AFFORDABILITY OF NUTRITIOUS FOODS FOR COMPLEMENTARY FEEDING IN **SOUTH AFRICA**

March 2021

gain Global Alliance for Improved Nutrition

unicef for every child

Recommended citation
Global Alliance for Improved Nutrition (GAIN) and United Nations Children's Fund (UNICEF). *Affordability of nutritious foods for complementary feeding in South Africa*. Geneva: GAIN, 2021.

Acknowledgements
This briefing paper was written by Theresa Ryckman and Ty Beal. This work was funded by contributions from the Ministry of Foreign Affairs of the Netherlands (grant no. MINBUZA-2019.334151 to the Global Alliance for Improved Nutrition) and the Bill & Melinda Gates Foundation through the Regional Initiatives for Sustained Improvements in Nutrition and Growth (RISING) to UNICEF (grant no. OPP1179059). The funders had no role in data collection and analysis, manuscript preparation and revision, or the decision to publish. This study used data from public sources, and all authors had access to the data analysed as part of this study. The findings and conclusions contained within are those of the authors and do not necessarily reflect positions or policies of the Bill & Melinda Gates Foundation. We thank Stella Nordhagen and the nutrition teams in UNICEF's Country Offices (South Africa), UNICEF's Eastern and Southern Africa Regional Office (ESARO), and UNICEF Headquarters for their inputs and feedback. Graphic design is by Danielle DeGarmo. Copy editing is by Heidi Fritschel. Cover photo: © Shutterstock/Roberto Nencini

For more details and full sources, see the following article from which this brief is drawn:
Ryckman T, Beal T, Nordhagen S, Chimanya K, Matji J. Affordability of nutritious foods for complementary feeding in Eastern and Southern Africa. *Nutr Rev.* 2021;79(4,Suppl 1):35–51.

Contact
Global Alliance for Improved Nutrition (GAIN)
Rue de Varembé 7
1002 Geneva, Switzerland
T: +41 22 749 18 50
E: info@gainhealth.org
www.gainhealth.org

UNICEF
Nutrition Section, Programme Division
3 United Nations Plaza
New York, NY 10017, USA
E: nutrition@unicef.org
www.unicef.org

gain Global Alliance for Improved Nutrition

unicef for every child

KEY MESSAGES

- Several foods commonly available in South Africa are rich in nutrients lacking in young children's diets. However, more than half of households struggle to afford enough of these nutritious foods to meet even 50% of the dietary requirements for iron and calcium of their children under age two. Chicken liver is the lowest-cost food to fill likely gaps in iron consumption, while small tinned fish and milk are the lowest-cost sources of calcium.
- About 25% of households face affordability barriers to meeting young children's protein requirements through animal-source foods. The most affordable options are chicken and small tinned fish.
- While a dietary gap in vitamins A persists, it is not due primarily to unaffordability. Almost all households can afford enough beef liver, chicken liver, carrots, or pumpkin to meet more than 50% of vitamin A needs.
- Beef liver, chicken liver, small tinned fish, fresh milk, and eggs are the most affordable foods for jointly meeting requirements for the six micronutrients commonly lacking in young children's diets in the region.
- In the short term, addressing child undernutrition among resource-constrained households may require providing cash or in-kind transfers or, for some nutrients, commercial fortification, point-of-use fortification, or supplementation. While lowering prices will help some households, in the medium to long term, efforts to raise incomes will likely be crucial.

WHY DOES AFFORDABILITY OF COMPLEMENTARY FOODS MATTER IN SOUTH AFRICA?

