Modelling the maximum potential contributions of zinc and iron biofortified cassava using Household Consumption and Expenditure Surveys

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Introduction

- Improving diets through **micronutrient interventions require sub-national assessment** to evaluate whether populations with the greatest risks for micronutrient deficiencies are being adequately reached.
- **Biofortification** is the process of increasing the density of micronutrients in widely consumed staple crops through conventional plant breeding, agronomic practices, or genetic modification.
- Biofortification **can be an effective intervention** to improve micronutrient accessibility, particularly for the poorest rural populations with the greatest micronutrient needs (Harvest Plus, 2021).
- **Household Consumption & Expenditure Surveys (HCES)** can contribute key insights into subnational variations in diets and can be used to model the potential for micronutrient interventions to help meet the micronutrient needs of at-risk populations.
- This **study aims** to demonstrate the opportunities of Household Consumption & Expenditure Survey data by modelling the current potential maximum contributions of zinc and iron biofortified cassava for meeting dietary requirements in Nigeria.

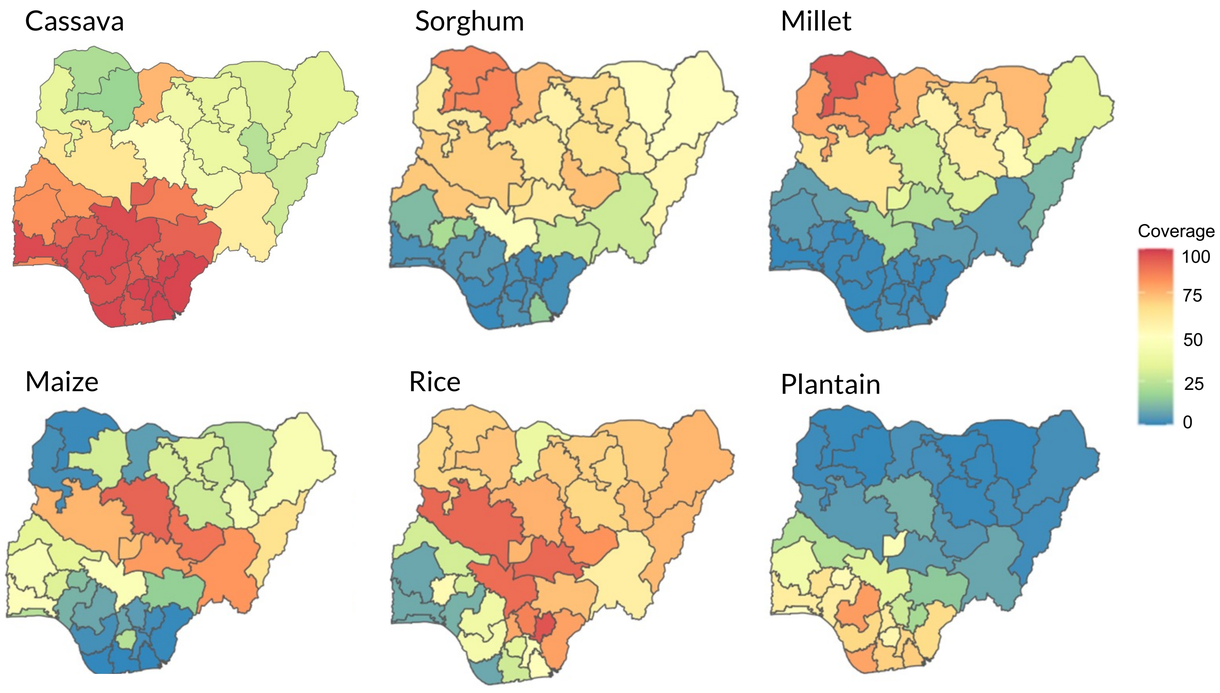

Figure 1. *Geographic variation in staple crop coverage by state using data from the 2018 – 2019 Living Standard Survey of Nigeria*

Methods

- Secondary data analysis of food consumption data provided by **2018 – 2019 Living Standards Survey of Nigeria** (N = 22,110 households).
- Food consumption data matched to **iron and zinc** composition data predominantly from the 2019 INFOODS West African Food Composition Table.
- Zinc and iron composition was modified for cassava to represent **three biofortification intervention scenarios**, guided by cassava genetic engineering studies (Narayanan et al. 2019)
- **Apparent intake** per adult female equivalent was used to estimate the **prevalence of apparent inadequacy** using the EAR cut-point method for zinc and full probabilistic approach for iron at national and state levels.

Table 1: Cassava biofortification scenario parameters guided by Narayanan et al. 2019.

