

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

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For more details and full sources, see the following article from which this brief is drawn:

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KEY MESSAGES

- Several foods commonly available to households in Pakistan are rich in nutrients lacking in the diets of young children. Among these foods, there is at least one option available to affordably meet half of children's needs for vitamin A, vitamin B₁₂, folate, calcium, animal-source protein, and iron.
- While dietary gaps in vitamin A, vitamin B₁₂, and folate persist, unaffordability is probably not the main culprit: even households that spend very little on food can afford liver (which supplies all three nutrients), dark green leafy vegetables (vitamin A and folate), carrots (vitamin A), or fish (vitamin B₁₂) in large enough quantities to meet 100% of the nutrient needs of young children.
- Dark leafy green vegetables are an affordable option for meeting iron and calcium needs, and for most households they are the only affordable option. About 5–10% of the lowest-resource households may struggle to meet children's iron needs through dark green leafy vegetables. Efforts to increase the desirability and acceptability of dark green leafy vegetables, as well as price reductions and production of these vegetables by households themselves, could potentially address several nutrient gaps.
- Dark green leafy vegetables were also an affordable food when all six micronutrients were considered jointly. The remaining affordable foods in this joint nutrient analysis were all animal-source foods, including liver, milk, eggs, and beef.
- Fresh fish, eggs, and chicken are the lowest-cost animal sources of protein but are unaffordable for 10–25% of households. At least 10% of households consume eggs and dairy that they themselves produce, and production-related interventions focused on egg and dairy could thus hold promise.
- Zinc is by far the least affordable nutrient, and a combination of interventions such as fortification, biofortification, safety net programmes like cash transfers and food subsidies, and market-based interventions to reduce the prices of the lowest-cost foods (pulses, beef, beef liver) will likely be required to address gaps in zinc consumption.

WHY DOES AFFORDABILITY OF COMPLEMENTARY FOODS MATTER IN PAKISTAN?

Pakistan is a lower-middle-income country with a per capita gross national income of \$1,580 and a population of approximately 217 million people, making it the sixth most populous country in the world.^{1–3} Pakistan has experienced steady and increasing economic growth rates in recent years: greater than 2% from 2013 to 2018 and greater than 3% from 2016 to 2018.² While the role of the agriculture sector has declined over time, making up only 24% of GDP and 42% of the labour force, growth in this sector reached almost 4% in 2018.^{4,5} Despite high levels of agricultural production, food insecurity and lack of dietary diversity remain major problems, especially in less-developed rural areas.^{6,7} Among children under age five, 38% are stunted and 7% are wasted, and only 21% of children aged 6–23 months consume an adequately diverse diet.⁸

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 B₁₂, and

animal-source protein, and these shortfalls hinder their growth and development.^{9,10} 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 and price data estimated from Pakistan's 2015–2016 Household Integrated Economic Survey (HIES),¹¹ we benchmarked the cost of foods that could meet nutrient requirements against current household food expenditures to assess affordability, using a previously developed method.¹² 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 B₁₂ for their children aged 6–23 months through specific foods. These foods were chosen because of their nutrient content and

availability in Pakistan. 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.¹³ 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.¹² 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).¹²

HOUSEHOLD FOOD EXPENDITURE AND CONSUMPTION PATTERNS

On average, households in Pakistan with children aged 6–23 months allocated 47% of expenditures toward food (that is, the total value of food consumption from purchases, home production, and in-kind sources). In the two weeks before the survey, 98–100% of households had consumed cereal products, dairy products, vegetables, roots and tubers, and pulses; 92% of households had consumed meat, fish, and eggs; and 84% of households had consumed fruit. On average, 46% of household expenditure was allocated to two food groups: cereal products and dairy products. Just 8–9% of food expenditure went toward vegetables and meat, fish, and eggs, while 2–3% of expenditure was allocated to fruit, roots and tubers, and pulses.

Of the specific nutritious foods chosen for this analysis as options to meet one or more nutrient gaps, pulses and fresh milk were consumed by the most households: 98% and 93%, respectively (Figure 1). The next most commonly consumed foods were chicken (72%), eggs (68%), and dark green leafy vegetables (52%). The remaining foods analysed here were consumed by 14–39% of

households. Only a few foods were consumed from home production by 10% or more of households: milk (30%), yogurt (12%), and eggs (10%).