South Africa, an upper-middle-income country, is home to 58 million people, 40% of whom live under the poverty line.[1–3] Only 5% of the population is employed in the agriculture sector, which accounts for only 3% of GDP.[4] While smallholder farming is relatively uncommon, a recent study found that households engaging in subsistence agriculture are more likely to be food secure.[3] South Africa's Gini coefficient, as well as other inequality metrics, is continually among the highest globally, and it is estimated that the wealthiest 1% of people own more than 70% of the country's wealth , making South Africa one of the least equitable countries in the world.[3] Owing in part to these persistent inequalities, health and nutrition outcomes remain poor among a substantial proportion of the population. Child undernutrition is widespread: 27% of children under five are stunted, and 49% of children aged 6–23 months do not consume an adequately diverse diet.[5]

Many children in the complementary feeding period—the period when infants and young children are 6–23 months old and breast milk is no longer sufficient to meet their nutritional needs—do not consume enough iron, vitamin A, calcium, and animal-source protein, and these shortfalls hinder their growth and development.[6,7] Unaffordability is an important barrier, among others, to the consumption of foods rich in these important nutrients. However, the extent to which unaffordability is a barrier for specific nutrients and which foods are the most affordable sources of these nutrients are unclear. This brief summarizes the affordability of nutritious foods that could fill important nutrient gaps during the complementary feeding period and discusses implications for policy and programmes.

METHODS

Using household expenditure data from South Africa's 2014–15 Living Conditions Survey (LCS)[8] and price data from Statistics South Africa[9] and the South Africa National Agricultural Marketing Council,[10] we benchmarked the cost of foods that could meet nutrient requirements against current household food expenditures to assess affordability, using a previously developed method.[11] Because nutrients are generally obtained from a combination of foods, we analysed whether households could afford to meet half of the daily requirements for protein, iron, vitamin A, and calcium for their children under age two through specific foods. These foods were chosen because of their nutrient content and availability in South Africa. For protein, only animal-source foods were used since plant-based sources of protein are generally not complete in essential amino acids critical for child growth and development.[12] We calculated the cost of realistic portion sizes required to meet 50% of nutrient needs from complementary foods (since nutrient requirements are met through a combination of foods), adjusting for refuse, cooking yield, and bioavailability where applicable. To assess the relative affordability of nutrients and foods, these costs were compared with current food spending per adult equivalent (a method of adjusting for household size and composition) for each household with children under age two surveyed. To assess absolute affordability, we established a threshold

of 10% of household food spending per adult equivalent, based on previous analysis.[11] We also assessed foods in terms of their affordability for meeting needs for several micronutrients in combination. In this joint micronutrient analysis of six key micronutrients commonly lacking in the diets of infants and young children, we calculated which foods are most affordable at providing an average of one-third of a young child's daily nutrient requirements from complementary foods. Finally, we compared the relative costs of energy among those foods that provide at least 100 kilocalories of energy in a 100-gram (g) portion (a threshold of 50 g was used for milk). It is important to note that this research contains several limitations, which are described in Ryckman et al. (2021).[11]

HOUSEHOLD FOOD EXPENDITURE AND CONSUMPTION PATTERNS

On average, households with children under age two in South Africa allocated 30% of total expenditures to food. Few households in South Africa produce food for their own consumption, so it is likely that the majority of food consumed comes from purchases for most households.[3,8] Households with children under age two spent the most on cereal products and meat, fish, and eggs, and these categories were also consumed by more than 85% of households. In the previous two weeks, 72% of households had consumed dairy products and vegetables, but they spent about half as much on vegetables (5% of food expenditure) as on dairy products (11%); 41% of households consumed roots and tubers, 36% consumed fruits, 22% consumed pulses, and 9% consumed nuts and seeds

Of the specific foods chosen as options to fill one or more nutrient gaps, none was consumed nearly as commonly as cereal products (Figure 1). Chicken was consumed by 66% of households, and all other foods were consumed by fewer than half of households. Of the remaining foods, only milk (36%), eggs (33%), and beef (27%) were consumed by at least one in four households.

AFFORDABILITY BY NUTRIENT

Animal-source protein: The most affordable animal-source foods to meet half of young children's daily protein requirements from complementary feeding are chicken and small tinned fish, both of which cost an average of 10% of adjusted household food expenditure (Figure 2). However, 25–27% of households would be unable to afford these foods in adequate quantities, assuming a 10% affordability threshold (Figure 3). Other options—eggs, beef, sour milk, fresh milk—cost 20–24% of adjusted food expenditure for the average household and exceed 10% of adjusted food expenditure for 59–67% of households.

