COMPREHENSIVE NUTRIENT GAP ASSESSMENT (CONGA)

FINDINGS FOR CHILDREN 6–23 MONTHS IN **UGANDA**

December 2019

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WHY IS CONGA NEEDED?

After a child's first six months, nutrient requirements exceed what breastmilk alone can provide. To meet growing nutrient needs and ensure proper growth and development, along with breastfeeding, infants should be introduced to nutrient-dense solid, semi-solid, or soft foods at six months of age (1,2). Despite this, only 30% of infants and young children aged 6–23 months in Uganda consume a diet meeting the minimum recommended number of food groups (3), increasing their risk of micronutrient deficiencies and growth faltering.

Identification of nutrient and dietary gaps during the complementary feeding period is essential to inform policies and programs designed to improve child health and nutrition. However, nationally-representative data specific to young children are usually only available for select nutrients and infrequently collected. Lower quality evidence can help fill data gaps, particularly when multiple sources point to the same nutrients of concern or dietary issues. Yet, decision makers have little guidance on how to locate and interpret the evidence to identify the magnitude and significance of nutrient gaps in child diets given the wide range of indicators used, diversity of data sources and population characteristics, and differences in severity of associated health outcomes. A Comprehensive Nutrient Gap Assessment (CONGA) meets this need by collating the evidence and rating the burden of nutrient gaps[1] and certainty of evidence. This brief summarizes the main food and micronutrient gaps identified from a CONGA conducted in Uganda and key policy and programmatic actions required. There are several other nutrients that may be limited in the diets of young children, including omega-3 fats (e.g., DHA) and specific essential amino acids (i.e., the quality of protein). The CONGA method can be extended in the future to these and others as more data becomes available.

KEY MESSAGES

- Based on available evidence, **iron** and **calcium** are micronutrients of concern among young children in Uganda.
- **More research** is required on **other nutrients**, like zinc, which may also represent important gaps in young children's diets in Uganda.
- The best food sources of micronutrients of concern in Uganda are **small dried fish** (calcium, iron), **chicken liver** (iron), **beef liver** (iron), **beef** (iron), **amaranth greens** (calcium, iron), **beans** (iron), and **whole milk** (calcium).
- **More research** is needed to understand the primary barriers to consuming these foods, such as limited **availability**, **accessibility**, **affordability**, or **desirability**.
- **Biofortification**, **fortification**, and **supplementation** can also help fill gaps for micronutrients of concern, particularly where food insecurity, social norms, palatability, and desirability make sufficient consumption from accessible diverse foods infeasible.

1 Micronutrients investigated via CONGA include iron, vitamin A, zinc, calcium, iodine, Vitamin B_1 (thiamine), niacin, vitamin B_{12}, vitamin B_6, folate, and vitamin C.

HOW DOES CONGA WORK?

We reviewed and summarized findings from nationally representative and quality sub-national surveys, grey literature, and journal articles related to infant and young child feeding practices, micronutrient deficiencies, dietary intake, household consumption and expenditure, and the food supply. Experts reviewed this evidence to rate the burden of gap (none, low, moderate, or high) and certainty of available evidence (low, moderate, or high) for 11 micronutrients commonly lacking in young children's diets.[2] We then identified the most nutrient-dense, locally available food sources of micronutrients of concern based on food composition data and local price data.

WHAT DID CONGA FIND IN UGANDA?

Based on available evidence, micronutrients of concern[3] during the complementary feeding period in Uganda are **iron** and **calcium** (Table 1). The annex describes specific evidence considered for all ratings. We summarize consequences of deficiencies in micronutrients of concern and justifications for their ratings below.

Table 1. Nutrient gaps and evidence ratings for children 6–23 months in Uganda[4]

	Iron	Ca	Zinc	Vit A	Vit B_{12}	Iodine	Vit B_1	Niacin	Vit B_6	Folate	Vit C
Gap burden	High	High	Mod	Low	Low	Low	Low	Low	Low	Low	Low
Evidence certainty	Mod	Mod	Low	High	Low	Low	Low	Low	Low	Low	Low

Iron

Iron deficiency is a primary cause of anemia and can result in cognitive impairment, decreased work productivity, and death (4). Data reveal inadequate iron consumption in infants and young children as well as women of reproductive age, and a subnational survey indicates high prevalence of anemia in young children.

