

Food-Based Recommendation

Improving dietary intakes among pregnant and lactating women in Rajasthan, India

Eva Monterrosa

Global Alliance for Improved Nutrition,
Geneva, Switzerland

Goutam Sadhu, DK Mangal, Varsha Rani, Ashish Bandhu

IIHMR University, Jaipur, India

Roli Singh

Principal Secretary to the Government
of Rajasthan, India

Raghwesh Ranjan

IPE Global, New Delhi, India

Manjula Singh

Children's Investment Fund Foundation,
New Delhi, India

Saul Morris, Ashish Deo

Global Alliance for Improved Nutrition, London, UK

Prachi Pandit

Arbuza Regenerate Private Ltd, Maharashtra, India

Key messages

- > Food-based approaches reduce nutrient gaps through foods that are consumed at meals, but snacking is usually not explored as an eating occasion.
- > A study carried out in Rajasthan in 2017 shows that foods consumed through meals may meet 100 percent of the Recommended Daily Allowance (RDA) but are 5.6 times more expensive than snacks. Snacking 2–3 times per day

may meet 25–50 percent of the daily RDA for calories and nutrients, depending on the food combinations.

- > Given the large nutrient gaps among pregnant and lactating women (PLW), significant household resources are needed to meet their nutritional needs. Gender-sensitive interventions that could help address inadequate intakes include food vouchers for milk and fruit, fortification of roti flour and targeted supplementation during pregnancy and lactation.

Background

Despite significant improvements during the past decade, maternal malnutrition remains a key public health problem in India.¹ Maternal anemia prevalence is 50 percent,² and 23 percent of women are thin (body mass index < 18.5 kg/m²).¹ Rajasthan is one of India's low-income states,³ with < 25 percent of women of reproductive age having completed 10 years of education and 35 percent of women getting married before the age of 18.⁴ Early marriages (pregnancies) and lack of education are associated with low birth weight (< 2.5 kg),⁵ and almost 23 percent of Rajasthani children are born with low birth weight.⁴ During pregnancy and lactation, vulnerability to malnutrition increases because of the higher nutrient needs of the fetus, the expansion of the placenta and maternal tissues, and the physiological demands of milk production. These needs are particularly acute for women living in rural areas, who remain active as farm workers throughout pregnancy and lactation.

Food-based approaches to address maternal malnutrition among PLW are popular because they build on and fit with habitual food patterns.⁶ In areas with strong gender inequities, the challenge with any food-based recommendations is women's access to food.⁷ Food access also depends on the level of prestige or value assigned to the foods that are being promoted.⁸ Because most of the calories that are ingested are obtained



© Prachi Pandit

Wives examine a storage box for storing snacks in their bedroom

through meals, the ‘default’ recommendation is to recommend more foods at meals to bridge nutrient gaps. Rarely, however, do we critically examine snacking as another route. To this end, the Children’s Investment Fund Foundation (CIFF), in cooperation with the Government of Rajasthan, commissioned a mixed-methods study to examine the feasibility of food-based approaches to support improved nutrient intakes among PLW.

“Rarely do we examine snacking as another way to address maternal malnutrition”

Methods

This mixed-methods study had two key objectives: first, to identify low-cost foods to fill nutrient gaps; and second, to assess the cultural feasibility of food-based recommendations. IIHMR University conducted the Optifood study to answer the first objective, while *Sight and Life* led the formative research study to answer the second objective.

The Optifood study was applied to identify low-cost foods that meet Indian RDAs for pregnant, lactating, and nonpreg-

nant, nonlactating women.⁹ An Optifood methodology consists of dietary data (as 24-hour recall data) and food cost data.¹⁰ The Optifood software optimizes cost and nutrient requirements, and retrieves an output that consists of a food list, frequency and portion size.¹⁰ Given the gender inequities and food norms of Rajasthani women in low-income communities, the Optifood lists were further assessed for cultural feasibility through a formative research study (see Monterrosa,¹¹ for further discussion).

Study area and sampling

The Optifood study relied on two rounds of household surveys: one in the wet season and another in the dry season. Udaipur, Baran and Barmer districts were sampled, and participants were selected using random and probability proportional to size (PPS) multi-stage sampling. In each district, 600 PLW over the age of 18 were sampled, along with 120 nonpregnant and nonlactating women. The final sample size was 2,160 women.

