

IZiNCG TECHNICAL BRIEF

The value of measuring plasma or serum zinc concentrations in national surveys

Zinc is an essential nutrient

Zinc deficiency increases the risk and severity of diarrhea and other infections, restricts physical growth, and increases the risk of adverse pregnancy outcomes, such as preterm birth (1,2). Approximately 116,000 child deaths are attributable to zinc deficiency each year (3). Because of the adverse health consequences of zinc deficiency, better information is needed on the national prevalence of zinc deficiency.

How do we assess zinc status?

The Biomarkers of Nutrition for Development (BOND) Zinc Expert Panel recommends three measures for estimating zinc status (4):

- dietary zinc intake;
- plasma or serum zinc concentration (PZC);
- height-for-age of growing infants and children.

How do we estimate the risk of zinc deficiency at the population level?

In the absence of a gold standard biomarker for zinc status, PZC is endorsed as the best available biomarker of zinc status, particularly for assessing the risk of zinc deficiency in target population groups such as preschool-aged children and women of reproductive age (4).

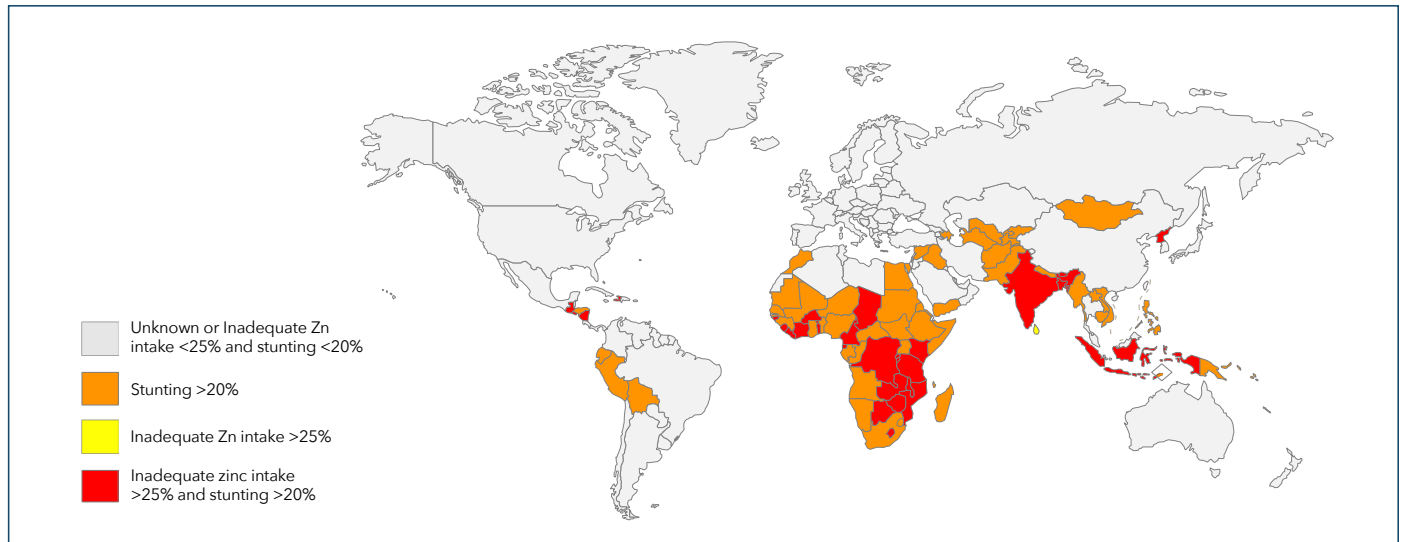
Given the scarcity of nationally representative PZC data, global estimates for the risk of zinc deficiency are based on two proxy measures: the amount of absorbable zinc in the national food supply, and the prevalence of stunting among children under five. The risk of zinc deficiency is considered to be elevated and a likely public health problem when the prevalence of inadequate absorbable zinc intakes is >25%, or if stunting rates are >20% (5).

FACTS ABOUT PLASMA/SERUM ZINC CONCENTRATION (4)

- PZC is associated with dietary zinc intake.
- PZC responds consistently to zinc supplementation.
- PZC decreases with very low zinc intakes.
- PZC reference limits have been established for children, men and women, and pregnant women.
- Different cutoffs are available for fasting, morning, or afternoon blood draws to adjust for diurnal variation.
- Guidance on appropriate blood collection protocols, techniques and suitable materials can be found in IZiNCG Technical Briefs and Technical documents available on <http://www.izincg.org/>.
- The risk of zinc deficiency is considered to be elevated and of public health concern when the prevalence of low serum zinc concentrations is >20%.

Based on the Food and Agriculture Organization of the United Nations' (FAO) Food Balance Sheets, at least 17% of the world's population is at risk of inadequate zinc intake (6). Simultaneously, 84 low- and middle-income countries (LMICs) with available data had a stunting prevalence >20% among children less than 5 years of age, and 32 of these countries were identified as high risk based on both dietary intake and stunting (6; **Figure 1**).

Figure 1. National risk of zinc deficiency based on the prevalence of childhood stunting and the estimated prevalence of inadequate zinc intake¹



¹ Figure from Wessells and Brown, 2012 (6)

Why do we need better data?

