Introduction to the MAPS tool and its value for informing micronutrient interventions

Mapping spatial data

The MAPS tool will present users with mapped micronutrient status data. The spatial presentation of data can inform decisions on how and where to intervene to reduce micronutrient deficiency burdens.

Spatial structure in micronutrient status might occur due to a range of factors, including changes in soil type as you move between areas (affecting the micronutrient content of crops that people grow and eat) or proximity to large lakes (determining access to fish). When there is spatial structure in an observed variable (e.g. urinary iodine concentration measured in a national micronutrient survey), you can combine this with covariates in a geostatistical model to map population micronutrient status.

The example of selenium status in Malawi

Figure 1 shows a map of selenium deficiency risk in Malawi – the blue areas indicate a low risk of deficiency, while the red areas indicate a high risk of deficiency. People living near Lake Malawi and/or living on high pH soil types found mainly in southern Malawi, tend to have better selenium status than those living in the upland areas. So, we can clearly see that selenium deficiency is prevalent in Malawi, but only in some parts of the country, and this is where we would need to target an intervention for maximum effectiveness.

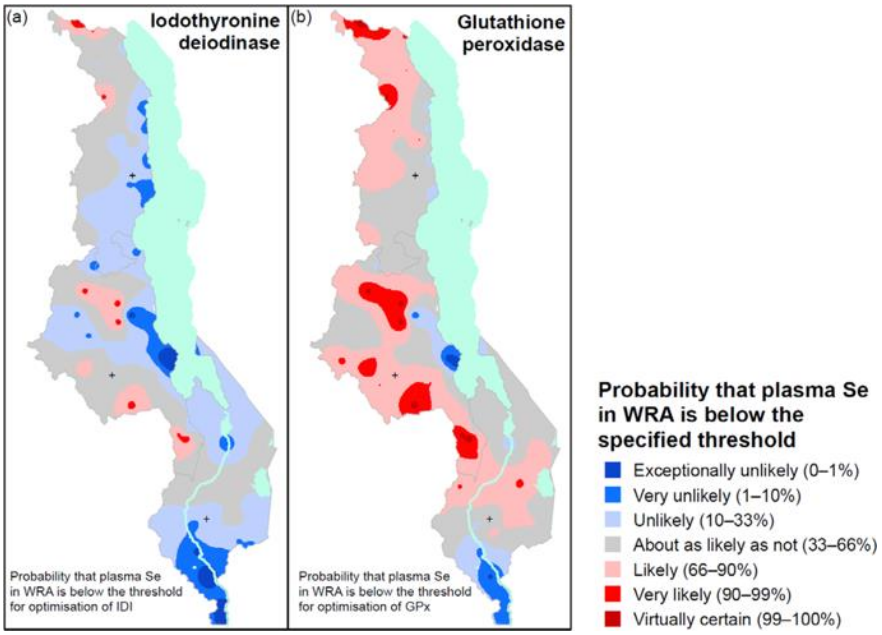

Figure 1. *Probability that measured plasma selenium (Se) concentration of women of reproductive age (WRA) would fall below the threshold for the optimal activity of (a) iodothyronine deiodinase (IDI), (b) glutathione peroxidase 3 (GPx3). Phiri et al. 2019; https://doi.org/10.1038/s41598-019-43013-z*

In the grey areas there is a mix of sufficient/deficient people. If we intervened here, we would reach some deficient people but also some who are sufficient and not in need of intervention. This may be a safety risk or cost issue, depending on the micronutrient and nature of the intervention. This kind of analysis helps us to identify where it may be appropriate to act to mitigate micronutrient deficiencies, or where more sampling and analysis effort is needed if we are to have sufficient data to make informed decisions.

Dietary micronutrient supplies

The MAPS tool will present estimates of dietary micronutrient supplies alongside the biomarker data. These will be derived from food consumption data – mainly from household consumption and expenditure surveys – combined with food composition data. Again, these will be analysed and presented to make maximum use of the spatial information that is contained within them.

Furthermore, users will be able to disaggregate the dietary supply estimates to look at average supplies by socioeconomic group, or variation over seasons. Users will also see the contribution of different food groups, e.g. proportion of calcium coming from animal-source foods.

Users will be able to turn 'on/off' different intervention strategies, such as fortification of a food vehicle, in order to understand the extent of change that may be created. For example, Figure 2 shows the dietary supply of iodine in Malawi with and without salt iodised to 15 mg/kg.

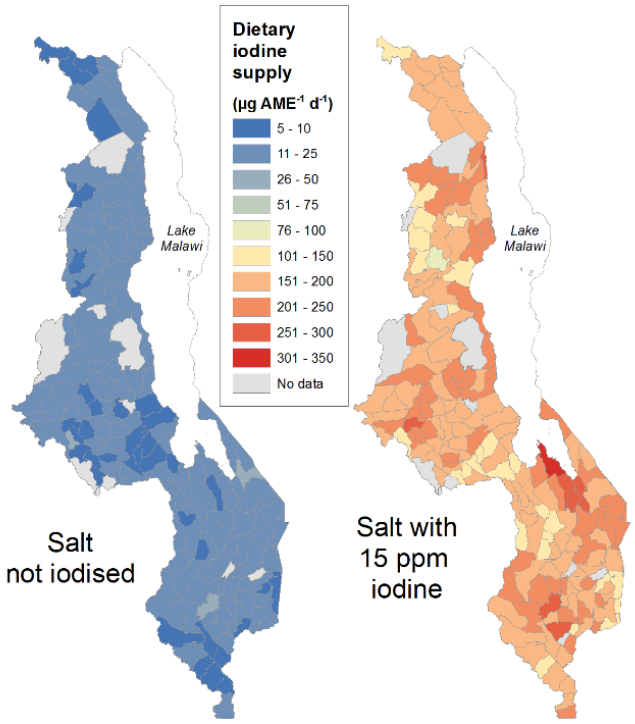

Figure 2. *Example visualization of dietary iodine supplies in Malawi with and without iodization of salt.*

Looking into the future

Food systems are changing and an important intended function of the MAPS tool is to estimate future dietary micronutrient supplies and deficiency risks, based on expected trends in production, diets and environment. These forecasts can be conducted with or without novel interventions.

Cost effectiveness

Estimates of the cost of different interventions will be presented to users, with the option of user input to fine-tune cost estimates. Combined with estimates of the effectiveness of different interventions, users will be able to compare and contrast the cost and cost-effectiveness of different interventions and targeting strategies aimed at reducing micronutrient deficiencies, such as fortification and biofortification.