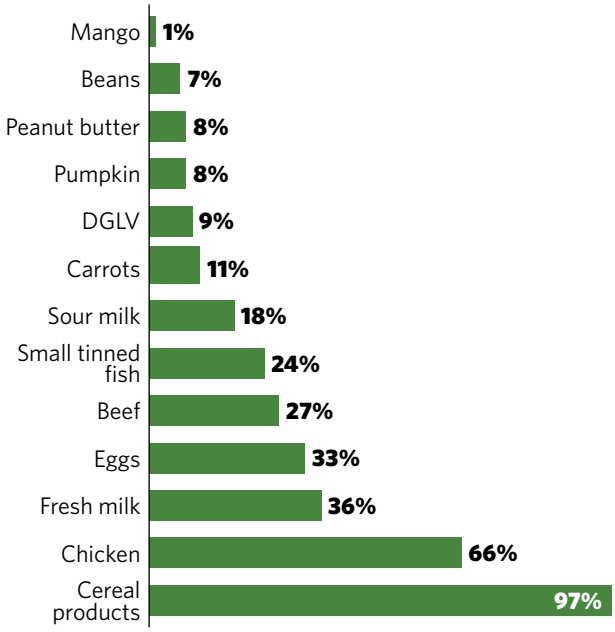

FIGURE 1. Percentage of surveyed households that had consumed selected foods in the past two weeks. Data are from 3,303 households in the 2014–15 Living Conditions Survey.[8] DGLV = dark green leafy vegetables.

Calcium: Calcium is least-affordable nutrient considered. Only three foods that are commonly consumed in South Africa could meet calcium requirements with reasonable portion sizes, and the portion sizes of all three of these foods would cost more than 30% of adjusted food expenditure for the average household. At a 10% threshold, milk and small tinned fish, the lower-cost sources, would be affordable options for only 18–20% of households.

Iron: Iron is a relatively unaffordable nutrient, with the lowest-cost option, chicken liver, averaging 20% of adjusted food expenditure (double the affordability threshold of 10%). Chicken liver costs more than 10% of adjusted food expenditure for 57% of households with children under age two in South Africa. Other sources of iron exceed the 10% threshold for 83% or more of households.

Vitamin A: Several foods could affordably meet half of children's vitamin A requirements from complementary feeding. Beef liver, chicken liver, carrots, and pumpkin all cost less than 7% of adjusted food expenditure for the average household. Liver is affordable for all households at a 10% threshold, carrots are affordable for 99% of households, and pumpkin is affordable for 88% of households. Dark green leafy vegetables and mango slightly exceed the 10% threshold for the average household but could be affordable for 63–64% of households.