Proxy estimates can be useful in identifying countries at risk of zinc deficiency. Once that risk has been identified, measuring PZC is needed to guide the design, targeting, and evaluation of effective zinc interventions.

Although some nationally-representative nutrition and/or health surveys have assessed PZC, more data are critically needed (**Figure 2**). A recent review of data from national surveys that measured PZC found that in the majority of countries the prevalence of low PZC among young children and women of reproductive age was much higher than the estimated percentage of the population in LMICs at risk of zinc deficiency based on FAO National Food Balance Sheets. In 13 of 19 surveys among young children PZC was >20%, indicative of a public health problem (7).

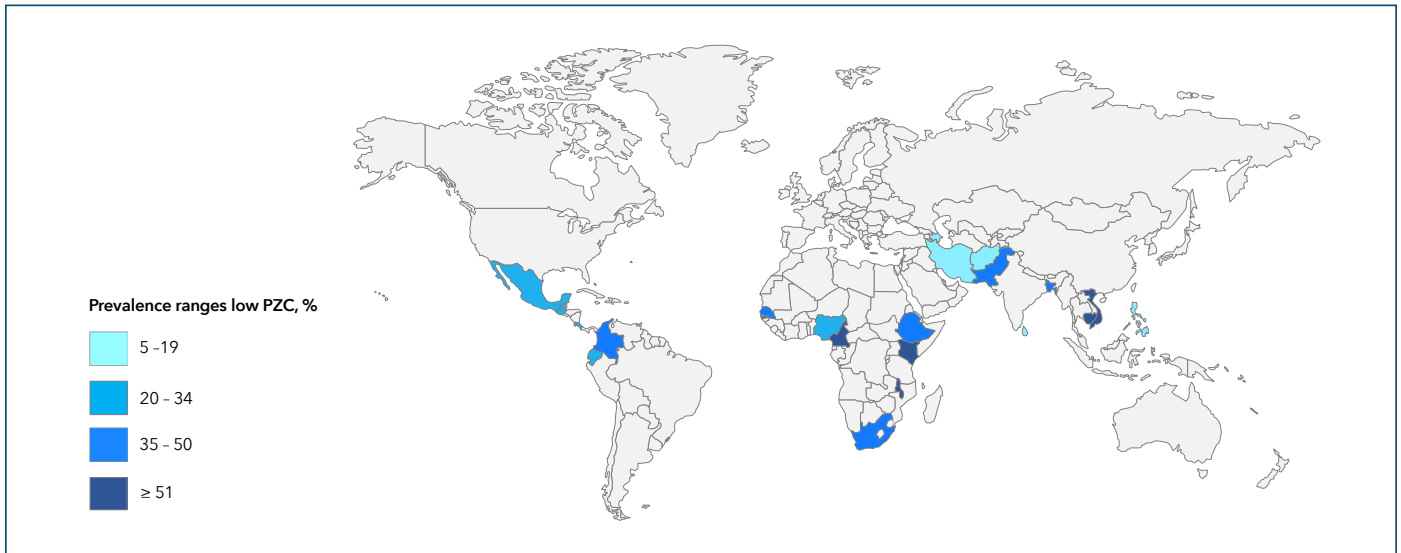
To this end, IZiNCG recommends that PZC be measured in all national nutrition and/or health surveys, particularly in countries that have been identified as having an increased risk of zinc deficiency according to a stunting prevalence >20% or >25% of the population at risk of inadequate zinc intake due to inadequate zinc in the food supply.

What is IZiNCG doing to help address this issue?

To support the inclusion of PZC in national surveys, IZiNCG is active in the following ways:

- Collaborating with the World Health Organization to include PZC data from national surveys in the Vitamin and Mineral Nutrition Information System Micronutrients Database (<https://www.who.int/vmnis/database/en/>).
- Dissemination of technical documents and briefs to guide survey planning for zinc-specific sample collection and analysis (<http://www.izincg.org/>).
- Provision of direct technical assistance to countries interested in assessing PZC.
- Development of laboratory reference methods for tissue sample preparation and analysis.
- Initiation of a technical working group in collaboration with the Micronutrient Forum to advocate for and support the inclusion of biomarkers of micronutrient status, including PZC, in national surveys.
- Continuous research to identify field-friendly approaches for determining PZC.

Figure 2. Percentage of pre-school children with low plasma or serum zinc concentrations²



² Map generated from data in the World Health Organization’s Vitamin and Mineral Nutrition Information System Micronutrients Database (<https://www.who.int/vmnis/database/en/>)

References

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6. Wessells KR, Brown KH. Estimating the global prevalence of zinc deficiency: results based on zinc availability in national food supplies and the prevalence of stunting. *PLoS One.* 2012;7(11):e50568.
7. Hess SY. National risk of zinc deficiency as estimated by national surveys. *Food Nutr Bull.* 2017;38(1):3-17.

About IZiNCG

IZiNCG is the International Zinc Nutrition Consultative Group whose primary objectives are to promote and assist efforts to reduce global zinc deficiency through interpretation of nutrition science, dissemination of information, and provision of technical assistance to national governments and international agencies. IZiNCG focuses on identification, prevention and treatment of zinc deficiency in the most vulnerable populations of low-income countries.

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