



Consortium for Improving Complementary Foods in Southeast Asia (COMMIT)

A comprehensive nutrient gap assessment in Cambodia:

Estimating micronutrient gaps during the complementary
feeding period

COMMIT ACTIVITY 1

COMMIT 1 Comprehensive nutrient gap assessment

COMMIT 2 Consumer survey

COMMIT 3 Legal and policy review

COMMIT 4 Nutrient profile model

COMMIT Synthesis report

COMMIT

Consortium for Improving Complementary Foods in Southeast Asia

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THE COMMIT INITIATIVE

Overview

A nutrition transition is underway across Southeast Asia, with convenience, time and aspiration increasingly influencing food choices. This changing food environment is resulting in a shift from traditional diets towards processed foods that are usually higher in salt, sugar and unhealthy fats, and lower in essential nutrients – and children’s diets are no exception.

The availability, affordability and variety of commercially produced, packaged foods marketed as suitable for older infants and young children – also known as commercially produced complementary foods (CPCF) – is increasing. Many CPCF exceed recommended levels of sugar, salt or fat and/or are labelled in ways that may mislead consumers; these products should not be promoted or provided to older infants and young children. For other CPCF, however, targeted improvements to their nutrient composition – such as through fortification – can help improve their nutritional impact. Governments and partners must work together to ensure that the CPCF promoted as suitable for older infants and young children are nutritionally adequate, safe and labelled in a responsible way.

The **Consortium for Improving Complementary Foods in Southeast Asia (COMMIT)**ⁱ was established to help ensure that the CPCF sold and consumed in the region contribute to healthy diets instead of unhealthy ones. COMMIT recognizes that one of the most effective ways to transform the food system and food environment is by supporting governments to set up regulatory environments that enable access to healthy food, adequately regulate unhealthy products and protect consumers from inappropriate marketing practices. To do this, COMMIT identified micronutrient gaps in the diets of older infants and young children, analysed current consumer CPCF preferences, reviewed national legislation regulating CPCF nutrient composition and labelling practices, and used a nutrient profile model to assess current CPCF nutrient composition, labelling practices and micronutrient content:



COMMIT Activity 1: Comprehensive nutrient gap assessment

A comprehensive nutrient gap assessment to identify limiting micronutrients in diets during the complementary feeding period.



COMMIT Activity 2: Consumer surveyⁱⁱ

Consumer perspective survey on provision of CPCF to older infants and young children, motivations for CPCF provision and factors influencing CPCF purchases.



COMMIT Activity 3: Legal and policy review

Assessment of current national binding legal measures related to CPCF nutrient composition and labelling practices and their adherence to global CPCF guidance.



COMMIT Activity 4: CPCF nutrient profile model

Benchmarking of CPCF nutrient composition and labelling practices against an adapted version of the 2019 WHO Europe nutrient profile model designed specifically for CPCF.

This report details the methods and results for COMMIT Activity 1 in Cambodia.

ⁱ COMMIT partners include Access to Nutrition Initiative; Alive & Thrive; Helen Keller International’s Assessment and Research on Child Feeding Project; JB Consultancy; School of Food Science and Nutrition, University of Leeds; UNICEF East Asia and the Pacific Regional Office; and World Food Programme Asia Pacific Regional Bureau.

ⁱⁱ COMMIT Activity 2 was not conducted in Cambodia; therefore, there is no country-specific report available.

1 Introduction

1.1 Micronutrient intake during the complementary feeding period

What, when, how and how much children are fed in early life lays the foundation for their health and survival.¹ Between 6 and 23 months of age – known as the complementary feeding period – children’s diets must provide adequate quantities of energy, protein and micronutrients to fuel their rapid growth and development. In fact, between 6 months and 2 years of age, children have greater nutrient needs per kilogram of body weight than at any other time in life.² Sufficient quality, quantity, and diversity of foods during this period can reduce their risk of micronutrient deficiencies and other forms of malnutrition.