During February and March 2017, data was collected for the formative study among urban and rural women in the same three districts as those in the Optifood study. We sampled 23 PLW for in-depth interviews, eight women for full-day home observations, and participants for 12 focus group discussions: four groups composed of PLW, four of husbands and four of moth-



Focus group discussion among husbands about foods and snack options for their wives

ers-in-law. The formative study also included a short validation phase during which another round of focus group discussions, in all three districts, was completed with PLW ($n = 3$), husbands ($n = 3$) and mothers-in-law ($n = 3$).

Dietary assessment and market study

Dietary intake data were collected using a food frequency questionnaire and the 24-hour recall method in both of the rounds. The qualitative food frequency questionnaire included 218 coded items (from 14 food groups) that were locally available, and the frequency of consumption and seasonal availability were noted for each food.

A survey of the market prices of foods, from both formal markets and informal stores, was also conducted using the standardized instrument ProPAN,¹² and the average price was calculated for every district.

Formative research study

This study specifically informed the feasibility of the Optifood recommendations by asking: (a) are women allowed to eat more

of the same foods at meals, (b) in addition to meals, what are the other eating occasions, and (c) which of the Optifood food-based recommendations are economically viable and culturally appropriate? The formative research study methodology was described in detail by Monterrosa.¹¹

Data analysis

Dietary intake data was entered using Microsoft Access. Using the food composition table published by the Indian Council of Medical Research (ICMR), foods were analyzed to extract energy (kcal), protein (g), fat (g) and micronutrients. Median intake (food serving size) and weekly frequency of foods and food groups at meals for each target group were entered in Optifood software, along with the average cost per 100 g of an edible portion of each food item. The Optifood food list included foods that were eaten by more than 5 percent of the women. Finally, all data were compared with RDAs suggested by the ICMR.

Socioeconomic data were analyzed with SPSS 21 using bivariate cross tabulation, central tendency. The qualitative data analysis has been described in detail elsewhere.¹¹ Transcripts underwent an in-depth textual analysis with a mix of predefined and emergent codes based on an initial conceptual model of food choice for women in Rajasthan.