AFFORDABILITY BY NUTRIENT

Animal-source protein: Most animal-source foods analysed could meet half of children’s protein needs from complementary feeding for less than 10% of adjusted household food expenditure, on average (Figure 2). The most affordable options were fresh fish (6% of average food expenditure), chicken (8%), beef (8%), and eggs (8%), followed by milk (10%) and yogurt (12%). Fish cost less than 10% of adjusted food expenditure for 94% of households with children aged 6–23 months, while eggs, chicken, and beef fell below the 10% threshold for 75–82% of households. Milk and yogurt would be unaffordable, based on a 10% threshold, for 46–58% of households.

Calcium: Dark green leafy vegetables are the most affordable food to fill likely gaps in calcium consumption, costing less than 4% of adjusted food expenditure on average and falling below the 10% threshold for 98% of households. Milk and yogurt only slightly exceed this threshold on average, but they fall below 10% of adjusted food expenditure for only 16–24% of households, making these food much less affordable options.

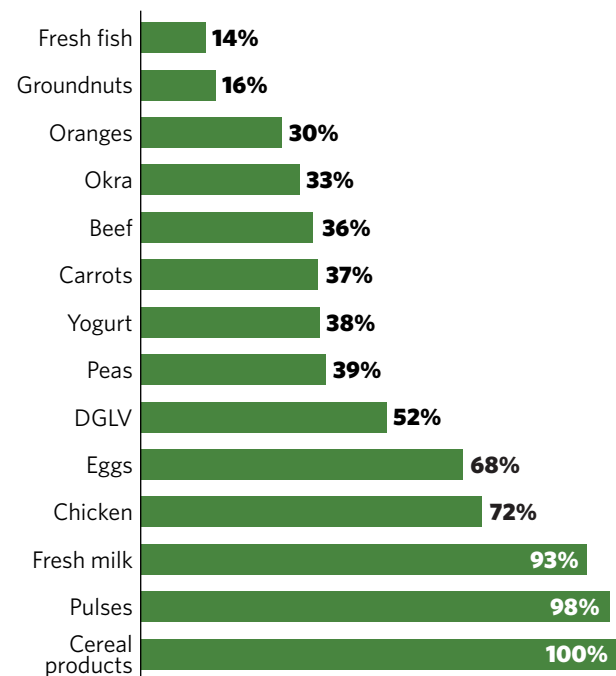


FIGURE 1. Percentage of surveyed households that had consumed selected foods in the past two weeks. Data are from 5,202 households in the 2015–16 Household Integrated Economic Survey.¹¹ DGLV = dark green leafy vegetables.

