AFFORDABILITY OF NUTRITIOUS FOODS FOR COMPLEMENTARY FEEDING IN **ZAMBIA**

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KEY MESSAGES

- Several foods commonly available in Zambia are rich in nutrients lacking in young children's diets. However, many households struggle to afford enough of these nutritious foods to meet even 50% of the dietary requirements for protein (from animal sources), iron, calcium, folate, and zinc of their children aged 6–23 months.
- Zinc is the least affordable nutrient, with 80% of households unable to purchase enough zinc-rich foods to meet 50% of requirements for young children.
- About 70% of households cannot afford calcium or iron, 50% face affordability barriers to accessing animal-source protein, and 35% cannot afford adequate quantities of folate.
- While dietary gaps in vitamins A and B_{12} persist, they are not due primarily to unaffordability: almost all households can afford enough foods rich in these nutrients to meet 100% of needs.
- The most affordable foods to fill nutrient gaps are dark green leafy vegetables (iron, calcium, folate, vitamin A, multiple micronutrients combined), small dried fish (calcium, protein, multiple micronutrients), fresh fish (protein), beef liver (vitamin A, vitamin B_{12}, multiple micronutrients), chicken liver (vitamin B_{12}, vitamin A, folate, multiple micronutrients), and pulses (zinc, folate, iron).
- The affordability of nutritious complementary foods is uniquely challenging in Zambia. 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. In the medium to long term, efforts to promote home production of nutritious foods, lower the prices of these foods, and raise incomes are crucial.

WHY DOES AFFORDABILITY OF COMPLEMENTARY FOODS MATTER IN ZAMBIA?

Zambia is a landlocked lower-middle-income country in Southern Africa with a population of nearly 18 million in 2019.[1,2] While economic growth was strong in the 2000s, reaching levels as high as 10% annually, it has slowed to about 3% in recent years, and 54% of the population still lives below the national poverty line.[3,4] The agriculture sector employs 55% of the workforce but accounts for only 8% of GDP.[4] Low agricultural productivity and limited crop diversity are drivers of undernutrition and affect the affordability of nutritious foods.[5] Overreliance on maize presents a potential food security risk, and crop diversification is a policy priority.[5] Child undernutrition is widespread: 40% of children under age five are stunted, and 78% of children under age two do not consume an adequately diverse diet.[6]

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, zinc, folate, vitamin B_{12}, and animal-source protein, and these shortfalls hinder their growth and development.[7,8] 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 price and household expenditure data from the 2015 Living Standards Measurement Survey (LSMS),[9] we benchmarked the cost of foods that could meet nutrient requirements against current household food expenditures to assess affordability, using a previously developed method.[10] 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, calcium, zinc, folate, and vitamin B_{12} for their children aged 6–23 months through specific foods. These foods were chosen because of their nutrient content and availability in Zambia. 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.[11] 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 aged 6–23 months surveyed. To

assess absolute affordability, we established a threshold of 10% of household food spending per adult equivalent, based on previous analysis.[10] 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).[10]

HOUSEHOLD FOOD EXPENDITURE AND CONSUMPTION PATTERNS

On average, households spent 58% of their total expenditures on food. Purchases made up 65% of food expenditures (that is, the total value of food from all sources) while 35% came from home production and other sources. Households with children aged 6–23 months allocated most of their food expenditure to meat, fish, and eggs (26% of food expenditure on average), vegetables (24%), and cereal products (18%). Nearly all of these households—98%—had consumed vegetables in the two weeks before being surveyed, 96% had consumed meat, fish, and eggs, and 83% had consumed cereal products. Roots and tubers were consumed by 60% of households; pulses, by 48%; nuts and seeds, by 32%; fruits, by 31%; and dairy products, by 23%.

Dark green leafy vegetables were the most-consumed food chosen as an option to fill one or more nutrient gaps and were consumed even more commonly than cereal products (92% of households; Figure 1). They were also the food most commonly consumed from home production (55% of households). The other foods were consumed by fewer than half of households. Pumpkin, okra, groundnuts, chicken, and pulses were consumed from home production by 10–22% of households.

