Potential contribution of biofortification and other nutrition interventions to the adequacy and the cost of diets in rural Zimbabwe during the COVID19 pandemic

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Introduction

In rural Zimbabwe, COVID-19 has disrupted food systems already stressed by two decades of economic crisis. Murehwa District was selected as a case study: in this district, stunting increased by 6% between 2010 and 2018, despite maize productivity is relatively higher than most other districts.

The objectives of the study were:

1. to assess the nutrient adequacy of the diets of the diversity of households found in the area
2. to estimate the impact of large-scale adoption of pro-vitamin A (PVA) enriched maize and other nutrition interventions
3. to model the cost of a nutrient adequate diet

Methods

A questionnaire was administered to 306 households in Ward 4 and Ward 27 of Murehwa in September 2020. Four farm types were identified using multi-dimensional scaling and hierarchical clustering (Cairns et al. 2021). Based on this typology, a stratified sample of 30 rural households was selected.

Each food item consumed as a meal or snack by these households was recorded and weighed during a week in April (end of wet season) and a week in October (end of dry season). Household members consuming each meal or snack were also recoded. A total of 4,543 food items were recorded and weighed (2,294 during the wet season and 2,249 during the dry season).Market surveys also took place during both periods to collect the local price of all food items recorded.

Intakes of all major nutrients, vitamins and minerals were calculated using the food composition tables published by the South African Medical Research Council (SAMRC 2017), while minimum requirements were calculated using recommended dietary allowances published by the National Institutes of Health (Otten, Pitzi Hellwig, and Meyers 2006). Balances were calculated by subtracting the later of the former.

The composition and cost of a nutrient adequate diet were calculated using linear programming, based on the median local price of each food item.

Results

The level of vitamin A consumed in the diet of all 30 households appeared to be inadequate during both seasons.

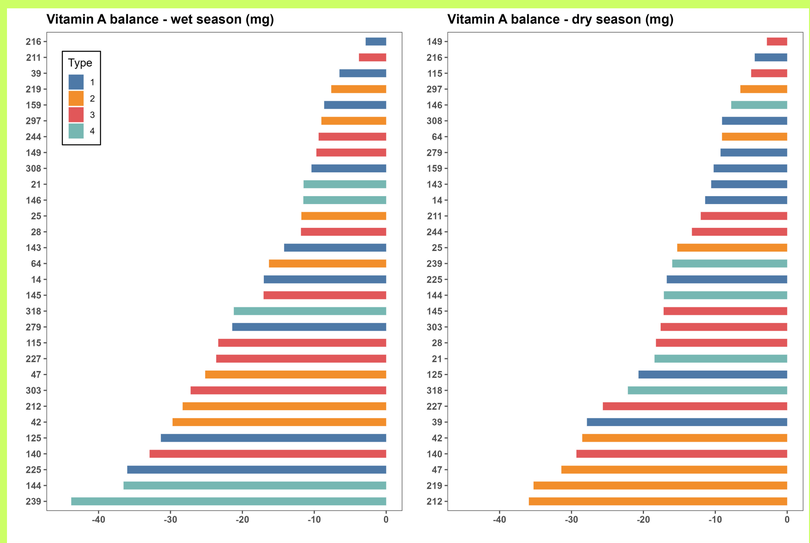

Fig 1 - Vitamin A balance (difference between intake and recommended dietary allowances) calculated for each household over a week in the wet and dry seasons. Type 1 is represented by larger farms, with larger herd, higher food security and higher dietary diversity; Type 2 is represented by farms of size, woth intermediate herd size, higer food security and lower dietary diversity; Type 3 has a predominance of female-headed households and is represented by farms of intermediate size, with intermediate herd size, lower food security and intermediate dietary diversity; Type 4 has a predominance of younger heads of household and is represented by smaller farms, with smaller herds, lower food security and lower dietary diversity.

