies are feasible and currently under consideration for markets in WA [4].

Bouillon fortification may provide an additional incentive for manufacturers to engage in sodium reformulation as part of broader efforts to meet WHO global sodium benchmarks for processed foods [19].

Recent work in multiple countries [6] demonstrates how structured, stakeholder-driven processes can define and respond to evidence needs and integrate this evidence into existing decision-making frameworks to guide bouillon fortification standards and monitoring arrangements. In practice, countries could use current intake data (such as national dietary surveys, household consumption and expenditure surveys) to determine if bouillon fortification is necessary and to set appropriate levels. Where adopted, bouillon fortification would require rigorous quality-control and clear labelling that lists ingredients and additives and their functional roles (for example, preservative, emulsifier, or flavour enhancer) alongside guidance on total sodium consumption. Coordinated public communication would clarify that fortified bouillon is not a “health food” but rather a complementary strategy to improve nutrient intake.

Appropriately regulated bouillon fortification to improve micronutrient intake is consistent with other “harm-reduction” interventions that use suboptimal but widely consumed food vehicles to deliver public health benefits, while also reducing the health risks associated with their consumption. Examples include iodized salt to address iodine deficiency disorders despite salt intake remaining above optimal levels, and mandatory fortification of wheat flour or edible oils to improve micronutrient intakes despite concerns that these vehicles may contribute to excess energy intake in some contexts. Rigorous, independent, population-level monitoring of micronutrient status, bouillon consumption, and sodium intake should accompany any national bouillon fortification program, to verify benefits, detect unintended consequences, and refine the program over time. Taken together, available evidence supports leveraging bouillon cubes, which are already deeply embedded in daily food preparation across WA, as a vehicle for addressing micronutrient inadequacies, rather than attempting the elimination of this condiment, in parallel with broader food-system transformation and sodium-reduction efforts.

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