AFFORDABILITY BY NUTRIENT

Animal-source protein: There are no animal-source foods that could provide 50% of young children's protein requirements from complementary feeding at a cost of less than 10% of adjusted food expenditure for the average household (Figure 2). Fresh fish is the lowest-cost food, but it averages 16% of adjusted food expenditure and exceeds the 10% affordability threshold for 45% of households with children aged 6–23 months in Zambia. Small dried fish, chicken, eggs, and beef are the next lowest cost animal

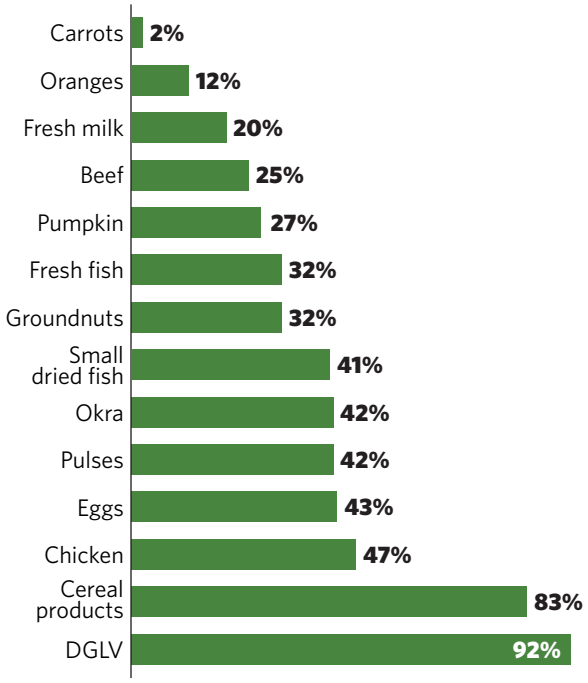

FIGURE 1. Percentage of surveyed households that had consumed selected foods in the past two weeks. Data are from 2,053 households in the 2015 LSMS.[9] DGLV = dark green leafy vegetables.

sources of protein but are even more unaffordable—they are out of reach for 61–66% of households.

Calcium: Only four foods commonly consumed by Zambian households could feasibly provide half of daily calcium requirements from complementary feeding: dark green leafy vegetables, small dried fish, fresh milk, and sour milk. All four are unaffordable, costing 28% or more of adjusted food expenditure for the average household. Dark leafy green vegetables and small dried fish are the lowest-cost options but would present substantial affordability barriers for 69–70% of households.

Folate: No foods that could meet half of folate requirements fall below the 10% threshold on average, but pulses come the closest, at 13% of adjusted food expenditure. However, pulses would be unaffordable for 35% of households. The next lowest cost foods are chicken liver, dark green leafy vegetables, and okra, but these foods present affordability barriers for 47–72% of households.

Iron: All foods that could feasibly provide half of iron requirements from complementary feeding cost at least 26% of adjusted food expenditure for the average household, making iron a largely unaffordable nutrient. Dark green leafy vegetables are the lowest-cost option, but they cost less than 10% of adjusted food expenditure for only 34% of households. Other sources of iron, such as