Calcium

Calcium deficiency increases risk of rickets, but the broader health implications of deficiency in young children are poorly understood (5). Data reveal low availability of calcium in the national food supply, very low consumption of calcium-rich foods during the complementary feeding period, and inadequate calcium intake for both children and women of reproductive age. However, no biochemical data was available to indicate the level of deficiency.

Other micronutrients

The burden of vitamin A was found to be low based on high certainty evidence. Burdens of zinc, iodine, niacin, folate, and vitamins B_1, B_6, B_{12}, and C gaps were based on low certainty evidence. More data is needed to generate higher quality evidence on the burden of these nutrient gaps in Uganda, particularly for zinc.

2 Iron, zinc, iodine, vitamin A, calcium, folate, vitamin C, vitamin B_{12}, thiamine, niacin, and vitamin B_6.

3 Micronutrients of concern are those with at least a moderate burden gap *and* moderate certainty of evidence. There may also be other important nutrient gaps, but evidence is limited.

4 Ca, Calcium; Mod, Moderate; Vit, Vitamin.

WHAT CAN BE DONE TO ADDRESS THESE GAPS?

Recommended actions to address each nutrient gap in Uganda are summarized in Table 2. The best complementary food sources of micronutrients of concern are **small dried fish** (calcium, iron), **chicken liver** (iron), **beef liver** (iron), **beef** (iron), **amaranth greens** (calcium, iron), **beans** (iron), and **whole milk** (calcium) (Table 2). More research is needed to understand the primary barriers to consuming these foods, like limited availability, accessibility, affordability, or desirability. **Biofortified** and **fortified** foods (including fortified complementary foods), **point-of-use fortification** products like micronutrient powders and lipid-based nutrient supplements, and supplements can also help fill nutrient gaps. **Continued breastfeeding** rates in Uganda are high at one year of age but decrease to < 50% by age 2 years (3). Efforts to improve continued breastfeeding rates should be prioritized to help fill calcium gaps. Improving the **quality** of **pregnant** and **lactating women's diets** can also improve their children's nutrition through improved birth outcomes, nutrient transfers at birth, and more nutrient-dense breast milk (6.)

Table 2. Recommended actions to address complementary feeding gaps in Uganda

Nutrient gap	Recommended actions to increase dietary intake
Iron	• Assess and ensure availability, accessibility, affordability, and desirability of natural foods rich in iron, including **chicken liver**, **beef liver**, **beef**, **small dried** or **smoked fish**, **beans**, and **amaranth greens**, as well as **iron-biofortified** and **fortified** foods. • Ensure **adequate coverage** and **quality** of large-scale **iron fortification**. • Consider **micronutrient powders** and/or **supplementation**.[5]
Calcium	• Improve rates of **continued breastfeeding**. • Assess and ensure availability, accessibility, affordability, and desirability of natural foods rich in calcium, including **small dried** or **smoked fish**, **amaranth greens**, and **fresh milk**, as well as **calcium-fortified** foods. • Consider calcium-containing **micronutrient powders** and/or **supplementation**. • Collect **biochemical** and **dietary data** in young children.

5 Some potential risks have been associated with supplemental iron in children with adequate iron status. Products with low iron doses may be more appropriate in this context.

CONCLUSION

There is clear evidence of significant complementary feeding gaps in iron and calcium in Uganda. There may also be other important gaps, but evidence is limited. The best food sources of micronutrients of concern that are relatively available in Uganda are small dried fish, chicken liver, beef liver, beef, amaranth greens, beans, and whole milk. These foods need to be available, accessible, affordable, and desirable as complementary foods to be consumed in adequate quantities by young children. Other approaches to fill gaps for micronutrients of concern should also be considered, including biofortification, fortification, and supplementation, particularly where food insecurity, social norms, palatability, and desirability make sufficient consumption from accessible diverse foods infeasible. Continued breastfeeding should be encouraged and can help young children consume enough calcium.