Results and discussion

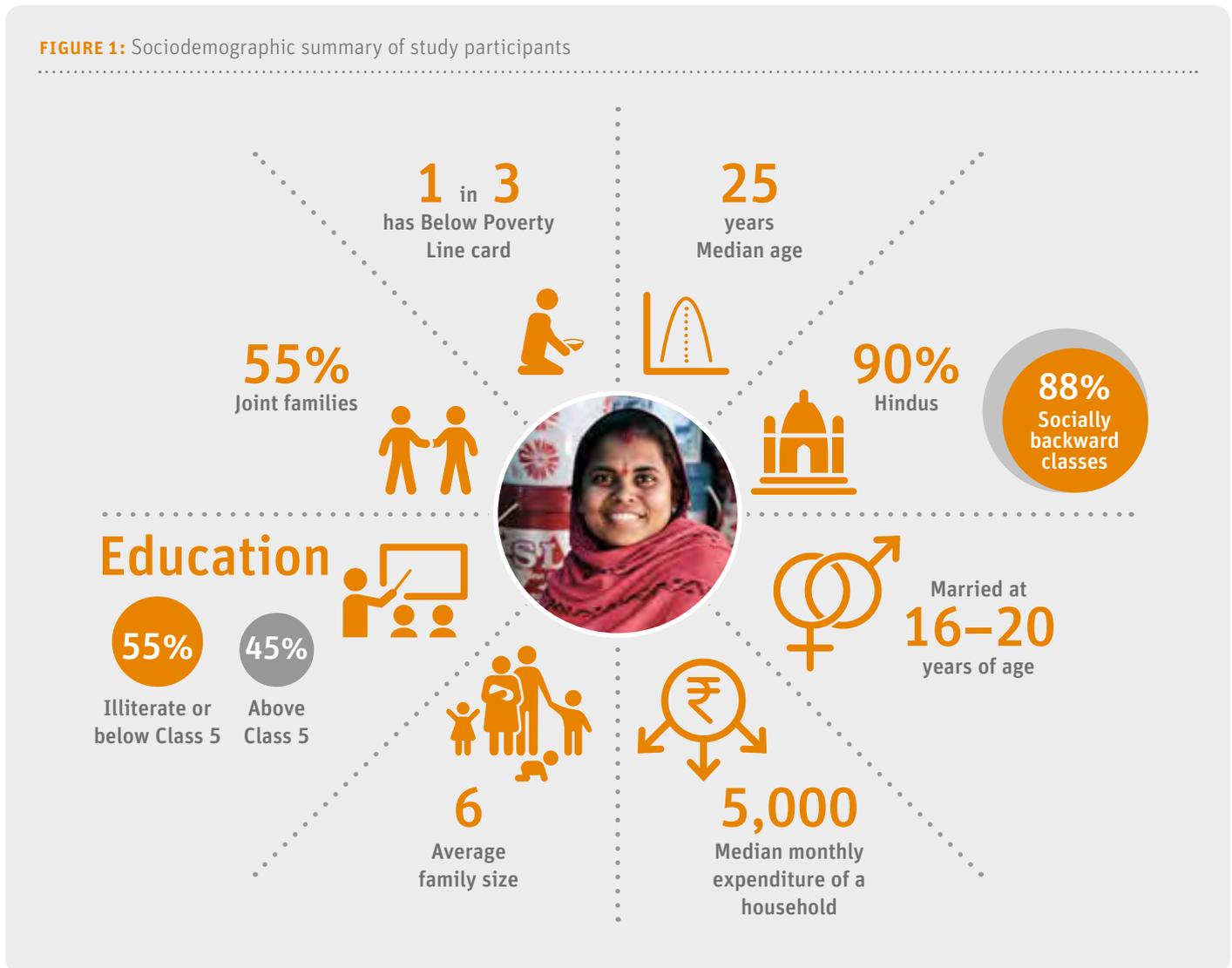
The participant profile is shown in Figure 1. Sixty percent of women were aware of messages related to nutrition and breastfeeding. With regard to household decision-making, PLW's participation in decision-making becomes prominent when their husbands are involved: > 80 percent of women were involved in decision-making in nuclear families, and about 50 percent in joint families.

The 24-hour dietary recall revealed 114 foods were consumed by the women. However, of these, only 46 were consumed by > 5

TABLE 1: Comparison of nutrient gaps for lactating and pregnant women at different life stages and nonpregnant, nonlactating women*

	Energy (kcal)	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Zinc (mg)	Vitamin A (µg)	Vitamin C (mg)
Lactating women (0–5 months)	41–60%	21–40%	61–80%	61–80%	41–60%	61–80%	61–80%	61–80%
Lactating women (6–11 months)	41–60%	21–40%	61–80%	61–80%	41–60%	61–80%	61–80%	61–80%
Lactating women (12–23 months)	21–40%	21–40%	61–80%	61–80%	21–40%	61–80%	61–80%	41–60%
Pregnant women (0–5 months)	41–60%	21–40%	61–80%	61–80%	61–80%	61–80%	61–80%	61–80%
Pregnant women (6–9 months)	41–60%	21–40%	61–80%	61–80%	61–80%	61–80%	61–80%	61–80%
Nonpregnant, nonlactating women	21–40%	21–40%	61–80%	61–80%	21–40%	61–80%	61–80%	41–60%

*Gaps were calculated as (average intakes – RDA)/RDA, and are expressed as percentages; average intakes are for all three districts (Baran, Barmer and Udaipur) and for each life stage 0–20% gap 21–40% gap 41–60% gap 61–80% gap 81–100% gap

FIGURE 1: Sociodemographic summary of study participants

percent of the participants and were included in the Optifood analysis. The food lists, however, varied for each target group, ranging from 29 foods for nonpregnant and nonlactating women to 41 foods for pregnant women (0–6 months). Cooking oils, sugar, wheat flour, buffalo milk, onion, tomato, potato, butter-milk, garlic, cow milk, buffalo ghee and green gram beans were the food items most widely consumed by all of the PLW. Current average household expenditure on a PLW is INR30/day.

