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Research

The trends and effects of food price inflation on the cost and affordability of nutritionally adequate diets in Malawi

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Background

Global challenges of hunger, food insecurity, and malnutrition persist, with nearly one in three people lacking sufficient food access. The COVID-19 pandemic exacerbated these issues, particularly in Africa, where 59.6% of the population grapples with food insecurity. Malawi faces high stunting and anaemia rates in children, driven by poverty, inadequate health services, and improper diet. Despite progress, the prevalence remains above regional averages. Research reveals imbalanced diets in Malawi, primarily reliant on maize, risking micronutrient deficiencies. This study examines diet affordability in the context of rising costs and low incomes, aiming to influence policy in addressing undernutrition in Malawi and highlighting the overlooked role of affordability in nutrition access.

Objectives

This assessment aimed to estimate the minimum cost of a nutritious diet using locally available and culturally acceptable food items in Malawi. The objective was to explore how economic constraints affect Malawian households, particularly the poor and ultra-poor, in accessing such diets. Additionally, it sought answers to questions about cost changes over 12 months and affordability among different wealth groups in the country.

Methods

This study involved secondary data analysis by employing the Cost of the Diet (CotD) research method and software. The World Food Programme's Minimum Expenditure Basket (MEB) provided monthly food prices for 28 items from April 2021 to March 2022. Comparing the cost of a nutritious diet with per capita income from the Malawi Poverty Report, we estimated the affordability gap. Food price data was from 77 markets in 25 districts, ensuring national representation.

Results

The annual cost of a culturally acceptable nutritious diet for a five-person household from April 2021 to March 2022 was MWK 84,658/month (≈$103). The diet's cost increased by 25% during the period, from MWK 2,519 to MWK 3,140 per day. Only average urban households had sufficient income to afford the diet, with a 9.7% surplus. Ultra-poor, poor, rural, and average Malawian households faced affordability gaps of 139.5%, 61.4%, 48.5%, and 32%, respectively. Closing the affordability gap would require additional monthly income of 29,134 kwacha (≈$35.5) for an average Malawian household, 37,481 kwacha for a typical rural household, 42,452 kwacha for a poor household, and 58,885 kwacha for an ultra-poor household.

Conclusion

The CotD assessment revealed a significant increase in the cost of a nutritious diet over the past 12 months. Most of the population cannot afford the cheapest nutritious diet.

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The recent currency devaluation may worsen the situation. Cash, voucher or food distribution could help close the affordability gap for poor and ultra-poor households. Regular monitoring and ongoing updates of the CotD results are necessary for informed decision-making.

BACKGROUND

Hunger, food insecurity, and malnutrition persist as formidable global challenges, despite concerted efforts to address them. In 2020, the United Nations Food and Agriculture Organization (FAO) revealed that almost one in three people worldwide, a staggering 2.37 billion individuals, lacked access to sufficient food, and the repercussions were stark, with 768 million people experiencing undernourishment in 2021 (FAO et al. 2021). The State of Food Security and Nutrition in the World report underscored a troubling reality – the cost of healthy diets, combined with stubbornly high-income inequality levels, rendered these diets unattainable for approximately 3 billion individuals, particularly those living in poverty. The COVID-19 pandemic further compounding the crisis, exacerbating food insecurity and pushing millions more into hunger. Among the world's regions, Africa bears the heaviest burden, with 59.6% of its population grappling with moderate to severe food insecurity. Hunger in Africa has been on an upward trajectory since 2010, with a sharp escalation across all subregions in 2020, followed by a more gradual increase in 2021 (FAO et al. 2021, 2023). The latest FAO report projects a reduction in hunger and undernutrition in Asia by 2030, a relatively stable situation in Latin America and the Caribbean, but a significant increase in Africa (FAO et al. 2023).