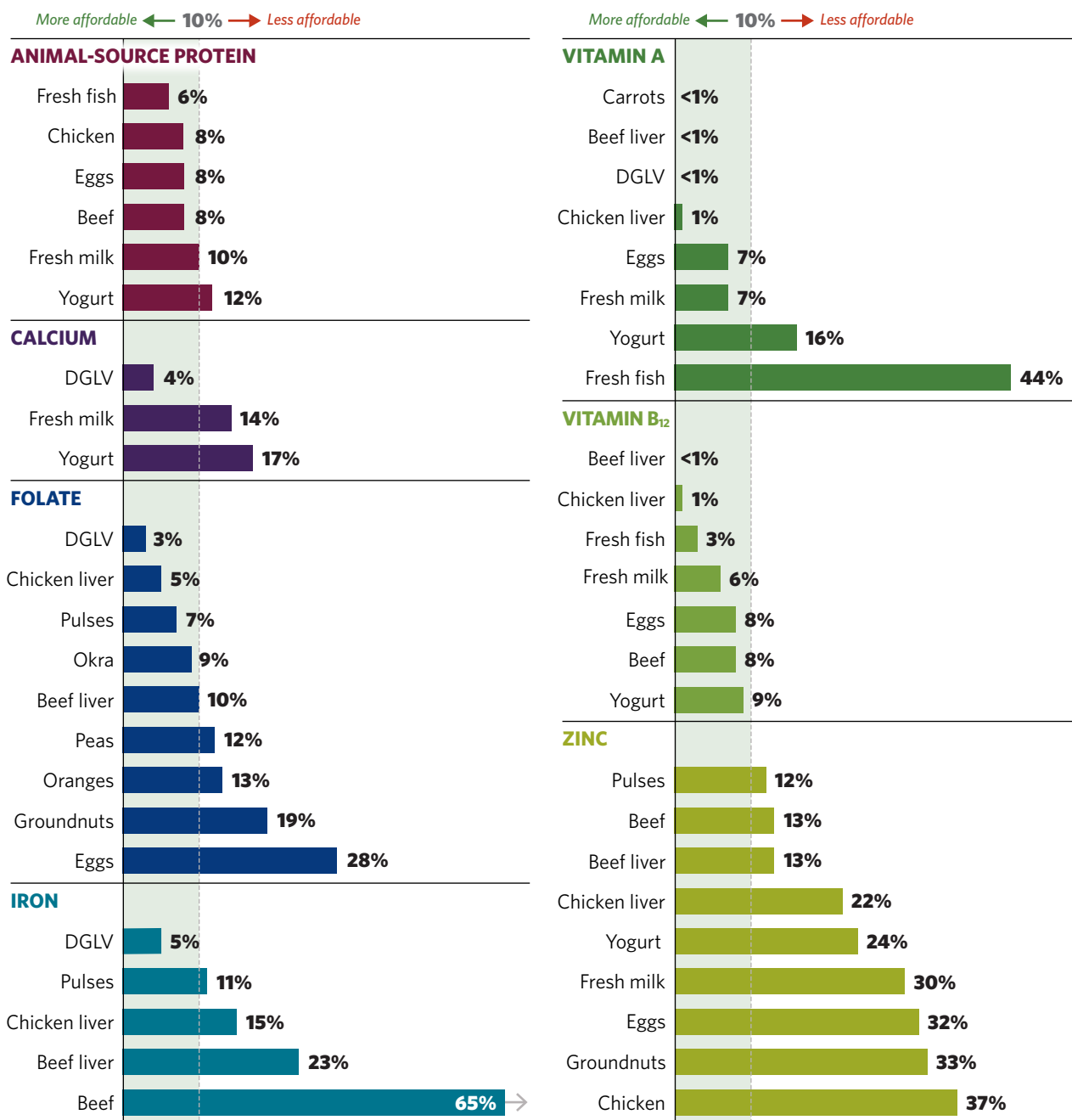


FIGURE 2. Share of food expenditures per adult equivalent needed to meet half of nutrient requirements from complementary foods. The dashed line represents the affordability threshold of 10%. Bars below the dashed line are considered affordable. Household expenditure data are from 5,202 households in the 2015-16 Household Integrated Economic Survey.¹¹ Nutrient densities are mostly from the United States Department of Agriculture food composition database as well as regional food composition tables and published studies.¹⁴⁻¹⁷ Nutrient requirements from complementary foods are from Ryckman et al. (2021).¹² DGLV = dark green leafy vegetables.

Folate: Several foods could meet half of children’s folate requirements from complementary feeding for less than 10% of adjusted food expenditure on average: dark green leafy vegetables (3% of adjusted food expenditure on average), chicken liver (5%), pulses (7%), okra (9%), and beef liver (10%). Dark green leafy vegetables and chicken liver would be affordable for 100% and 95% of households,

respectively, based on a 10% threshold, and pulses would be affordable for 86% of households. Okra and beef liver would be unaffordable for 27-38% of households.

Iron: Ninety-three per cent of households with children aged 6-23 months would need to spend less than 10% of adjusted food expenditure to obtain enough dark green