The most recent estimates of diet quality in children aged 6–23 months in Cambodia indicate that many (83 per cent) are consuming nutrient-rich eggs or other animal-source foods. However, nearly a third (29 per cent) are not consuming any fruits or vegetables and only 40 per cent of children 12–23 months of age receive nutrient-rich breastmilk.ⁱⁱⁱ Further, only half (49 per cent) of children aged 6–23 months are consuming the minimum recommendation for a diverse diet (i.e., at least five food groups per day).⁴ Approximately 16 per cent of children aged 6–23 months in Cambodia suffer from severe food poverty,^{iv} meaning they consume foods from only one or two (or zero) food groups per day, and a further 44 per cent suffer from moderate food poverty, meaning they consume foods from only three or four food groups per day.⁵ Limited dietary diversity and the absence of nutrient-rich foods during the complementary feeding period can increase the risk of micronutrient deficiencies, which take a devastating toll on children’s physical and cognitive development.⁶⁻⁸

Recent national data indicate that young children are also consuming unhealthy foods and sweet beverages. Approximately 21 per cent of children aged 6–23 months consumed unhealthy foods and 28 per cent consumed sweet beverages in the 24 hours preceding a 2021–2022 national survey.⁴ Consumption of unhealthy foods and beverages in early childhood can displace more nutritious foods in the diet and set children on a path to unhealthy food preferences later in life.^{9, 10}

Improvements in diet quality in the first two years of life can help reduce the burden of micronutrient deficiencies and accelerate progress in ending other forms of malnutrition. However, robust evidence on specific nutrient gaps in the diets of older infants and young children is often unavailable, underused or misinterpreted.^{11, 12} While standard global indicators on complementary feeding provide information on the number of food groups children are consuming and the frequency of meal consumption for children 6–23 months of age,¹³⁻¹⁵ these indicators only provide limited insight into the magnitude and significance of specific nutrient gaps. As a result, governments may lack the evidence base needed to design effective policies to improve nutrient intake – such as legislation on mandatory fortification.^{11, 12}

1.2 What is a comprehensive nutrient gap assessment?

The comprehensive nutrient gap assessment (CONGA) is a methodology designed to identify nutrient gaps in the diets of a defined population and estimate both the public health significance of these gaps and the certainty of evidence on which they are based. To do this, CONGA guides the compilation and synthesis of evidence relevant to nutrient gaps, including data and indicators beyond those typically used to assess the diets of children aged 6–23 months.

ⁱⁱⁱ Between the ages of 12 and 23 months, it is estimated that children still receive 35–40 per cent of their energy needs from breastmilk, which is also a good source of essential fatty acids and micronutrients.³

^{iv} UNICEF defines child food poverty as the percentage of children under 5 years of age consuming foods and beverages from four or fewer of the eight defined food groups. If children are fed 0–2 food groups per day, they live in severe food poverty. If children are fed 3–4 food groups per day, they live in moderate food poverty.

A CONGA analysis was conducted in Cambodia to identify micronutrient gaps experienced during the complementary feeding period. This brief summarizes the results of the CONGA.