The nutrient gaps for PLW at each stage are presented in **Table 1**. Nonpregnant, nonlactating women are shown for reference and demonstrate that significant gaps already exist at this life stage, which are further compounded by the increased nutritional needs generated by pregnancy and lactation.

Food-based recommendations given by Optifood to close the gaps, along with the quantities, are presented in **Table 2**, from most to least expensive. The cost of a nutritionally adequate diet was INR60–70/day/woman, about US\$0.90–1.00, across all life-stage groups. Not surprisingly, most of the foods were ingredients found in dishes that are served at meals.

“Mealtimes are not the ideal eating occasions for improving nutrient intakes”

Feasibility of foods recommended as meals

Data from qualitative research revealed that mealtimes are not the most ideal occasions for improving nutrient intakes. “If she is eating four times, then the other family members are also eating four times. For that, you have to earn a lot.” The custom of shared family meals is too strong in this context to support dietary recommendations for the woman alone. Any meal-based recommendation for large families (more than five adult members) would become prohibitively expensive if household income is < INR344/day (US\$5/day). We found that in general women feel hungry, and do want to eat more food, but fear to do so. Prevailing ideas of ‘eat too much and you are lazy,’ ‘selfish-

TABLE 2: Optifood food-based recommendations and costs to meet 100 percent of Indian Recommended Dietary Allowances for pregnant and lactating women*

Recommendations for a pregnant woman (6–9 months)	Serving size (g or mL)	Cost in INR	Cost in US\$
Six and a half servings of milk, buttermilk or curd	80.43	30.84	0.48
Four servings of cereals or millets	82.35	12.00	0.19
Four servings of vegetables	62.92	6.46	0.10
One serving of orange	180.00	5.14	0.08
Three servings of fats or oils	70.23	5.37	0.08
One and three-quarter servings of pulses	26.82	4.31	0.07
One egg three times <i>a week</i>	55.00	2.37	0.04
Two and a quarter servings of sugars	18.24	1.33	0.02
One serving of potato	101.00	1.21	0.02
Total cost per day		69.03	1.08

Recommendations for a lactating woman (0–5 months)	Serving size (g or mL)	Cost in INR	Cost in US\$
Five servings of milk, buttermilk or curd	140.55	25.71	0.40
Four servings of cereals or millets	81.18	12.17	0.19
Three servings of fats or oils	19.78	9.74	0.15
Four servings of vegetables	60.87	6.00	0.09
One and a half servings of pulses	25.36	3.57	0.06
One serving of banana	120.00	3.13	0.05
One egg three times <i>a week</i>	54.20	2.33	0.04
One serving of nuts	6.13	1.33	0.02
One serving of potato	94.70	1.14	0.02
One serving of <i>gond</i> (edible gum)	9.80	0.99	0.02
One and a quarter servings of sugars or jaggery	24.05	0.76	0.01
Total cost per day		66.87	1.05

*Data are presented for only the most nutritionally demanding life stages, and recommendations are per day unless otherwise indicated; these diets do not meet the daily requirements for vitamins B₁₂ and A

ness’ and the mother-in-law stating ‘too many luxuries now for PLW’ were quite prominent reasons for food restrictions. Fears of miscarriage and complicated childbirth also scared women into eating less.

Meal-based recommendations posed another barrier: the kitchen was the domain of the mother-in-law, and starting the stove required her permission. So, we explored other occasions for improving nutrient intake, such as teatime and snack time, because these occasions fit with prevailing ideas of how much women could eat (see Monterrosa¹¹). Snacks such as rabdi and lassi (two fermented, milk-based beverages) and fruits consisted of foods that did not require cooking on a stove and were accessible to all family members when purchased. Other eating occasions were morning and afternoon tea,¹¹ where morning tea might be taken with a dry chapati leftover from the dinner meal.

