

### Approaches to Quantify the Contribution of Multiple Anemia Risk Factors in Children and Women From Cross-Sectional National Surveys

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**Objectives:** Despite challenges interpreting attributable fractions (AF) from cross-sectional data, AF of anemia are often used to understand the multifactorial etiologies of anemia. However, different strategies to calculate AF are adopted, and some can be inappropriate especially in cross-sectional studies. We aim to compare statistical approaches for estimating AF for anemia due to inflammation, malaria, iron deficiency, and other micronutrient deficiencies.

**Methods:** AF were calculated using nationally representative survey data among preschool children (10 countries) and nonpregnant women of reproductive age (11 countries) from the Biomarkers Reflecting Inflammation and Nutrition Determinants of Anemia (BRINDA) project, using 1) Levin's formula with prevalence ratio (PR) in place of relative risk (RR), 2) Levin's formula with odds ratio (OR) in place of RR, and 3) average (sequential) AF considering all possible removal

sequences of risk factors. PR was obtained by 1) modified Poisson regression with robust variance estimation, 2) Kleinman-Norton's approach, and 3) approximated by OR using Zhang-Yu's approach. Survey weighted country-specific analysis was performed with and without adjustment for age, sex, socioeconomic status, and other risk factors.

**Results:** About 20–70% of children and 20–50% of women suffered from anemia. Using OR yielded the highest AF, in some cases double those using PR. Adjusted AF using different PR estimations (Poisson regression, Kleinman-Norton, Zhang-Yu) were nearly identical. Average AF estimates were similar to those using PR. Inflammation, malaria, and iron deficiency were associated with 5–20% and <10%, 2–61% and 1–24%, and 10–20% and 15–30% of children and women with anemia, respectively. Unadjusted AF were substantially higher than adjusted AF in some countries.

**Conclusions:** This study shows the effects of not accounting for confounding and using OR instead of the RR when quantifying AF of anemia in cross-sectional studies. Using different PR estimation approaches yielded similar results.

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