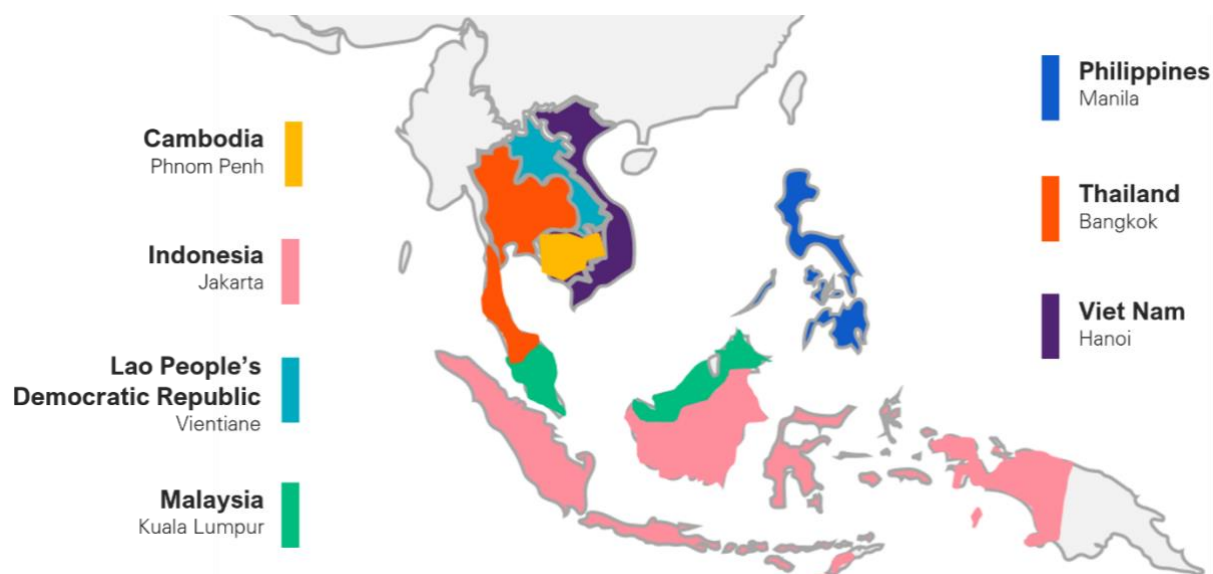
2 Objectives

To better understand micronutrient gaps during the complementary feeding period in Southeast Asia, the CONGA was implemented in seven countries in the region: Cambodia, Indonesia, the Lao People's Democratic Republic, Malaysia, Philippines, Thailand and Viet Nam (**Figure 1**).

The objective of this analysis was to (1) estimate micronutrient gaps in the diets of older infants and young children aged 6–23 months; and (2) establish the certainty of available evidence for each gap.

Micronutrients assessed in this analysis included those commonly lacking in the diets of older infants and young children aged 6–23 months: iron, vitamin A, zinc, calcium, iodine, vitamin B₁ [thiamine], niacin, vitamin B₁₂, vitamin B₆, folate, vitamin C and vitamin D.³

Figure 1: Map of the seven COMMIT Initiative countries



3 Summary of methods

The analysis in Cambodia followed the CONGA methodology,¹⁶ with key steps summarized here.

- Step 1** CONGA considers existing evidence only, with no primary data collection or analysis required. A literature search was conducted to gather five types of evidence identified by CONGA as relevant for assessing nutrient gaps: (1) biological, clinical and functional markers; (2) nutrient adequacy of individual diets; (3) nutrient adequacy of household diets; (4) nutrient adequacy of national food supplies; and (5) nutrient-informative food group intake of individuals or households. Evidence that did not fall into one of these five evidence categories but was still relevant to the diets of children 6–23 months of age (e.g., linear programming to identify problem nutrients) was compiled and classified as ‘other’ evidence. Data points from identified evidence sources were extracted and captured in a spreadsheet.
- Step 2** Each data point was reviewed and assigned an implied nutrient burden gap rating (i.e., public health significance) of either negligible, low, moderate or high. Per CONGA methodology, ratings were based upon suggested prevalence and mean ranges for commonly available population-level indicators from each of the five priority evidence types (e.g., a data point for vitamin A deficiency prevalence >20 per cent was assigned a rating of ‘high’). Each rating had an associated weight score: negligible (0); low (1); moderate (2); and high (3). If no implied nutrient burden was available (e.g., for ‘other’ evidence types), the implied burden was marked ‘not applicable’ and no weight score was assigned.
- Step 3** To document and account for variations in evidence type, recency, relevance, and representativeness of each data point, five types of metadata were extracted, recorded, and assigned a weight in the country-specific spreadsheets: (1) evidence type; (2) geographic representation; (3) year of data collection; (4) age and sex group; and (5) sample size. Metadata information was standardized and assigned a weight score per CONGA methodology. Metadata weight scores were used to generate overall weight scores for each data point, where the most robust data points (e.g., the most recent, representative and relevant) were assigned greater weight and the less robust (e.g., older, subnational and small sample size) were assigned lower weight. Weight scores were calculated for each data point by multiplying the evidence-type metadata weight score by the combined weight scores of its other four metadata categories. Data points were *not* assigned a weight score if they were (1) categorized as ‘other’ evidence; (2) representative of <10 per cent of the national population; (3) collected before 2010; (4) representative of an age and sex group that excluded and was not near to children aged 6–23 months (i.e., women of reproductive age); or (5) based on a sample size <50.
- Step 4** To determine nutrient gap burden and evidence certainty ratings, CONGA requires at least two content experts to jointly review all evidence. Two researchers with expertise in infant and young child nutrition and knowledge of the Southeast Asian context reviewed the data points for Cambodia.