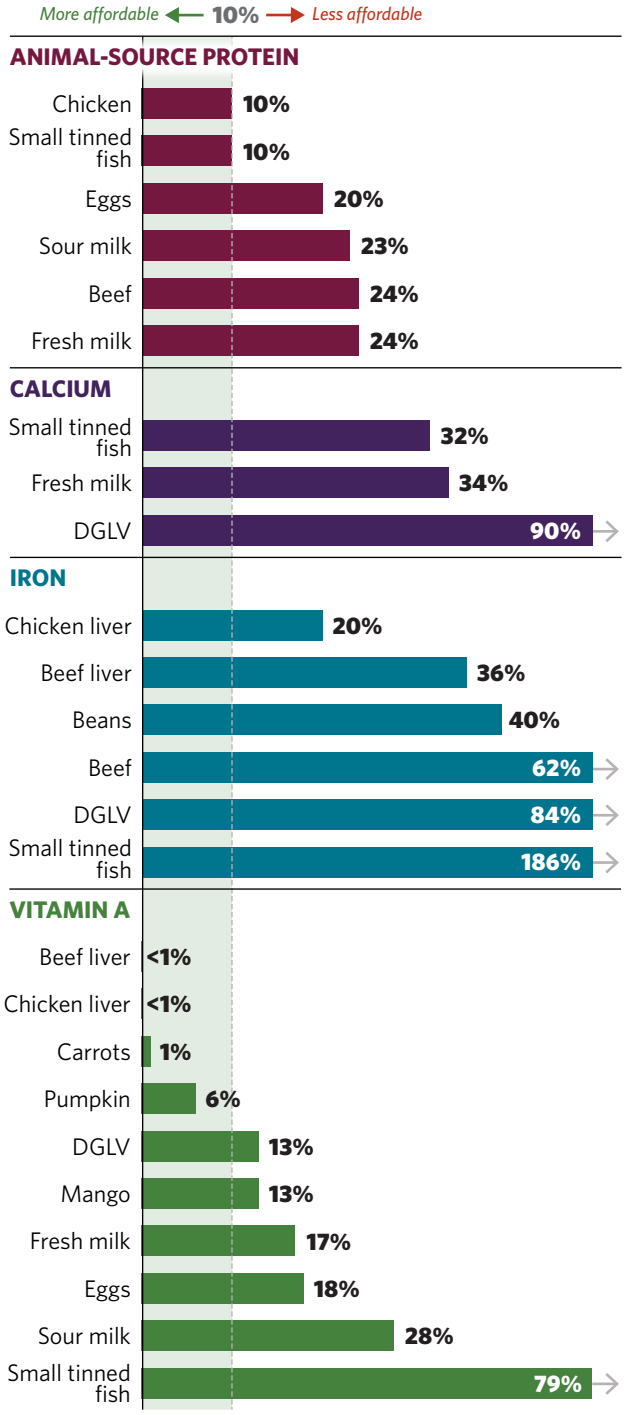

FIGURE 2. Share of food expenditures per adult equivalent needed to meet half of nutrient requirements from complementary foods. The dashed line represents the affordability threshold of 10%. Bars below the dashed line are considered affordable. Household expenditure data are from 3,303 households in the 2014–15 Living Conditions Survey.[8] Nutrient densities are mostly from the United States Department of Agriculture food composition database as well as regional food composition tables and published literature.[13–19] Nutrient requirements from complementary foods are from Ryckman et al. (2021).[11] DGLV = dark green leafy vegetables.