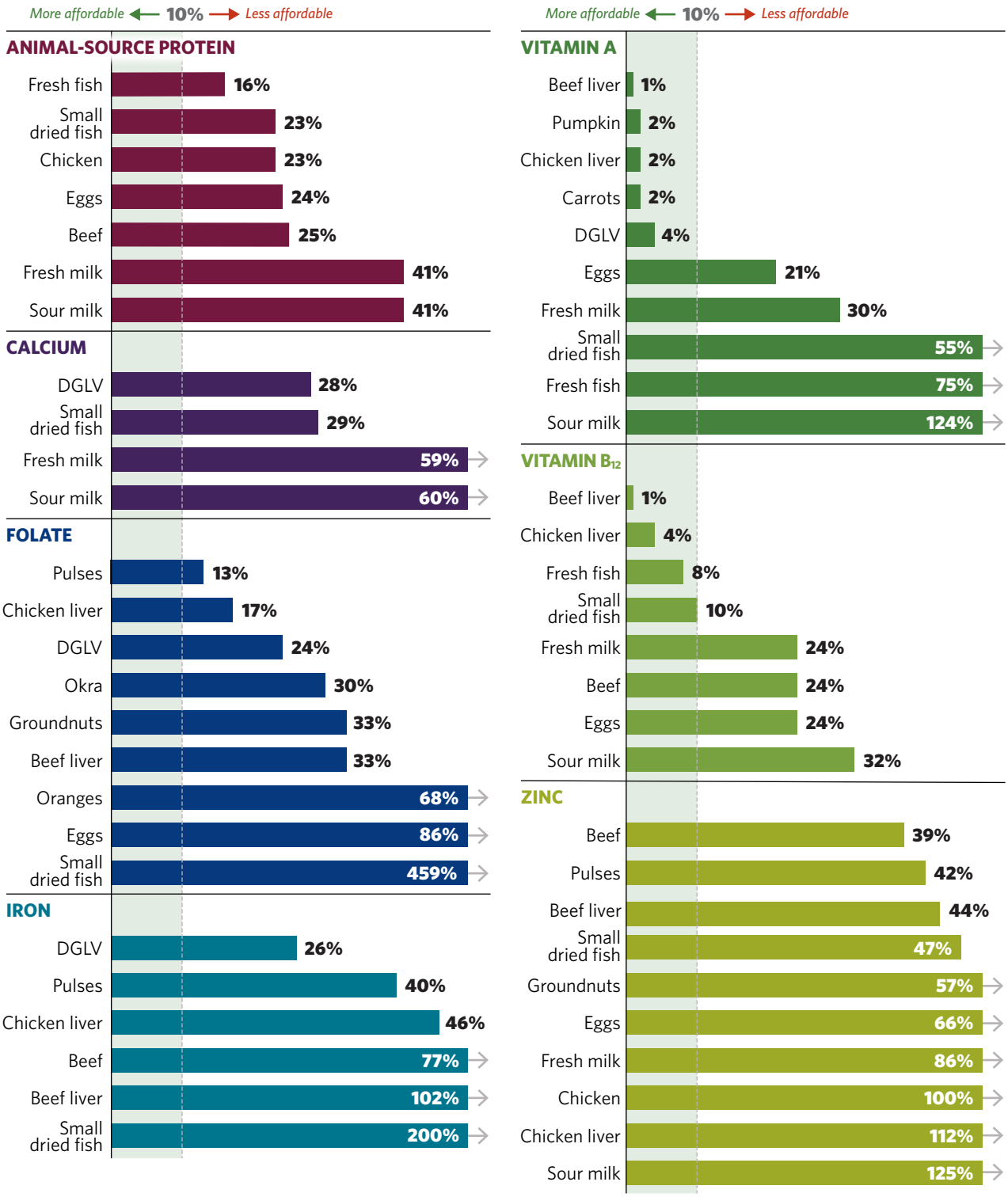

FIGURE 2. Share of food expenditures per adult equivalent needed to meet half of nutrient requirements from complementary foods. The dashed line represents the affordability threshold of 10%. Bars below the dashed line are considered affordable. Household expenditure data are from 2,053 households in the 2015 LSMS.[9] Nutrient densities are mostly from the United States Department of Agriculture food composition database as well as regional food composition tables and published literature.[12–18] Nutrient requirements from complementary foods are from Ryckman et al. (2021).[10] DGLV = dark green leafy vegetables.