A quantitative nutrient gap burden score was calculated for each of the 12 micronutrients assessed using *only* data points from the five priority evidence types that received weight scores. The nutrient gap burden score was calculated by multiplying the implied nutrient burden weight score by the overall data point weight score (thus, data points without weight scores, such as for ‘other’ evidence, were omitted from this calculation). A rating of either negligible, low, moderate or high was assigned based on its value.

- Step 5** The quantitatively derived nutrient gap burden ratings were then reviewed by the two researchers alongside the totality of evidence collated for each micronutrient, including the 'other' evidence data points and any additional information available (e.g., indicator trends). Researchers considered all evidence to determine whether the final nutrient gap burden rating should deviate from the quantitatively derived rating calculated in step 4. Final ratings of negligible, low, moderate, or high were assigned to each nutrient, and any deviation from the quantitatively derived ratings was documented and explained.
- Step 6** A criteria-based rating of evidence certainty (low, moderate or high) was assigned to each final nutrient gap burden rating per the CONGA methodology. This criteria-based rating only considers the data points that received a weight score and is based both on the level of agreement between the implied nutrient burden ratings (e.g., variation in implied nutrient burden ratings for iron data points) and the evidence weight score for the data points. The two researchers again conducted a qualitative review, considering the totality of evidence available, to determine whether the final rating should deviate from the criteria-based rating. Any deviations were documented and explained.
- Step 7** Finally, any disagreements with the final nutrient gap burden of evidence certainty ratings were discussed and critically re-evaluated by researchers. Ratings were only finalized once consensus was reached.

4 Results

4.1 Evidence sources and relevant data points

A total of 17 evidence sources were identified during the literature search for Cambodia, including Demographic and Health Surveys (DHS), Socio-economic Surveys and several peer reviewed articles and global databases. No explicit national nutrition or micronutrient surveys were identified, however, the 2014 DHS included a micronutrient component. A full list of evidence sources identified and used in this analysis is provided in the Annex.

A total of 54 data points relevant to micronutrient intake, availability and/or deficiency during the complementary feeding period (the most of any country assessed in Southeast Asia) were extracted from these evidence sources. The majority of these data points (n=39) were nationally representative, and many (n=27) were representative of children aged 6–23 months. Nearly half (n=27) were collected between 2010 and 2012 and 16 were collected between 2013 and 2014.

The availability of data points for the five priority evidence types varied (**Table 1**). A total of 15 biological, clinical or functional marker data points (e.g., deficiency prevalence data) were identified,[†] including for iron, vitamin A, zinc, calcium, vitamin B₁₂, thiamine and vitamin D, with all data points representative of a subgroup of young children. An estimate of nutrient adequacy of national food supplies was available for all micronutrients except vitamin D. Data on nutrient-informative food group intake was available for iron, vitamin A and iodine (e.g., household coverage of iodized salt). No data points were identified for nutrient adequacy of individual or household diets. A total of 26 'other' data points were identified, including several from an Optifood analysis. Fewer than half of identified data points (n=20) qualified to receive a weight score.