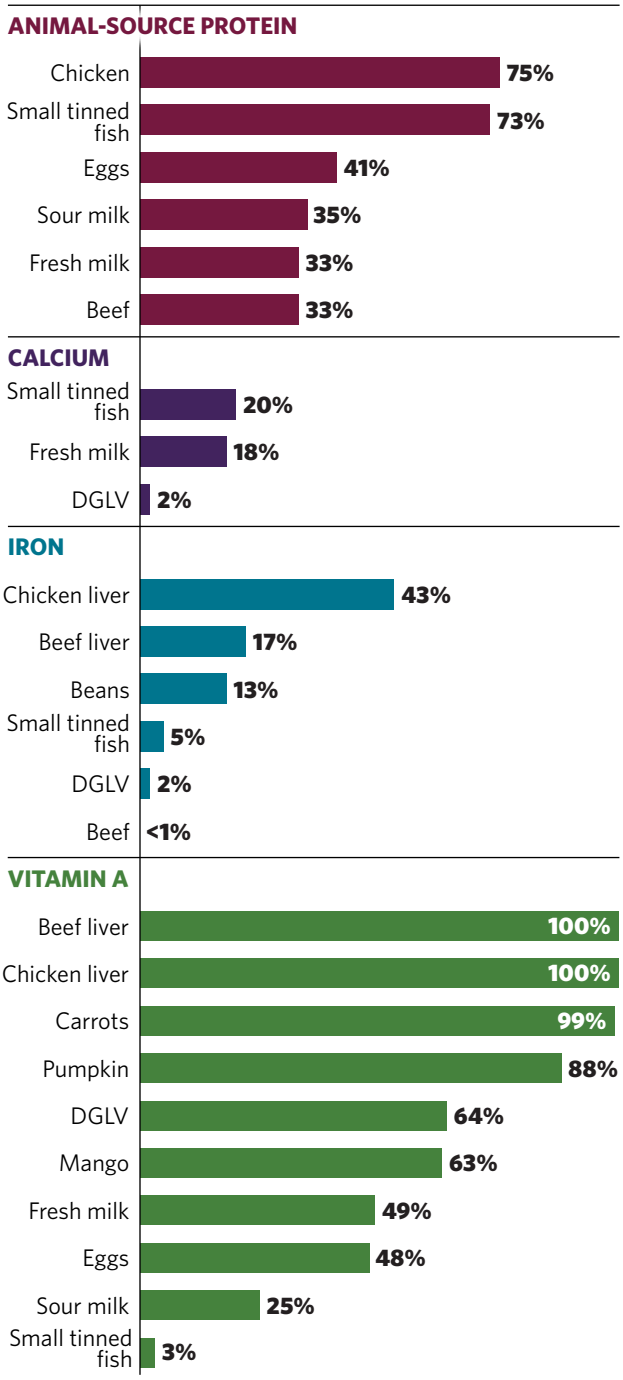

FIGURE 3. Percentage of households able to afford portion sizes meeting half of nutrient requirements from complementary foods. Foods were considered affordable if their required share of food expenditures per person was below the affordability threshold of 10%. Household expenditure data are from 3,303 households in the 2014–15 Living Conditions Survey.[8] Nutrient densities are mostly from the United States Department of Agriculture food composition database as well as regional food composition tables and published literature.[13–19] Nutrient requirements from complementary foods are from Ryckman et al. (2021).[11] DGLV = dark green leafy vegetables.

AFFORDABILITY ACROSS MULTIPLE MICRONUTRIENTS

Figure 4 shows affordability based on foods' contributions toward meeting the requirements for more than one of the six micronutrients that are commonly lacking in young children's diets in Eastern and Southern Africa. Beef liver and chicken liver are by far the most affordable foods in this analysis, and they are also the lowest-cost foods to fulfil vitamin A and iron requirements. Small tinned fish, fresh milk, and eggs are also considered affordable foods to meet micronutrient needs in combination, although their cost to achieve one-third mean probability of adequacy is 15–29 times that of liver. Dark green leafy vegetables and peanut butter are the only plant-source foods that could achieve one-third mean probability of adequacy with a portion size not exceeding 100 g and are unaffordable, illustrating the relatively high nutrient densities of animal-source foods when multiple micronutrients are considered jointly.

DIETARY ENERGY AFFORDABILITY

By contrast, plant-source foods are the lowest-cost options when affordability is assessed based on energy content rather than micronutrient content (Figure 5). The animal-source foods with the lowest cost per kilocalorie (sour milk, small tinned fish, chicken, fresh milk) cost about twice as much as the plant-source foods included in this analysis (peanut butter and beans). However, even peanut butter and beans are much more expensive per kilocalorie than maize flour, a nutrient-poor but cheaply available staple. Households that currently rely mostly on staples to feed young children are therefore likely to struggle to replace current staple consumption with adequate quantities of nutritious foods to meet daily energy requirements.

CONCLUSIONS

The most affordable foods to fill likely complementary feeding nutrient gaps in South Africa are chicken liver (iron, vitamin A, multiple micronutrients jointly), small tinned fish (calcium, protein, multiple micronutrients jointly), beef liver (vitamin A, multiple micronutrients jointly), milk (calcium, multiple micronutrients jointly), chicken (protein), orange-fleshed vegetables (vitamin A), and eggs (multiple micronutrients jointly). However, only vitamin A is affordable for almost all households at current prices, whereas iron and calcium are unaffordable for half or more of households.

The findings of this analysis contrast with similar analyses conducted for other countries in Eastern and Southern Africa. Calcium is much less affordable in South