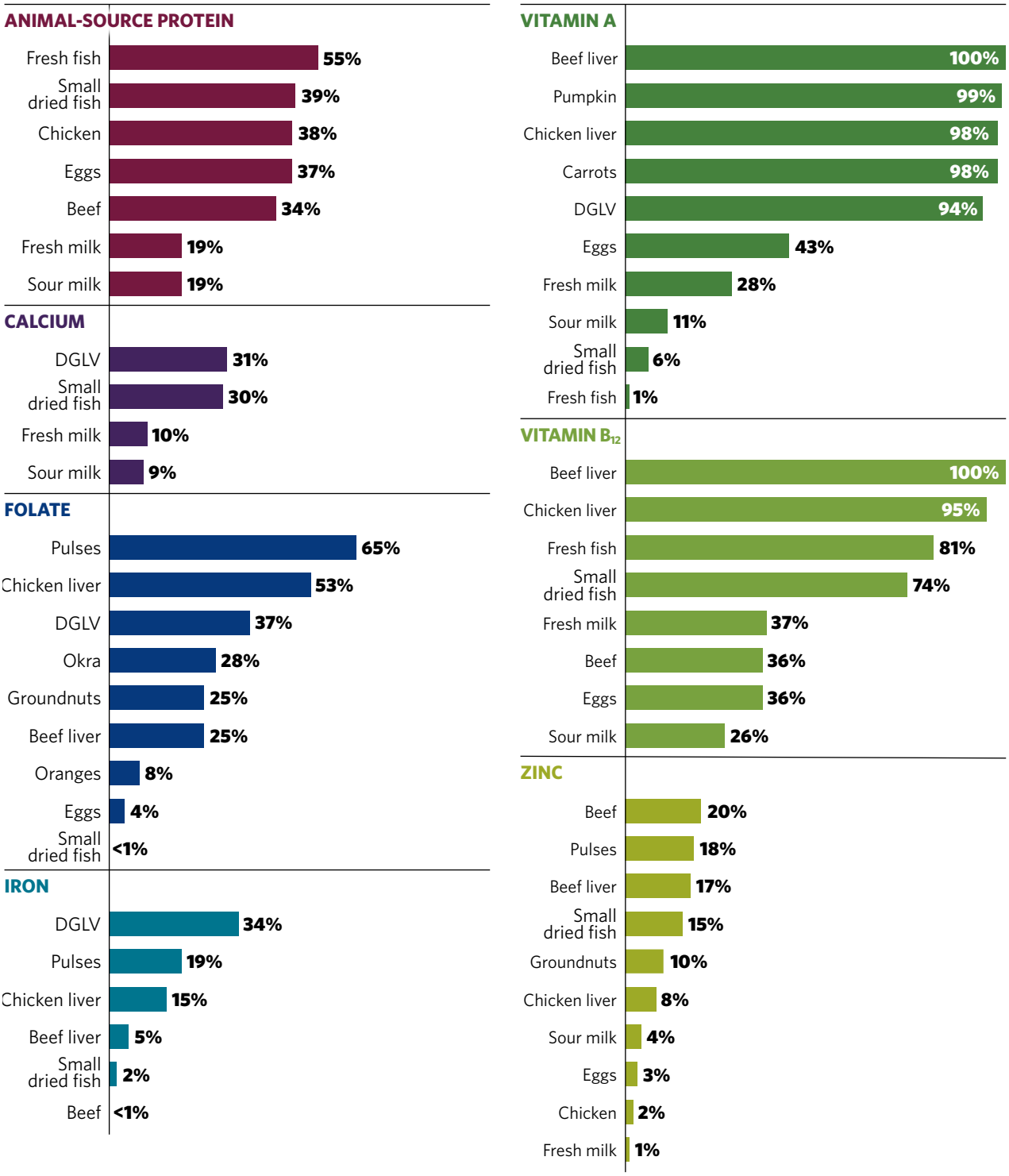

FIGURE 3. Percentage of households able to afford portion sizes meeting half of nutrient requirements from complementary foods. Foods were considered affordable if their required share of food expenditures per person was below the affordability threshold of 10%. Household expenditure data are from 2,053 households in the 2015 LSMS.[9] Nutrient densities are mostly from the United States Department of Agriculture food composition database as well as regional food composition tables and published literature.[12–18] Nutrient requirements from complementary foods are from Ryckman et al. (2021).[10] DGLV = dark green leafy vegetables.

pulses and chicken liver, are even less affordable (they are affordable for only 19% of households or fewer).