.....
“Optifood methodology revealed that a low-cost diet was locally available and acceptable”

In **Table 3**, we show how we adapted Optifood recommendations for snacking, easy storage (in the couple’s bedroom) and portability (carried on the PLW’s person in a small pouch). We took the Optifood list and prioritized affordable non-meal items, leaving out foods that are seasonal (e.g., green garbanzos). Next, we selected foods with a high protein content and prioritized ‘low-status’ foods (roasted chickpeas and groundnuts). Last, we adjusted down the frequency of consumption for lassi, butter-

milk and biscuits, to keep in line with the food norms for women. The average cost of our snack food suggestions was INR12/day (US\$0.17/day). For a pregnant woman in her last trimester, who snacked 2–3 times per day, this would provide on average 270 kcal/day and 8 g protein/day.

Summary and reflections

Optifood methodology was extremely useful in revealing that a low-cost diet was locally available and acceptable to close most of the nutrient gaps. Even though it was low-cost, it was far from affordable. The cost of a high-quality diet for women is about INR60–70/day, and families were spending only half of this amount. A cash incentive of INR30/day for pregnant women and INR40/day for lactating women will help to improve the uptake of recommendations. However, to meet the nutritional needs of PLW, the actual cash transfer investment would need to be higher, owing to the strong meal-sharing culture and food norms for women.

The formative study revealed restrictive food norms for women. It is clear that social sanctions and permissions need to be activated to support women to eat more food. Mothers-in-law are more likely to support food-based recommendations if they are affordable and fit the prevailing ideas of ‘do not over-eat,’ ‘take food in small amounts’ and ‘abide by sanctioned eating times.’ We have previously described the role of husbands in supporting food access for their wives.¹¹ While it is difficult to overtly challenge prevailing gender norms on food access, we can use the existing norms to support equity of food access for women and normalize higher food consumption among social influencers. The Government of Rajasthan, with support from CIFF, is considering launching ‘Champion,’ a statewide behavior change communication campaign to motivate husbands and mothers-in-law to encourage PLW to eat more and better.

“The Government of Rajasthan, with support from CIFF, is considering launching a campaign to motivate husbands and mothers-in-law to encourage PLW to eat more and better”

This research study also highlighted the significant nutrient gaps among PLW, especially for those living in joint families. While snacking might be culturally feasible, the promotion of healthy snacks cannot close this nutrition gap. On the other hand, a food-based intervention closes the nutrition gap, but it is not culturally appropriate because of the gendered eating practices. So, what to do in this scenario? We suggest that, in addition to sensible snacking that is culturally appropriate, other practical food-based approaches that are gender-sensitive might include: (a) mandatory fortification of roti flour (e.g., with vitamins B₁₂ and A); (b) cash transfers or vouchers to support the consumption of nutrient-rich foods that can be shared with women, such as fruit and milk;¹³ and (c) vouchers for food supplements that are rich in fats including omega-3 fats.¹⁴ Other approaches would include the provision of multiple micronutrient supplements during antenatal care and well-baby care to close nutrient gaps among PLW.¹⁴

Acknowledgements

We would like to thank the women and men who participated in this study for their willingness to share the food culture of Rajasthan with us.

TABLE 3: Optifood food-based recommendations and their modifications based on the formative research study

Optifood food list recommendations	Snack food recommendations*
1. Rice flakes, biscuits, dry toast	1. One cup of tea with biscuits or dry toast or roti
2. Whole-wheat and chickpea flour roti (flatbread), sprouted moong bean dal, sprouted legumes, green chickpea or boiled channa (chickpeas)	2. One handful of channa (chickpeas); enjoy them any way you prefer: roasted or boiled, lightly salted or with jaggery
3. Roasted or soaked groundnut, sweet sesame laddoo (macaroon)	3. One handful of groundnuts
4. Paneer (cheese), doodh patti (tea with milk), kadhi (gravy made of chickpea flour and yogurt), rabdi (homemade sweet condensed milk), kache doodh ki lassi (water with milk mixed in a 2:1 ratio)	4. One glass of milk (e.g., cow, buffalo)
5. Arbi (taro root), potato, tinda (Indian squash), tori ghia (sponge gourd), brinjal (eggplant), sanjhane ki phalli (moringa drumstick), kachri (cucumber), guarphali (green beans), peas, tomato	5. One glass of your favorite lassi
	6. One glass of rabdi
	7. One fruit (fresh)

*Consume 2–3 foods every day, between meals

.....