Malawi has made notable progress since 2000 in terms of reducing hunger and undernutrition (Bernstein and Wiesmann 2019); however, they remain a significant problem. The stunting rates have fallen in Malawi over the past two decades from 54.6% in 2000 to 37.1% in 2018 (Bernstein and Wiesmann 2019; Clara Chikhungu 2022); the prevalence is still high and well over the regional average of 29% in Southern Africa (NSO and ICF 2017; UNICEF, WHO, and The World Bank Group 2019). In addition, one in every four cases of young child mortality in Malawi is linked to undernutrition and nearly two out of three children under five years old suffer from anaemia (NSO and ICF 2017; UNICEF 2018). While there can be many reasons in a country for the high burden of malnutrition, widespread poverty, nutritionally poor diet, infectious diseases, and over-dependence on maize as a staple food are the predominant underlying causes of malnutrition in Malawi (UNICEF 2018).

Malawi, a small landlocked low-income country in South-Eastern Africa, has a population of 19.1 million and ranks 146th out of 162 countries in terms of progress toward meeting the United Nation's Sustainable Development Goals (SDG) (FAO 2022b; Sachs et al. 2019). The SDG report also highlighted that about 70% of the population lives below the international poverty line (i.e., USD 1.90 per day). However, the national poverty line in Malawi is set at the far lower USD 0.61 per person per day (calculated using the average exchange range for August 2020, 744.1774 MWK for each USD), and according to the government estimates, more than half of the population lived below that poverty line in 2020 (NSO 2021). According to the latest Malawi Chronic Food Insecurity analysis, conducted in February 2022, as a result of both poverty and recurrent shocks (particularly floods and droughts), nearly 5.4 million people are facing moderate to severe food insecurity and hunger, and another 4.4 million are facing mild food insecurity (FAO 2022b). The 80% of Malawians who depend on smallholder and subsistence farming are particularly vulnerable to these climactic shocks and lack resilience (FAO 2022b; USAID 2021).

Recent research reveals that the majority of Malawian diets are deficient in overall quality. They lack sufficient quantity and lack representation from all recommended food groups, increasing the risk of micronutrient deficiencies (Schneider 2021). These diets are notably imbalanced, with a predominant reliance on maize for energy, resulting in excessive carbohydrate intake and insufficient intake of lipids, riboflavin, and vitamin B12 (Gelli et al. 2020; Schneider 2021).

It is evident that ensuring an adequate diet and improving nutritional intake is a pressing need and critical to reducing the burden of undernutrition in Malawi. This can only be possible with the availability and access (both physical and economic) to enough food of adequate quality to meet the nutritional requirements. However, the World Food Programme's (WFP) Minimum Expenditure Basket (MEB) monitoring system reported that households' minimum survival expenditures continued to rise across the country during the Covid-19 pandemic period and afterwards (WFP 2022a). The MEB monitoring system also reported that the average price of staple food items such as maize, rice and cassava continued to trend higher than the previous quarter throughout 2021 and early 2022. During the same period, the labour demand and wage rates remained below the normal range due to lower crop production compared to the previous two years, resulting in poor and very-poor families having very little cash income to spend on their food and non-food needs (FEWS NET 2022).

While global efforts focus on enhancing diets, affordability's role in nutrition access remains overlooked. Poverty lines determine grant access criteria, and basic plate costs inform food aid values. However, the impact of the lack of affordability of essential nutrients on the establishment of benchmarks or standards at the national level remains largely unexplored (Bwanaisa and Hendriks 2023). Hence, this Malawi-based study examines diet cost, level of affordability, impact of inflation, and affordability gap aiming to influence benchmarks and policy.

AIMS AND OBJECTIVES

This assessment aimed to estimate the minimum cost of a nutritious diet based on a selected list of locally available

and culturally acceptable food items in Malawi and the degree to which economic constraints might affect an average Malawian household (especially the poor[1], ultra-poor[2] households). Specifically, the study set out to answer the following questions:

a) What is the minimum cost of a nutritionally adequate and culturally acceptable diet for typical households in Malawi?
b) How has the cost of a nutritious diet changed within the past 12 months between April 2021 and March 2022?
c) What is the level of affordability of a nutritious diet by different wealth groups in Malawi?