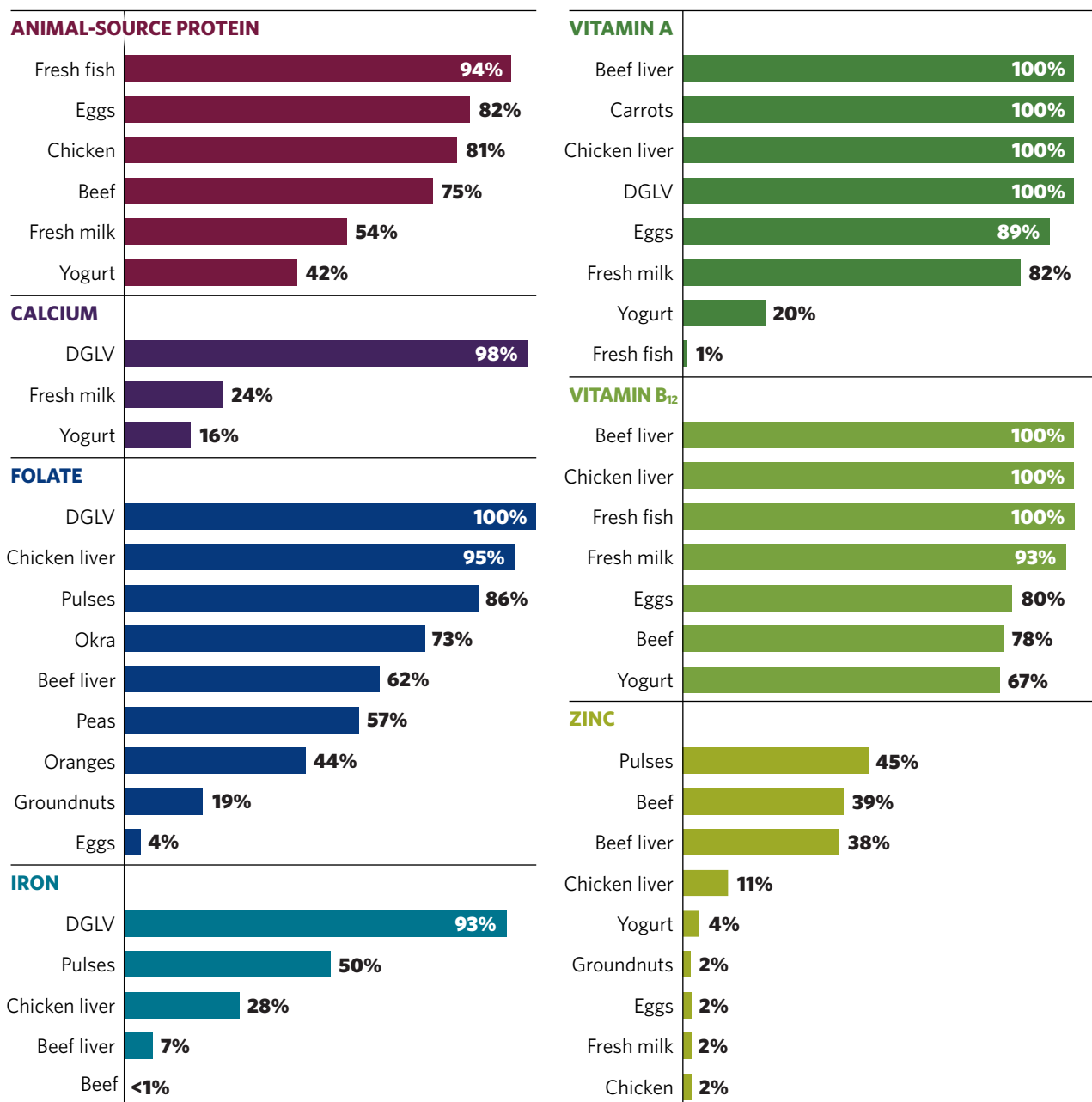


FIGURE 3. Percentage of households able to afford portion sizes meeting half of nutrient requirements from complementary foods. Foods were considered affordable if their required share of food expenditures per person was below the affordability threshold of 10%. Household expenditure data are from 5,202 households in the 2015-16 Household Integrated Economic Survey.¹¹ Nutrient densities are mostly from the United States Department of Agriculture food composition database as well as regional food composition tables and published studies.¹⁴⁻¹⁷ Nutrient requirements from complementary foods are from Ryckman et al. (2021).¹² DGLV = dark green leafy vegetables.

leafy vegetables to meet half of children’s iron needs from complementary feeding. Dark green leafy vegetables cost 5% of adjusted food expenditure for the average household. The next lowest cost options to meet iron needs are pulses (11% of adjusted food expenditure on average, but affordable for only half of households) and chicken liver (15% of adjusted food expenditure, but affordable for only 28% of households).

Vitamin A: Carrots, beef liver, dark green leafy vegetables, and chicken liver could all meet half of vitamin A requirements from complementary feeding for 1% or less of adjusted food expenditure, making them affordable options (at a 10% threshold) for 100% of households in Pakistan. Eggs and milk both cost 7% of adjusted food expenditure on average and would also be affordable for more than 80% of households.