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ANNEX

Key evidence used to inform ratings[6]

Iron	High burden gap	Moderate certainty evidence
Biochemical data: National prevalence of anemia (hemoglobin < 11.0 g/dL) in children 6–59 m found to be 53% in the 2016 DHS (slight increase from 49% in 2011), with prevalence > 70% in children 6–23 m (1,2). **Dietary data:** 40% of children 6–23 m consumed iron-rich foods in the past 24 h nationally in the 2016 DHS (an increase from 34% in 2011) (1,2). **Nutrient intake in children:** The 2008 FCS in one urban and two rural regions[7] estimated inadequate intake of micronutrients in children aged 24–59 m. Inadequate iron intake was > 50% in all three regions for this age group (3). **Nutrient intake in WRA:** The 2008 subnational FCS estimated > 65% inadequate iron intake in WRA in studied regions (3). **Food supply nutrient availability:** The amount of iron available in the food supply estimated to be inadequate for 4% of the national population in 2011 (4).		
Calcium	**High burden gap**	**Moderate certainty evidence**
Dietary data: Animal milk was consumed by 25% and 37% of breastfed and non-breasted children 6–23 m,[8] respectively, and cheese, yogurt or other dairy products were consumed by 3% and 7% of breastfed and non-breastfed children 6–23 m, respectively, in the past 24 h nationally in the 2016 DHS (with little change from 2011) (1,2). **Nutrient intake in children:** The 2008 subnational FCS estimated inadequate intake of micronutrients in children aged 24–59 m. Inadequate calcium intake was > 75% in all studied regions for this age group (3). **Nutrient intake in WRA:** The 2008 subnational FCS estimated > 80% inadequate calcium intake in WRA in studied regions (3). **Food supply nutrient availability:** The amount of calcium available in the food supply estimated to be inadequate for 64% of the national population in 2011 (4).		

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6 DHS, Demographic and Health Survey; FCS, Food Consumption Survey; h, hours; Mod, Moderate; m, months; WRA, women of reproductive age (15–49 years); y, years.

7 Urban area: Kampala City Council; rural area: Bushenyi and Hoima Districts (South-West); Kitgum and Lira Districts (West).

8 The estimates for consumption of animal milk are for all children 6–23 months, however, it has been recommended that children under 12 months of age do not consume milks (flavoured or plain) (7).

Zinc	Moderate burden gap	Low certainty evidence

Biochemical data: Prevalence of zinc deficiency is quoted as ranging between 20% and 69% in children in national policy documents, but no data source is provided for the estimates (5).

Dietary data: 32% of breastfed and 42% of non-breastfed children 6–23 m consumed meat, fish, or poultry in the past 24 h nationally in the 2016 DHS (with increases in both populations from 2011) (1,2).

Nutrient intake in children: The 2008 subnational FCS estimated inadequate intake of micronutrients in children aged 24–59 m. Inadequate zinc intake was > 75% in studied regions for this age group (3).

Nutrient intake in WRA: The 2008 subnational FCS estimated > 15% inadequate zinc intake in WRA in studied regions (3).

Food supply nutrient availability: The amount of zinc available in the food supply estimated to be inadequate for 0% of the national population in 2011 (4).

Vitamin A	Low burden gap	High certainty evidence

Biochemical data: National prevalence of vitamin A deficiency (retinol binding protein < 0.825 μmol/L) in children 6–59 m found to be 9% in 2016 (a decrease from 33% in 2011) (1,2,6).

Dietary data: 67% of children 6–23 m consumed vitamin A-rich foods in the past 24 h nationally in the 2016 DHS (increase from 61% in 2011) (1,2).

Nutrient intake in children: The 2008 subnational FCS estimated inadequate intake of micronutrients in children aged 24–59 m. Inadequate vitamin A intake was > 50% in all studied regions for this age group (and 99% in the North) (3).

Nutrient intake in WRA: The 2008 subnational FCS estimated > 30% inadequate vitamin A intake in WRA in studied regions (and 98% in the North) (3).

Food supply nutrient availability: The amount of vitamin A available in the food supply estimated to be inadequate for 1% of the national population in 2011 (8).

Supplementation: National vitamin A supplementation coverage for children 6–59 months was 62% in 2016 (up from 57% in 2011) (1,2).

Vitamin B_{12}	Low burden gap	Low certainty evidence

Dietary data: Among breastfed children 6–23 m, 32% consumed meat, fish or poultry, 25% consumed animal milk, 3% consumed other dairy, and 13% consumed eggs in the past 24 h nationally in the 2016 DHS (with consumption of eggs increasing from 8% in 2011). In non-breastfed children, consumption of meat, milk, other dairy and eggs was 42%, 27%, 7% and 17%, respectively (1,2).

Nutrient intake in children: The 2008 subnational FCS estimated inadequate intake of micronutrients in children aged 24–59 m. Inadequate vitamin B_{12} intake ranged from 30% to 90% in studied regions for this age group (3).

Nutrient intake in WRA: The 2008 subnational FCS estimated inadequate vitamin B_{12} intake ranged from 64% to 100% in WRA across studied regions (3).