Correspondence: *Eva Monterrosa,*

*Global Alliance for Improved Nutrition, Rue de Varembe 7,
1202 Geneva, Switzerland*

Email: *emonterrosa@gainhealth.org*

.....

[Dr Monterrosa led the formative research study during her tenure as Sr Scientific Manager, *Sight and Life* – Ed.]

.....

References

01. International Institute for Population Sciences. India Fact Sheet. National Family Health Survey – 4. Government of India; 2015–16. Internet: rchiips.org/nfhs/pdf/NFHS4/India.pdf (accessed 19 November 2019).
02. Nguyen PH, Scott S, Avula R, Tran LM, Menon P. Trends and drivers of change in the prevalence of anaemia among 1 million women and children in India, 2006 to 2016. *BMJ Glob Health*. 2018 Oct 19;3(5):e001010.
03. World Bank. Rajasthan: Poverty, Growth & Inequality. World Bank; 2016. Internet: documents.worldbank.org/curated/en/423761467995629413/pdf/105877-BRI-P157572-ADD-SERIES-India-state-briefs-PUBLIC-Rajasthan-Proverty.pdf (accessed 19 November 2019).
04. International Institute for Population Sciences. State Fact Sheet: Rajasthan. National Family Health Survey – 4. Government of India; 2015–16. Internet: http://rchiips.org/nfhs/pdf/NFHS4/RJ_FactSheet.pdf (accessed 19 November 2019).
05. Raj A, Saggurti N, Winter M, Labonte A, Decker MR, Balaiah D, et al. The effect of maternal child marriage on morbidity and mortality of children under 5 in India: cross sectional study of a nationally representative sample. *BMJ*. 2010 Jan 21; 340:b4258.
06. Burchi F, Fanzo J, Frison E. The Role of Food and Nutrition System Approaches in Tackling Hidden Hunger. *Int J Environ Res Public Health*. 2011 Feb;8(2):358–73.
07. Gittelsohn J. Opening the box: Intrahousehold food allocation in rural Nepal. *Soc Sci Med*. 1991 Jan;33(10):1141–54.
08. Harris-Fry HA, Paudel P, Harrisson T, Shrestha N, Jha S, Beard BJ, et al. Participatory Women’s Groups with Cash Transfers Can Increase Dietary Diversity and Micronutrient Adequacy during Pregnancy, whereas Women’s Groups with Food Transfers Can Increase Equity in Intrahousehold Energy Allocation. *J Nutr*. 2018 Sep 1;148(9):1472–83.
09. National Institute of Nutrition. Nutrient Requirements and Recommended Dietary Allowances for Indians. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad; 2009.
10. Ferguson EL, Darmon N, Fahmida U, Fitriyanti S, Harper TB, Premachandra IM. Design of optimal food-based complementary feeding recommendations and identification of key “problem nutrients” using goal programming. *J Nutr*. 2006 Sep;136(9):2399–404.
11. Monterrosa E. The Sociocultural Drivers of Food Choices: Formative research among pregnant and lactating women in Rajasthan. *Sight and Life*. 2017;31(2):27–35. sightandlife.org/wp-content/uploads/2017/12/SALmagazine_TechnologyandEntrepreneurship_TheSocioculturalDriversofFoodChoice_181215.pdf (accessed 19 November 2019).
12. PAHO. ProPAN: Process for the Promotion of Child Feeding. 2nd ed. Washington, DC: Pan American Health Organization; 2013. Internet: www.paho.org/hq/dmdocuments/2013/Propan2-Eng.pdf (accessed 19 November 2019).
13. Hamad R, Batra A, Karasek D, LeWinn KZ, Bush NR, Davis RL, et al. The Impact of the Revised WIC Food Package on Maternal Nutrition during Pregnancy and Postpartum. *Am J Epidemiol*. 188(8):1493–502.
14. Das JK, Hoodbhoy Z, Salam RA, Bhutta AZ, Valenzuela-Rubio NG, Weise Prinzo Z, et al. Lipid-based nutrient supplements for maternal, birth, and infant developmental outcomes. *Cochrane Database Syst Rev*. 2018 Aug 31;8:CD012610.