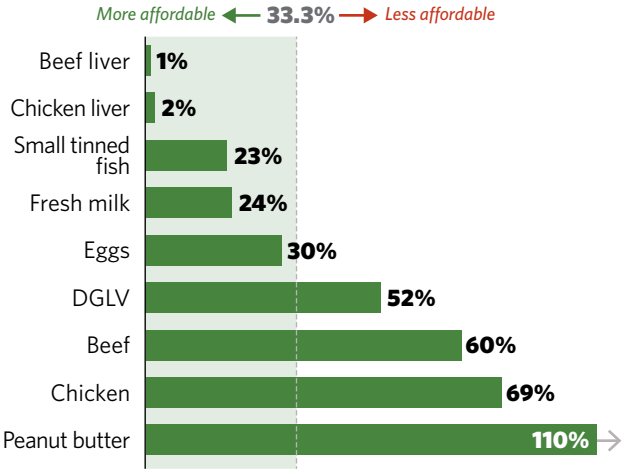

FIGURE 4. Share of food expenditures per person needed to provide an average of one-third of a young child's requirements for iron, vitamin A, zinc, folate, vitamin B_{12}, and calcium. The affordability threshold (dashed line) was set at one-third (33.3%) of food expenditures because this analysis is based on meeting an average of one-third of requirements for six micronutrients from complementary foods. The share of daily requirements of each nutrient provided by the specified quantity of food was capped at 100%. Household expenditure data are from 3,303 households in the 2014–15 Living Conditions Survey.[8] Nutrient densities are mostly from the United States Department of Agriculture food composition database as well as regional food composition tables and published literature.[13–19] Nutrient requirements from complementary foods are from Ryckman et al. (2021).[11] DGLV = dark green leafy vegetables.

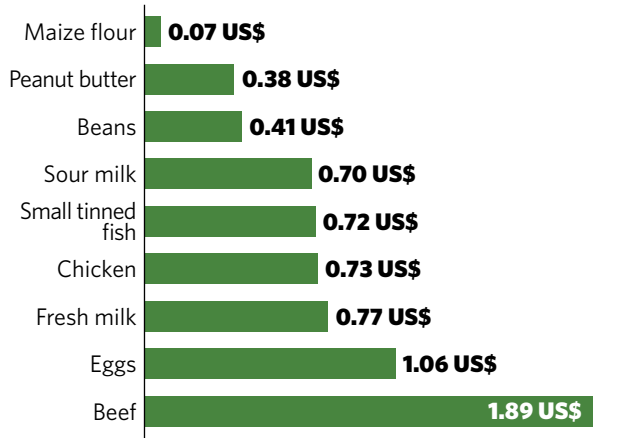

FIGURE 5. Cost of daily dietary energy requirements from complementary foods (450 kilocalories). Price data are from Statistics South Africa and the National Agricultural Marketing Council. Dietary energy densities are mostly from the United States Department of Agriculture food composition database as well as regional food composition tables and published literature.[13–19] The cost of 450 kilocalories is shown because this is the average daily dietary energy requirement for a child aged 6–23 months.

Africa than it is in other countries. Pulses and dark green leafy vegetables were generally the most affordable sources of iron in other countries, but not in South Africa. One reason for this difference is that the relative prices of pulses and, especially, dark leafy green vegetables, are substantially higher in South Africa than in many neighbouring countries.[11] However, some foods that are expensive and rarely consumed in other countries are much more frequently consumed in South Africa. In particular, chicken was the most affordable animal source of protein and was consumed by two-thirds of surveyed households with children under age two. South Africa's status as an upper-middle-income country and its relatively low levels of smallholder farming may explain some of these differences.

One similarity between South Africa and other countries in the region is the affordability of vitamin A from liver and orange-fleshed fruits and vegetables (in other countries, dark leafy greens were also an affordable source of vitamin A). In South Africa, as in other countries, interventions to address likely gaps in vitamin A consumption may need to focus on generating demand among caregivers. The survey did not contain data on consumption of these foods by young children or on household liver consumption, but less than 11% of households surveyed had consumed carrots, pumpkin, or mango in the previous two weeks.

A combination of approaches will likely be needed to address the remaining nutrients. Home production interventions may also be more challenging to implement in South Africa than in other countries, given the current low levels of consumption from home production.

- For the 25% of households for whom protein (from chicken or small tinned fish) is unaffordable, efforts could focus on food prices, including market-based interventions and price subsidies. Although some combinations of plant-source proteins can also provide complete amino acids, plant sources of protein such as beans and groundnuts are consumed infrequently and are relatively high cost.
- The gap in iron affordability is great enough (the lowest-cost food source is unaffordable for 57% of households) that price reductions are unlikely to help enough households. Other approaches, such as iron supplementation, may need to be considered.
- Calcium is a nutrient with even greater affordability barriers (unaffordable for 80% of households). Price reductions could help some households but will likely need to be implemented in combination with other approaches, such as fortification.