Table 1: Number of datapoints identified that qualified* for a weight score, by evidence type

Qualification for quantitative calculations*	Evidence types						Total
	Biological, clinical and functional markers	Nutrient adequacy of individual diets	Nutrient adequacy of household diets	Nutrient adequacy of national food supplies	Nutrient-informative food group intake of individuals or households	Other	
Qualified	7	0	0	10	3	0	20
Did not qualify	8	0	0	0	0	26	34
Total	15	0	0	10	3	26	54

*Qualifying data points were: (1) one of the five priority evidence types; (2) collected in 2010 or later; (3) based on a sample size >50; (4) representative of >10 per cent of the population; and (5) representative of an age group at least similar to children aged 6–23 months.

[†] The most of any of the seven countries in Southeast Asia where a CONGA was conducted.

4.2 Final ratings

Micronutrient gaps are identified when a micronutrient is assigned both a nutrient gap burden and evidence certainty rating of at least moderate. Based on available evidence, micronutrient gaps during the complementary feeding period in Cambodia were identified for zinc, iron, iodine and vitamin D (Table 2).

Potential micronutrient gaps were identified for vitamin C, with a high nutrient gap burden but low certainty evidence, and calcium and thiamine, both with a moderate nutrient gap burden but low certainty evidence. Vitamin A, vitamin B₁₂ and folate each received a nutrient gap burden rating of low with moderate certainty evidence, suggesting these may not be significant dietary gaps during the complementary feeding period.

More high-quality evidence is required to estimate the burden of micronutrient gaps, particularly for those with low certainty evidence (i.e., vitamin C, calcium and thiamine).

Table 2: Final micronutrient gap burden and certainty of evidence ratings

Micronutrient	Micronutrient gap burden rating	Certainty of evidence rating
Zinc	High	Moderate
Iron	Moderate	Moderate
Iodine	Moderate	Moderate
Vitamin D	Moderate	Moderate
Vitamin C	High	Low
Calcium	Moderate	Low
Thiamine	Moderate	Low
Vitamin A	Low	Moderate
Vitamin B ₁₂	Low	Moderate
Folate	Low	Moderate
Niacin	Low	Low
Vitamin B ₆	Negligible	Low

5 Conclusion

Preventing micronutrient deficiencies through relevant, context-specific national nutrition policies and programmes requires a comprehensive understanding of dietary gaps; however, relevant evidence and analyses to identify nutrient gaps are often lacking.^{12, 16} The CONGA methodology applied to Cambodia enabled the synthesis of multiple evidence types from disparate sources. It provided a comprehensive picture of the magnitude and significance of micronutrient gaps in the diets of children aged 6–23 months, and highlighted the depth, breadth and quality of the relevant evidence base in the country.^{vi} In addition, using CONGA in Cambodia allowed for the consideration of evidence types not typically synthesized to assess the quality of young children’s diets.

Available evidence indicates that children aged 6–23 months face micronutrient gaps in zinc, iron, iodine and vitamin D. Zinc deficiency in early life is associated with impaired immune function, diminished cognitive and motor development and increased risk of diarrhoea.^{17, 18} Early iron deficiency can result in poorer cognitive, motor and social-emotional development.^{19, 20} Iodine deficiency in early life can impair cognitive and motor development, and may adversely affect school performance. And vitamin D deficiency may cause rickets and delayed motor development in young children and osteomalacia (bone softening) in adulthood.²¹

Biological, clinical and functional markers (i.e., deficiency prevalence data) for young children were available for iron, vitamin A, zinc, calcium, vitamin B₁₂, thiamine and vitamin D from the 2014 Cambodia DHS. This is more data than are typically available on micronutrient deficiencies in other countries in Southeast Asia, as well as globally.²² No data, however, on the nutrient adequacy of individual or household diets were identified in Cambodia. The majority of data points identified were collected prior to 2015.