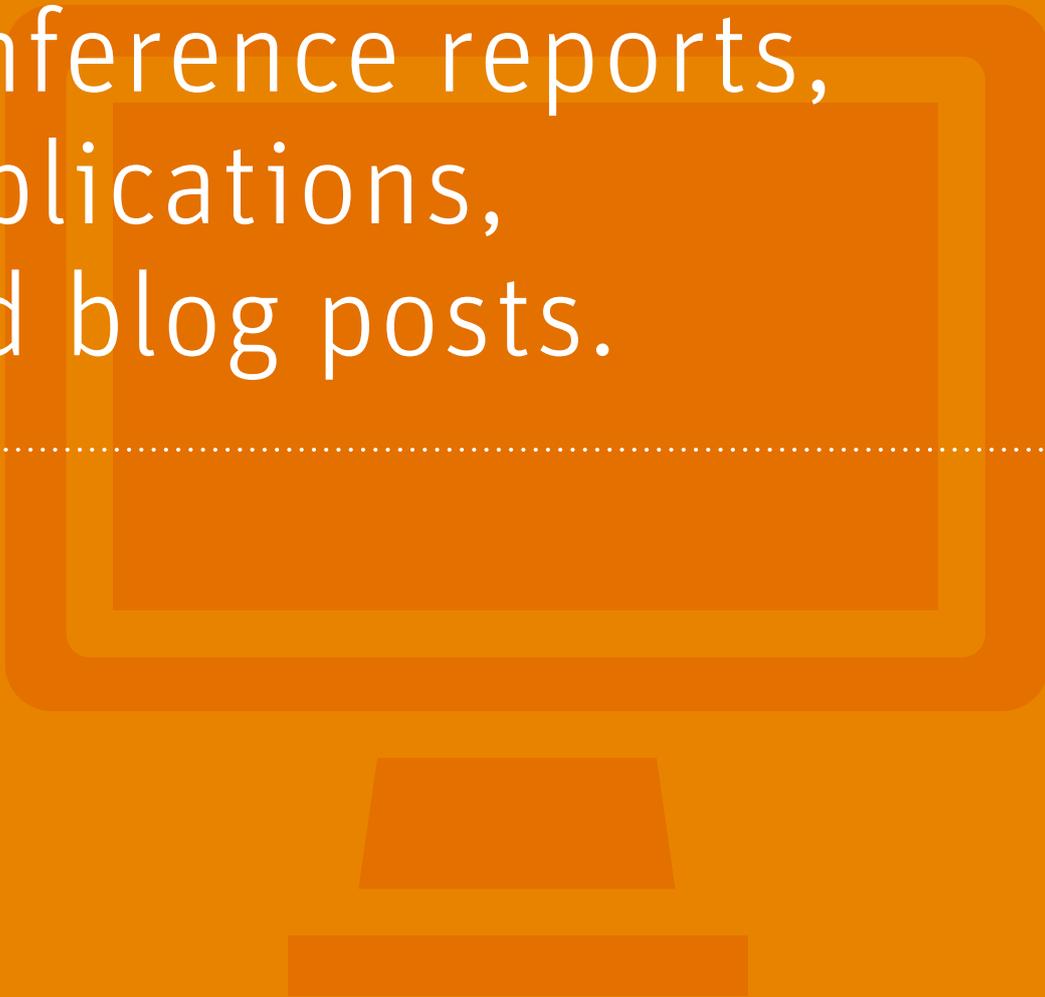
A world free from malnutrition.



Sight and Life is a humanitarian nutrition think tank delivering innovative solutions to eliminate all forms of malnutrition in children and women of childbearing age and improve the lives of the world's most vulnerable populations.

Sight and Life provides a range of online educational materials and resources covering a variety of topics in nutrition from strategies to combat malnutrition to behavior change communication.

••• Visit
sightandlife.org
for the most recent
conference reports,
publications,
and blog posts.

A stylized, minimalist illustration of a computer monitor. The monitor is represented by a large, rounded rectangle with a thick orange border. Below the rectangle is a trapezoidal shape representing the base of the monitor, also in orange. The entire graphic is centered at the bottom of the page.