Vitamin A: Vitamin A is among the most affordable nutrients analysed. Beef liver, pumpkin, chicken liver, carrots, and dark green leafy vegetables all cost less than 4% of adjusted food expenditure for the average household. At a 10% affordability threshold, these foods are affordable for 94–100% of households. Other options to fill likely gaps in vitamin A consumption are unaffordable for most households.

Vitamin B_{12}: Vitamin B_{12} is a more affordable nutrient. Beef liver, chicken liver, fresh fish, and small dried fish all cost less than 10% of adjusted food expenditure for the average household. Beef liver is the lowest-cost option and would be affordable for all households in Zambia, based on a 10% affordability threshold. Chicken liver and fish are affordable for 74–95% of households. Other options cost substantially more.

Zinc: Zinc is the least affordable nutrient analysed. All foods that could help fill gaps in zinc consumption cost at least 39% of food expenditure on average. Beef is the lowest-cost option, followed by pulses, beef liver, and small dried fish. However, these foods exceed 10% of adjusted food expenditure for more than four in five households.

AFFORDABILITY ACROSS MULTIPLE MICRONUTRIENTS

When foods are assessed based on their contributions to all six micronutrients jointly, the most affordable foods are beef liver, chicken liver, dark green leafy vegetables, and small dried fish (Figure 4). Liver is also the most affordable food to meet vitamin A and vitamin B_{12} needs, dark green leafy vegetables were the most affordable food to meet calcium and iron needs (and are also an affordable source of vitamin A), and small dried fish were among the most affordable sources of protein and calcium. Animal-source foods tend to have higher densities of more nutrients, illustrated by the fact that only two plant-source foods (dark green leafy vegetables and groundnuts) were included in this analysis, since portion sizes of 100 g or less of these two foods could achieve an average of one-third of micronutrient requirements.

DIETARY ENERGY AFFORDABILITY

All nutritious foods in the analysis cost at least four times as much as maize flour, a low-cost but nutrient-poor staple (Figure 5). This finding illustrates the challenges many households may face in shifting expenditure toward more nutritious foods. Plant-source foods—groundnuts and

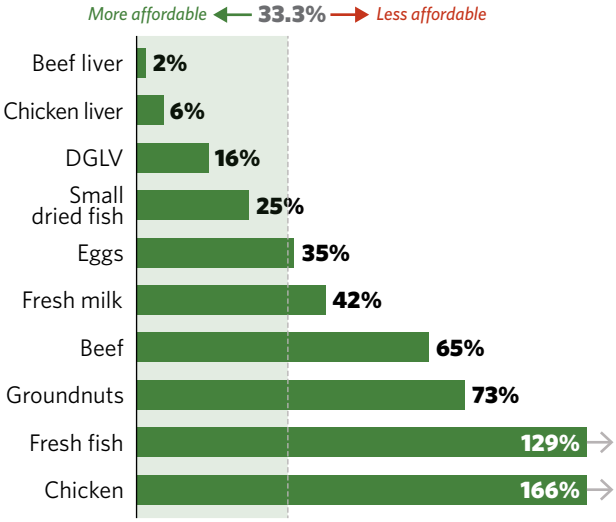

FIGURE 4. Share of food expenditures per person needed to provide an average of one-third of a young child's requirements for iron, vitamin A, zinc, folate, vitamin B_{12}, and calcium. The affordability threshold (dashed line) was set at one-third (33.3%) of food expenditures because this analysis is 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 2,053 households in the 2015 LSMS.[9] Nutrient densities are mostly from the United States Department of Agriculture food composition database as well as regional food composition tables and published literature.[12–18] Nutrient requirements from complementary foods are from Ryckman et al. (2021).[10] DGLV = dark green leafy vegetables.