Food supply nutrient availability: The amount of vitamin B_{12} available in the food supply estimated to be inadequate for 3% of the national population in 2011 (4).

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Iodine	Low burden gap	Low certainty evidence
Household iodized salt coverage: > 95% of households found to have iodized salt since 2006 (1,2,8).		
Vitamin B_1 (thiamine)	Low burden gap	Low certainty evidence
Dietary data: 71% of breastfed and 84% of non-breastfed children 6–23 m consumed grains (whole grains contain moderate amounts of thiamine) in the past 24 h nationally in the 2016 DHS (with notable increases in consumption since 2011 in both populations) (1,2). **Nutrient intake in children:** The 2008 subnational FCS estimated inadequate intake of micronutrients in children aged 24–59 m. Inadequate thiamine intake was < 20% in studied regions for this age group (3). **Nutrient intake in WRA:** The 2008 subnational FCS estimated ≤ 20% inadequate thiamine intake in WRA in studied regions (3). **Food supply nutrient availability:** The amount of thiamine available in the food supply estimated to be inadequate for 0% of the national population in 2011 (4).		
Niacin	Low burden gap	Low certainty evidence
Dietary data: 32% of breastfed and 42% of non-breastfed children 6–23 m consumed meat, fish, or poultry (the highest sources of niacin) in the past 24 h nationally in the 2016 DHS (1). **Nutrient intake in children:** The 2008 subnational FCS estimated inadequate intake of micronutrients in children aged 24–59 m. Inadequate niacin intake was < 15% in studied regions for this age group (3). **Nutrient intake in WRA:** The 2008 subnational FCS estimated ≤ 15% inadequate niacin intake in WRA in studied regions (3). **Food supply nutrient availability:** The amount of niacin available in the food supply estimated to be inadequate for 0% of the national population in 2011 (4).		
Vitamin B_6	Low burden gap	Low certainty evidence
Nutrient intake in children: The 2008 subnational FCS estimated inadequate intake of micronutrients in children aged 24–59 m. Inadequate vitamin B_6 intake was < 10% in studied regions for this age group (3). **Nutrient intake in WRA:** The 2008 subnational FCS estimated inadequate vitamin B_6 intake in WRA ranged from 0% to 26% across studied regions (3). **Food supply nutrient availability:** The amount of vitamin B_6 available in the food supply estimated to be inadequate for 0% of the national population in 2011 (4).		

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Folate	Low burden gap	Low certainty evidence
Nutrient intake in children: The 2008 subnational FCS estimated inadequate intake of micronutrients in children aged 24–59 m. Inadequate folate intake ranged from 0% to 17% across studied regions for this age group (3). **Nutrient intake in WRA:** The 2008 subnational FCS estimated ≤ 15% inadequate folate intake in WRA in studied regions (3). **Food supply nutrient availability:** The amount of folate available in the food supply estimated to be inadequate for 0% of the national population in 2011 (4).		
Vitamin C	Low burden gap	Low certainty evidence
Nutrient intake in children: The 2008 subnational FCS estimated inadequate intake of micronutrients in children aged 24–59 m. Inadequate vitamin C intake was < 15% in studied regions for this age group (3). **Nutrient intake in WRA:** The 2008 subnational FCS estimated ≤ 15% inadequate vitamin C intake in WRA in studied regions (3). **Food supply nutrient availability:** The amount of vitamin C available in the food supply estimated to be inadequate for 1% of the national population in 2011 (4).		

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Recommended citation

GAIN and UNICEF. Comprehensive Nutrient Gap Assessment (CONGA): Findings for children 6–23 months in Uganda. GAIN. Geneva, Switzerland, 2019.

Acknowledgements

This briefing paper was written by Jessica M White, Heather Kelahan, and Ty Beal. It was produced by GAIN and UNICEF under the Regional Initiatives for Sustained Nutrition and Growth (RISING) program, supported by the Bill & Melinda Gates Foundation and the Ministry of the Foreign Affairs of the Netherlands. We thank nutrition teams in UNICEF ESARO and Headquarters for their helpful feedback on earlier drafts; Saul S Morris and Alison Tumilowicz for their contribution to the methods; Joanne E Arsenault, Harriet Okronipa, and Guy-Marino Hinnouho for their role as expert reviewers; and Wendy Gonzalez and Sharada Keats for their help framing this briefing paper series. Cover photo credit: ©Shutterstock/Adam Jan Figel.

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