Vitamin B₁₂: All foods analysed fall below the 10% threshold for vitamin B₁₂. The most affordable options are beef liver (<1% of adjusted food expenditure on average), chicken liver (1%), fish (3%), and milk (6%), followed by eggs (8%), beef (8%), and yogurt (9%). Liver and fish cost less than 10% of adjusted food expenditure for 100% of households, milk costs less than 10% for 93% of households, and the remaining foods would be unaffordable at this threshold for only 20–33% of households.

Zinc: Zinc is relatively unaffordable compared with the other nutrients: no foods are available that would cost less than 10% of adjusted food expenditure for the average household. The foods that come the closest to being affordable are pulses (12% of adjusted food expenditure on average), beef (13%), and beef liver (13%). However, these foods exceed 10% of adjusted food expenditure for 55–62% of households.

AFFORDABILITY ACROSS MULTIPLE MICRONUTRIENTS

In addition to being the most affordable foods to fill several single micronutrient gaps, liver and dark green leafy vegetables are also the lowest-cost foods when the densities

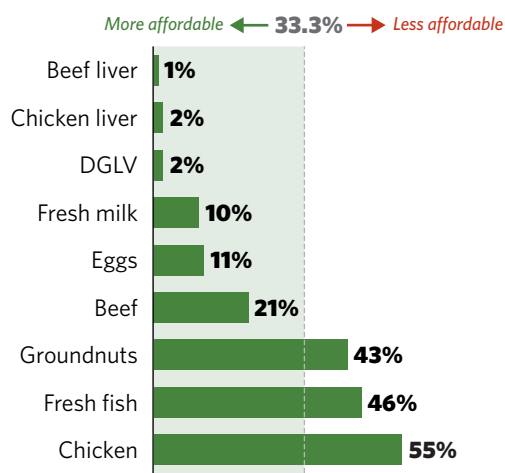


FIGURE 4. Share of food expenditures per person needed to provide an average of one-third of a young child's requirements for iron, vitamin A, zinc, folate, vitamin B₁₂, and calcium. The affordability threshold (dashed line) was set at one-third (33.3%) of food expenditures because this analysis is based 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 5,202 households in the 2015–16 Household Integrated Economic Survey.¹¹ Nutrient densities are mostly from the United States Department of Agriculture food composition database as well as regional food composition tables and published studies.^{14–17} Nutrient requirements from complementary foods are from Ryckman et al. (2021).¹² DGLV = dark green leafy vegetables.

of all six micronutrients are considered jointly (Figure 4). The next most affordable foods to achieving one-third of micronutrient requirements are milk and eggs, followed by beef. Fish is a highly affordable source of protein and vitamin B₁₂ but a relatively poor source of some of the other micronutrients considered. Dark green leafy vegetables and groundnuts were the only plant-source foods that could achieve an average of one-third of micronutrient requirements with portion sizes of less than 100 g.

DIETARY ENERGY AFFORDABILITY

All the nutritious foods analysed cost more than twice as much as rice, a low-cost but nutrient-poor staple, when only energy content is considered (Figure 5). This finding shows the challenges many households likely face in allocating resources to more nutrient-dense foods. Animal-source foods tend to be more expensive than plant-source foods (pulses and groundnuts). The lowest-cost animal-source foods per kilocalorie are fresh milk and eggs.

CONCLUSIONS

In summary, for the vast majority of households in Pakistan, multiple foods are affordable for meeting 50% of young children's daily requirements for vitamin A, for vitamin B₁₂, and for folate, whereas only a single food each is affordable for meeting requirements for iron, for calcium, and for protein. These foods include dark green leafy vegetables (vitamin A, folate, iron, calcium), liver (vitamin B₁₂, vitamin A, folate), pulses (folate; also an affordable source of iron for many households), and fish (protein). Eggs are a reasonably affordable source