Identifying micronutrient and dietary gaps requires relevant, reliable and representative data. Evidence generation on micronutrient availability, intake and deficiency should be prioritized in Cambodia, particularly for the micronutrients with moderate or high nutrient burden ratings but low evidence certainty (i.e., calcium).

Evidence-based strategies are required to address the clear micronutrient gaps identified during the complementary feeding period. Relevant strategies include increasing the availability and consumption of nutrient-dense foods, micronutrient supplementation, large-scale fortification of staple foods and condiments, and point-of-use fortification with multiple micronutrient powders and fortified specialty foods (e.g., fortified infant cereals). Nutrition programmes and policies should consider a multitude of approaches to equitably improve nutrition for older infants and young children. The strategies noted here can be implemented concurrently, and in a complementary fashion. Efforts to protect, promote and support breastfeeding should also be considered essential. Social and behaviour change strategies and interventions are also critical to support efforts to reduce micronutrient gaps, including by encouraging the consumption of micronutrient-dense foods and improving caregiver awareness of the suitability of fortified speciality foods for their older infants and young children.

^{vi} Other methods exist for collating and assessing data to guide policy and programming decisions on nutrient gaps and/or diets. For example, the Fill the Nutrient Gap exercise designed and implemented by the World Food Programme provides a comprehensive look at the environment within which observed diets are shaped. However, in contrast to the CONGA, the Fill the Nutrient Gap exercise does not provide estimates of nutrient gaps, their public health significance or the certainty of the relevant evidence base. The CONGA can be a complementary exercise to Fill the Nutrient Gap efforts and other similar exercises.