Given high levels of inequality in South Africa and extremely large affordability gaps that are unlikely to be fully addressed through price reductions, particularly for iron and calcium, a package of interventions to address nutrient gaps among children of complementary feeding age in South Africa may need to include safety net programmes (such as transfers of food or cash) and, in the long term, interventions to boost the incomes of low-resource South Africans.

REFERENCES

1. United Nations. World Population Prospects 2019. Accessed March 18, 2019.
2. World Bank. Data: World Bank country and lending groups. Accessed February 22, 2019.
3. Sulla V, Zikhali P. *Overcoming Poverty and Inequality in South Africa : An Assessment of Drivers, Constraints and Opportunities*. Washington, DC: World Bank; 2018.
4. Central Intelligence Agency. The World Factbook: South Africa. Accessed March 18, 2019.
5. National Department of Health (NDoH), Statistics South Africa (Stats SA), South African Medical Research Council (SAMRC), ICF. *South Africa Demographic and Health Survey 2016*. Pretoria, South Africa, and Rockville, Maryland, USA: NDoH, Stats SA, SAMRC, and ICF. Accessed March 18, 2019.
6. Beal T, White JM, Arsenault JE, Okronipa H, Hinnouho G-M, Morris SS. Comprehensive Nutrient Gap Assessment (CONGA): A method for identifying the public health significance of nutrient gaps. *Nutr Rev*. 2021;79(4,Suppl 1):4–15.
7. Global Alliance for Improved Nutrition (GAIN), United Nations Children's Fund (UNICEF). *Comprehensive Nutrient Gap Assessment (CONGA): Micronutrient gaps during the complementary feeding period in South Africa*. Geneva: GAIN; 2021.
8. World Bank. Living Conditions Survey 2014–2015: South Africa. Accessed March 14, 2019.
9. Statistics South Africa. Average Food Prices in South Africa. Accessed March 14, 2019.
10. National Agricultural Marketing Council (South Africa). Food Price Monitoring. Accessed March 14, 2019.
11. Ryckman T, Beal T, Nordhagen S, Chimanya K, Matji J. Affordability of nutritious foods for complementary feeding in Eastern and Southern Africa. *Nutr Rev*. 2021;79(4,Suppl 1):35–51.
12. Semba RD, Shardell M, Sakr Ashour FA, et al. Child stunting is associated with low circulating essential amino acids. *EBioMedicine*. 2016;6:246–252. doi:10.1016/j.ebiom.2016.02.030.
13. U.S. Department of Agriculture, Agricultural Research Service. FoodData Central. Accessed January 26, 2020.
14. Food and Agriculture Organization of the United Nations (FAO), Government of Kenya. *Kenya Food Composition Tables*. Nairobi: FAO and Government of Kenya; 2018.
15. Stadlymayr B, Charrondiere UR, Enujiugha VN, et al. *West African Food Composition Table/Table de Composition des Aliments d'Afrique de l'Ouest*. Rome: FAO; 2012.
16. Korkalo L, Hauta-alus H, Mutanen M. *Food Composition Tables for Mozambique: Version 2*. Helsinki: Department of Food and Environmental Sciences, University of Helsinki; 2011. Accessed January 26, 2020.
17. Nyirenda DB, Musukwa M, Mugode RH, Shindano J. *Zambia Food Composition Tables*. 4th ed. Lusaka, Zambia: National Food and Nutrition Commission; 2009.
18. Steiner-Asiedu M, Lied E, Lie Ø, Nilsen R, Julshamn K. The nutritive value of sun-dried pelagic fish from the rift valley in Africa. *J Sci Food Agric*. 1993;63(4):439–443.doi:10.1002/jsfa.2740630410.
19. Kabahenda MK, Amega R, Okalany E, Husken SMC, Heck S. Protein and micronutrient composition of low-value fish products commonly marketed in the Lake Victoria region. *World J Agric Sci*. 2011;7(5):521–526.