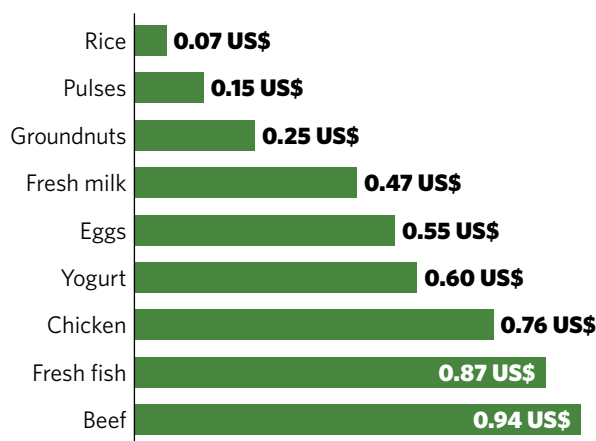


FIGURE 5. Cost of daily dietary energy requirements from complementary foods (450 kilocalories). Price data are estimated from the 2015–16 Household Integrated Economic Survey.¹¹ Dietary energy densities are mostly from the United States Department of Agriculture food composition database as well as regional food composition tables.^{14,15} The cost of 450 kilocalories is shown because this is the average daily dietary energy requirement for a child aged 6–23 months.

of protein, vitamin B₁₂, and vitamin A, and chicken is a reasonably affordable source of protein, but 15–25% of households would likely be unable to afford these foods in adequate quantities. Many of these same foods (liver, dark green leafy vegetables, eggs, milk) are the most affordable when the six micronutrients are assessed jointly. Beef was also an affordable food under this analysis.

Zinc was the least affordable nutrient analysed, with fewer than half of households able to access pulses, beef, or beef liver (the most affordable options) for less than 10% of adjusted food expenditure. Efforts to reduce prices or enhance household production of pulses (currently only 3% of households consume pulses they have produced themselves), or alternatives such as fortification, bio-fortification, or social safety net programmes, will likely be needed to reduce gaps in zinc consumption among children of complementary feeding age.

Two other analyses recently assessed the affordability of cost-optimized diets in Pakistan.^{18,19} Although results varied between the two studies, at least one included dark green leafy vegetables, orange-fleshed vegetables, and pulses as relatively low-cost foods in the cost-optimized diets for most households; these foods were also identified as affordable sources of several nutrients here. Fish, milk, or eggs were often included in the cost-optimized diets, with some regional variation, but were among the most expensive foods included. These results are consistent with our findings that these foods cost more than plant-source foods but tend to be among the most affordable sources of particular nutrients—especially those that require animal-source foods (vitamin B₁₂ and animal-source protein). Some differences in findings between the two analyses and this brief may be due to differences in the range of foods analysed, age groups considered, and data sources.*

Interventions and future research could also focus on dark leafy green vegetables, which are an affordable source of several micronutrients. Only half of households consume dark green leafy vegetables, and only 3% of households consume dark leafy greens from their own production. Communication interventions may be needed to improve knowledge and encourage more consumption and adequate preparation of dark leafy greens, especially for young children. Prices of (and access to) dark leafy greens may also vary seasonally,¹² as well as subnationally.

* The cost-of-diet analyses differ from this brief in that they aim to identify a lowest-cost complete diet to meet nutrient needs or dietary guidelines for all household members while this brief focuses on specific nutrients and foods only for children under age two. In contrast to this brief, the cost-of-diet studies did not include liver but did consider plant-source foods to meet protein needs. Whereas this brief excluded grains such as millet and sorghum, both cost-of-diet studies found them to be affordable sources of several nutrients and included them in the cost-optimized diets. One of the two cost-of-diet studies presented results stratified by age group and identified iron and calcium as limiting nutrients for children under age two that could present affordability challenges. However, that study also found that vitamin A and vitamin B₁₂ were limiting nutrients while zinc was not, in contrast with the findings of this brief. Finally, the cost-of-diet studies included the use of different price and nutrient composition data from those used by this brief.

Eggs and dairy were the foods most likely to be consumed from households' own production, but they often cost more than plant-source alternatives for a given nutrient. Interventions to expand home production of these foods could offer low-resource households an alternative path to accessing important and nutrient-rich animal-source foods, although they may need to be paired with interventions to increase households' knowledge of the nutritional value of these foods for young children. Fish were the most affordable animal-source food for meeting protein needs, but consumption and availability likely vary substantially across Pakistan.

In addition to exploring the suggested policy interventions, future research could focus on food acceptability, including habits and preferences, for young children. For example, liver was an affordable source of several micronutrients, both individually and jointly, but there were no data on current liver consumption levels. Other research shows that the acceptability of some foods, such as eggs, for complementary feeding varies regionally in Pakistan.²⁰ More research is needed on the potential for interventions to address any acceptability barriers to the most affordable foods identified in this analysis.

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