Annex

List of references utilized in the CONGA in Cambodia

- Beal, T., Massiot, E., Arsenault, J. E., Smith, M. R., & Hijmans, R. J. (2017). Global trends in dietary micronutrient supplies and estimated prevalence of inadequate intakes. *PLoS One*, *12*(4), e0175554. doi:10.1371/journal.pone.0175554
- Blaney, S., Menasria, L., Main, B., Chhorvann, C., Vong, L., Chiasson, L., . . . Raminashvili, D. (2019). Determinants of Undernutrition among Young Children Living in Soth Nikum District, Siem Reap, Cambodia. *Nutrients*, *11*(3). doi:10.3390/nu11030685
- Cambodia National Institute of Statistics, Ministry of Planning,. (2022). *Report of Cambodia Socio-Economic Survey 2021*. Phnom Penh, Cambodia.
- Cambodia National Institute of Statistics, Ministry of Planning,, & World Food Programme. (2022). *Food and nutrition security trend analysis report: Cambodia socio-economic survey 2014-2019/20*. Phnom Penh, Cambodia.
- Ferguson, E. L., Watson, L., Berger, J., Chea, M., Chittchang, U., Fahmida, U., . . . Winichagoon, P. (2019). Realistic Food-Based Approaches Alone May Not Ensure Dietary Adequacy for Women and Young Children in South-East Asia. *Matern Child Health J*, *23*(Suppl 1), 55-66. doi:10.1007/s10995-018-2638-3
- Kumssa, D. B., Joy, E. J., Ander, E. L., Watts, M. J., Young, S. D., Walker, S., & Broadley, M. R. (2015). Dietary calcium and zinc deficiency risks are decreasing but remain prevalent. *Sci Rep*, *5*, 10974. doi:10.1038/srep10974
- Kuong, K., Tor, P., Perignon, M., Fiorentino, M., Chamnan, C., Berger, J., . . . Wieringa, F. T. (2019). Multi-Micronutrient Fortified Rice Improved Serum Zinc and Folate Concentrations of Cambodian School Children. A Double-Blinded Cluster-Randomized Controlled Trial. *Nutrients*, *11*(12). doi:10.3390/nu11122843
- Laillou, A., Sophonneary, P., Kuong, K., Hong, R., Un, S., Chamnan, C., . . . Wieringa, F. (2016). Low Urinary Iodine Concentration among Mothers and Children in Cambodia. *Nutrients*, *8*(4), 172. doi:10.3390/nu8040172
- National Institute of Statistics/Cambodia, Directorate General for Health/Cambodia, & ICF International. (2015). *Cambodia Demographic and Health Survey 2014*. Phnom Penh, Cambodia: <http://dhsprogram.com/pubs/pdf/FR312/FR312.pdf>
- Reinbott, A., Jordan, I., Herrmann, J., Kuchenbecker, J., Kevanna, O., & Krawinkel, M. B. (2016). Role of Breastfeeding and Complementary Food on Hemoglobin and Ferritin Levels in a Cambodian Cross-Sectional Sample of Children Aged 3 to 24 Months. *PLoS One*, *11*(3), e0150750. doi:10.1371/journal.pone.0150750
- Smith, G., Wimalawansa, S. J., Laillou, A., Sophonneary, P., Un, S., Hong, R., . . . Wieringa, F. T. (2016). High Prevalence of Vitamin D Deficiency in Cambodian Women: A Common Deficiency in a Sunny Country. *Nutrients*, *8*(5). doi:10.3390/nu8050290
- UNICEF Division of Data, Analysis, Planning and Monitoring. (October 2021). *UNICEF Global Databases on Iodized salt*. New York, New York: United Nations Children's Fund.
- UNICEF Division of Data, Analysis, Planning and Monitoring. (September 2021). *UNICEF Global database: Vitamin A supplementation coverage 2000-2020 for current priority country list*. New York: United Nations Children's Fund.
- Wessells, K. R., & Brown, K. H. (2012). Estimating the global prevalence of zinc deficiency: results based on zinc availability in national food supplies and the prevalence of stunting. *PLoS One*, *7*(11), e50568. doi:10.1371/journal.pone.0050568
- Whitfield, K. C., Smith, G., Chamnan, C., Karakochuk, C. D., Sophonneary, P., Kuong, K., . . . Wieringa, F. T. (2017). High prevalence of thiamine (vitamin B1) deficiency in early childhood among a nationally representative sample of Cambodian women of childbearing age and their children. *PLoS Negl Trop Dis*, *11*(9), e0005814. doi:10.1371/journal.pntd.0005814
- Wieringa, F. T., Dahl, M., Chamnan, C., Poirot, E., Kuong, K., Sophonneary, P., . . . Laillou, A. (2016). The High Prevalence of Anemia in Cambodian Children and Women Cannot Be Satisfactorily Explained by Nutritional Deficiencies or Hemoglobin Disorders. *Nutrients*, *8*(6). doi:10.3390/nu8060348
- Wieringa, F. T., Sophonneary, P., Whitney, S., Mao, B., Berger, J., Conkle, J., . . . Laillou, A. (2016). Low Prevalence of Iron and Vitamin A Deficiency among Cambodian Women of Reproductive Age. *Nutrients*, *8*(4), 197. doi:10.3390/nu8040197