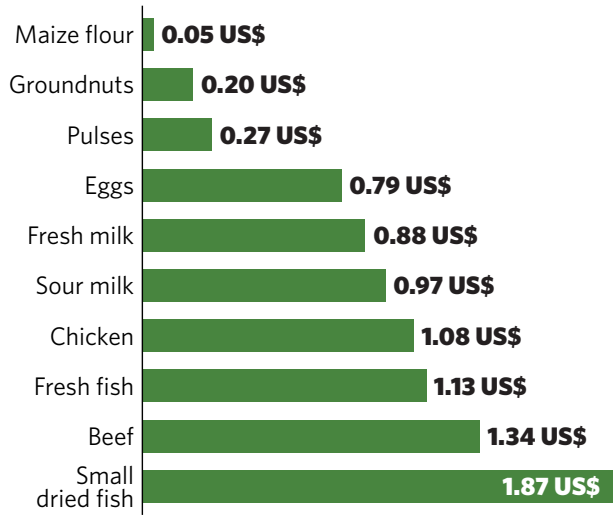

FIGURE 5. Cost of daily dietary energy requirements from complementary foods (450 kilocalories). Price data are from the Zambia Central Statistical Office.[19] Dietary energy densities are mostly from the United States Department of Agriculture food composition database as well as regional food composition tables and published literature.[12–18] The cost of 450 kilocalories is shown because this is the average daily dietary energy requirement for a child aged 6–23 months.

pulses—are the lowest-cost nutritious sources of energy. Eggs and fresh milk are the lowest-cost animal-source foods, but they cost three to four times more than plant-source foods. Fish (small dried and fresh) is among the most expensive foods per kilocalorie, even though fish was found to be among the more affordable sources of several micronutrients (protein, calcium, vitamin B_{12}).

CONCLUSIONS

Food unaffordability is a major barrier to the consumption of several nutrients among children of complementary feeding age in Zambia. Between 30% and 80% of households in Zambia cannot affordably fill their young children's requirements from complementary feeding of zinc, calcium, iron, animal-source protein, and folate. Several nutrients—particularly zinc, as well as calcium and iron—are so unaffordable that small declines in prices or increases in income are unlikely to impact nutrient gaps. For these nutrients, reducing gaps in consumption will likely require alternative approaches, such as supplementation, fortification, or biofortification, or safety net programmes that provide these foods for free or with substantial subsidies.

Although unaffordable, dark green leafy vegetables are among the lowest-cost options for meeting iron, calcium, and folate requirements (they are also an affordable source of vitamin A and of several micronutrients in combination). Nearly all households in Zambia—92%—consume dark green leafy vegetables, and 55% of households consume dark green leafy vegetables that they grow themselves. Thus it is possible nutrient requirements could be met through existing consumption. However, given that gaps in these nutrients persist, interventions may be needed to encourage households to feed dark green leafy vegetables to young children. Programmes to encourage or boost existing production of leafy greens could also help.

Declines in the prices of fresh or small dried fish (protein) and pulses (folate) may help more households access these nutrients for young children. Pulses are another food that could feasibly be attained from households' own production, and all three foods are currently consumed by 32–42% of households. Small dried fish are also among the most affordable foods to meet calcium needs and to address gaps in the consumption of multiple micronutrients jointly. Safety net and income-boosting interventions could also help increase the affordability of animal-source protein and folate.

While dietary gaps in vitamins A and B_{12} persist, they are not due primarily to unaffordability: all households can afford enough foods rich in these nutrients to meet more than half of daily requirements. Instead, interventions to generate demand focused on complementary feeding may be needed. In addition to focusing on dark green leafy vegetables, more research is needed on current consumption and acceptability of liver as a complementary food, since liver consumption was not tracked in the survey data. Beef and chicken liver were also affordable foods in the joint micronutrient analysis, and chicken liver was the second most affordable food to meet folate needs.

Zambian households face among the greatest affordability barriers of all countries in Eastern and Southern Africa for which this analysis was conducted.[10] One of the drivers of this distinction is that in Zambia low-resource households spend less, as a share of food spending by average households, than low-resource households in other countries, implying that Zambian low-resource households have far fewer resources for shifting consumption to more nutritious foods than low-resource households in other countries. Addressing the many nutrient gaps among children of complementary feeding age will likely require a package of interventions focusing on markets, production, household income, and demand.

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