		Cassava composition (mg per 100g of cassava)		
Micronutrient	**Food item**	**No biofortification**	**Biofortified (3X)**	**Biofortified (10X)**
Zinc	Cassava (root)	2.1	6.2	20.5
	Cassava flour	0.2	0.5	1.7
	Gari (white)	0.7	2.0	6.7
	Gari (yellow)	0.6	1.9	6.4
Iron	Cassava (root)	1.5	4.5	15.0
	Cassava flour	2	6	20.0
	Gari (white)	1.6	4.8	16.0
	Gari (yellow)	1.5	4.6	15.3

Results

- ***Apparent zinc inadequacy* prevalence decreased from 59%** assuming no biofortification **to 53%** assuming biofortification triples cassava zinc, and **to 43%** assuming biofortification increases cassava zinc concentration by 10 times.
- ***Apparent iron inadequacy* prevalence decreased from 72%** assuming no biofortification **to 64%** assuming biofortification triples cassava iron, and **to 50%** assuming biofortification increases cassava iron concentration by 10 times.

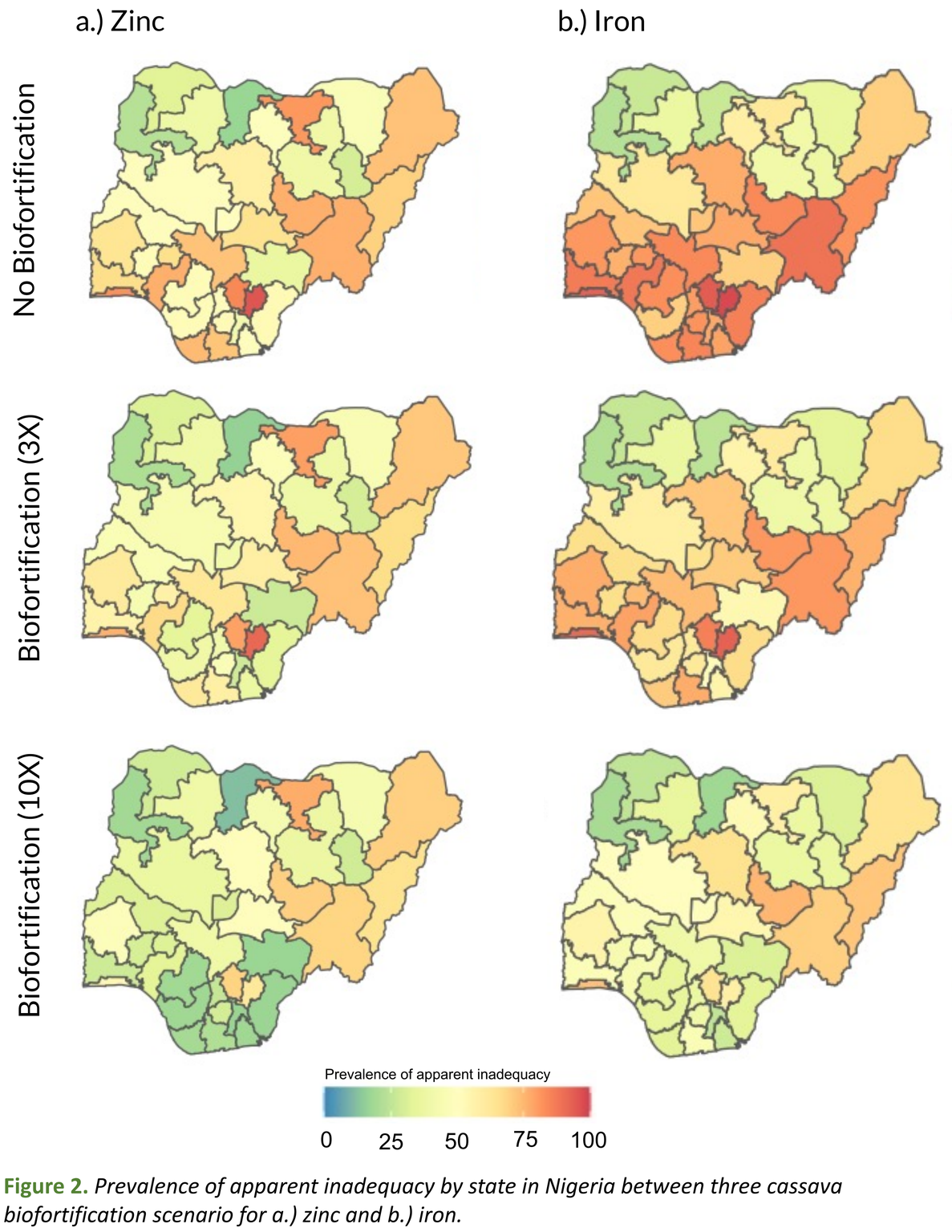

Figure 2. *Prevalence of apparent inadequacy by state in Nigeria between three cassava biofortification scenario for a.) zinc and b.) iron.*

Discussion

- Nationally implemented cassava biofortification programs have the **potential to marginally improve zinc and iron inadequate diets** in Nigeria.
- **Effectiveness varies sub-nationally** where regions in Nigeria with lower cassava consumption (e.g., northeast) will not benefit from cassava biofortification as much as regions where coverage is higher (e.g., south).

- This study **demonstrates an application of HCES data** for generating insights about variations in micronutrient supplies at subnational scales and the extent to which a large micronutrient intervention can help fulfill micronutrient needs.

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