References

1. UNICEF. (2021). Fed to Fail? The Crisis of Children's Diets in Early Life. 2021 Child Nutrition Report. New York: United Nations Children's Fund.
2. Dewey, K.G. (2013). The Challenge of Meeting Nutrient Needs of Infants and Young Children during the Period of Complementary Feeding: An Evolutionary Perspective. *The Journal of Nutrition*, 143(12), 2050-2054. doi:10.3945/jn.113.182527
3. PAHO. (2003). Guiding principles for complementary feeding of the breastfed child. Washington, DC: Pan American Health Organization.
4. National Institute of Statistics (NIS), Ministry of Health (MoH), and ICF. (2022). Cambodia Demographic and Health Survey 2021–22 Final Report. Phnom Penh, Cambodia and Rockville, Maryland, USA: NIS, MoH, and ICF.
5. UNICEF Division of Data, Analysis, Planning and Monitoring. (October 2022). Global UNICEF Global Databases: Infant and Young Child Feeding: Child food poverty. New York: United Nations Children's Fund.
6. Prado, E.L. and Dewey, K.G. (2014). Nutrition and brain development in early life. *Nutr Rev*, 72(4), 267-84. doi:10.1111/nure.12102
7. Aguayo, V.M., et al. (2016). Determinants of stunting and poor linear growth in children under 2 years of age in India: an in-depth analysis of Maharashtra's comprehensive nutrition survey. *Matern Child Nutr*, 12 Suppl 1(Suppl 1), 121-40. doi:10.1111/mcn.12259
8. UNICEF. (2016). From the First Hour of Life: Making the case for improved infant and young child feeding everywhere. New York: United Nations Children's Fund.
9. Ventura, A.K. and Mennella, J.A. (2011). Innate and learned preferences for sweet taste during childhood. *Curr Opin Clin Nutr Metab Care*, 14(4), 379-84. doi:10.1097/MCO.0b013e328346df65
10. Khandpur, N., et al. (2020). Ultra-Processed Food Consumption among the Paediatric Population: An Overview and Call to Action from the European Childhood Obesity Group. *Ann Nutr Metab*, 76(2), 109-113. doi:10.1159/000507840
11. Beal, T., et al. (2021). Micronutrient gaps during the complementary feeding period in South Asia: A Comprehensive Nutrient Gap Assessment. *Nutr Rev*, 79(Suppl 1), 26-34. doi:10.1093/nutrit/nuaa144
12. White, J.M., et al. (2021). Micronutrient gaps during the complementary feeding period in 6 countries in Eastern and Southern Africa: a Comprehensive Nutrient Gap Assessment. *Nutr Rev*, 79(Suppl 1), 16-25. doi:10.1093/nutrit/nuaa142
13. UNICEF. (2020). Improving Young Children's Diets During the Complementary Feeding Period. UNICEF Programming Guidance. New York: United Nations Children's Fund.
14. UNICEF, et al. (2017). Meeting report on considering, refining, and extending the World Health Organization infant and young child feeding indicators.
15. WHO and UNICEF. (2018). Meeting Report: Inter-agency technical consultation on infant and young child feeding indicators. World Health Organization, United Nations Children's Fund.
16. Beal, T., et al. (2021). Comprehensive Nutrient Gap Assessment (CONGA): A method for identifying the public health significance of nutrient gaps. *Nutr Rev*, 79(Suppl 1), 4-15. doi:10.1093/nutrit/nuaa140
17. Black, M.M. (1998). Zinc deficiency and child development. *Am J Clin Nutr*, 68(2 Suppl), 464S-469S. doi:10.1093/ajcn/68.2.464S
18. Semrad, C.E. (1999). Zinc and intestinal function. *Curr Gastroenterol Rep*, 1(5), 398-403.
19. Stoltzfus, R.J. (2003). Iron deficiency: global prevalence and consequences. *Food Nutr Bull*, 24(4 Suppl), S99-103. doi:10.1177/15648265030244S206
20. Lozoff, B. (2007). Iron deficiency and child development. *Food Nutr Bull*, 28(4 Suppl), S560-71. doi:10.1177/15648265070284S409

21. Balasubramanian, S. (2011). Vitamin D deficiency in breastfed infants & the need for routine vitamin D supplementation. *Indian J Med Res*, 133(3), 250-2.
22. Stevens, G.A., et al. (2022). Micronutrient deficiencies among preschool-aged children and women of reproductive age worldwide: a pooled analysis of individual-level data from population-representative surveys. *Lancet Glob Health*, 10(11), e1590-e1599. doi:10.1016/S2214-109X(22)00367-9

COMMIT ACTIVITY 1
CAMBODIA

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