Inadequacies were also observed for most households, and particularly during the dry season, in twelve other nutrients, vitamins and minerals including: protein, fiber, vitamin C, vitamin D, vitamin E, riboflavin, folate, vitamin B12, pantothenic acid, choline, calcium and potassium.

Interestingly, there was no association between nutrient adequacy and farm type, suggesting that nutrition education may be as important as (or more important than) wealth.

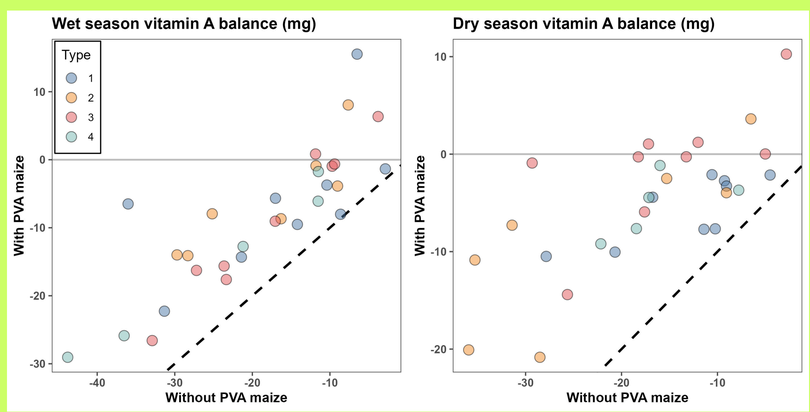

Fig 2 - Comparison of vitamin A balance calculated for each household over a week in the wet and dry season with current diets (x-axis: without PVA maize) and assuming all maize prducts consumed to have a vitamin A content of 95 µg RAE per 100 g (y-axis: with PVA maize)

If all maize products consumed originated from PVA maize with a vitamin A content of 95 µg RAE per 100 g (the highest content recorded on experimental station, Ndhela, pers. com.), diets would only be adequate in vitamin A for 4 households (out of 30) in the wet season, and 4 in the dry season.

In on-farm conditions, low fertilizer rates, soil degradation and drought are likely to reduce the provitamin A content of maize.

All households could obtain a nutrient adequate diet from food produced on their farms or available in local markets (Fig 3), but this would raise the cost of the diet significantly for all of them.

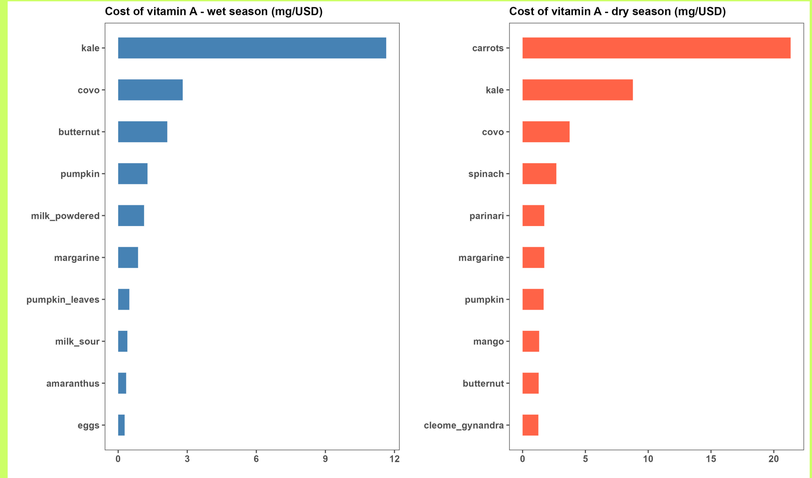

Fig 3 - Cheapest sources of vitamin A in the study area during the wet and the dry seasons

Conclusion

In conclusion, this study confirms that diets in rural Zimbabwe tend to be inadequate in vitamin A. Scaling up PVA maize, maize being the staple food, can contribute to alleviate the problem, but the diet of most household will only be adequate in vitamin A if biofortification is combined with other nutrition interventions.

Interventions to lower the cost of nutrient-dense food and nutrition education could promote a diverse and nutrient adequate diet.

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