METHODS

This study employed the Cost of the Diet (CotD) research method and CotD research software. The CotD method and software were developed by Save the Children to estimate the cost of a nutritious diet in different contexts (Save the Children and Food Economy Group (FEG) 2020). The study involves the use of linear programming, drawing on three quantitative datasets (food composition tables, individual nutritional specifications, and food price data), combined with qualitative data on local dietary preferences to calculate the hypothetical minimum amount of money a typical household would need to purchase their recommended intakes of energy, protein, fat, and micronutrients, using locally available foods (Deptford et al. 2017). The version of the CotD software that was used for this study, was menu driven and applied a set of liner optimisation routines to select locally available foods to meet these nutrient requirements at the lowest possible cost (Deptford et al. 2017; Rana 2022b).

This study did not involve any primary data collection, and was completed by sourcing and analysing secondary data. In terms of data sourcing, the nutrient requirement of individuals and households are publicly available information shared by the World Health Organisation (WHO) and the Food and Agriculture Organisation (FAO) of the United Nations, and are built into the CotD software. The nutrient values of different food items (i.e. food composition) are also published information in the form of national and regional 'Food Composition Tables/Databases' (Deptford et al. 2017; FAO 2022a) and are built into the CotD software. The food price and availability data were sourced from WFP's Minimum Expenditure Basket (MEB) (WFP 2020). In Malawi, the WFP regularly monitors food prices through the MEB, which includes 28 different food items (WFP 2022a, 2022b). These items encompass a variety of categories, including four grains and grain-based products (maize, millet, rice, sorghum), three types of roots and tubers (cassava, potato, sweet potato), three types of legumes, nuts, and seeds (white bean, cowpea, pigeon pea), five types of fish, seafood, amphibians, and invertebrates (*Bonya, Kapenta, Matemba, Usipa Wowuma, Utaka*), chicken Eggs, 10 different vegetables (Chinese cabbage, blackjack leaf, rape leaf, onion tuber, amaranth, cowpea leaf, green snap bean leaf, pumpkin leaf, mustard leaf, tomato), as well as vegetable oil and sugar. For this CotD study, the monthly food price of these food items between April 2021 and March 2022 from 77 markets in 25 districts was included.

For the affordability analysis, the average income/expenditure for different household types was taken from the latest Malawi Poverty Report (NSO 2021). The report presented average annual per capita consumption for various household types in Malawi, which we used as a proxy indicator of income. It was then used to calculate a five-member household's average annual household income. We used the poverty lines defined in the poverty report to estimate the income of ultra-poor (total consumption below MWK 101, 293 per person per year) and poor (total consumption below MWK 165, 879 per person per year) households (NSO 2021). The Malawi Poverty Report used the 64,586 Kwacha, per person per year as the non-food cost in the calculation of non-food poverty line, which is 38.9% of the national poverty line. We used this proportion to estimate the non-food expenditure.

The Cost of the Diet analysis is primarily based on a typical family or household. For the purpose of this assessment, an average household size of five was used (NSO and ICF 2017), based on the HEA/CotD standard five-member family (Rana 2022b) that contains a man, a woman, and 3 children including one child below 23 months. The detailed composition of the family is given in Table 1.

During data analysis, this study employed the Cost of the Diet (CotD) software, version 2.5.2, to estimate the cost of different diets that would meet the nutritional requirements of all the household members. The CotD software uses a linear optimisation routine to identify the most cost-effective combination of foods that fulfilled the recommended nutrient intake for the study population (Rana 2022b). This article will discuss two diets: (i) Energy-Only Diet or EO Diet, and (ii) Food Habit Nutritious Diet or FHAB Diet. The EO diet consists of food items that fulfil only the average energy needs of a family, aiming to minimize costs. However, the FHAB diet represents a culturally acceptable and nutritionally balanced dietary plan, taking into account the customary dietary habits in the assessed region, as well as the macro and micronutrient requirements for all fam-

1 If an individual's total expenditure falls beneath the poverty line, they are categorised as **poor**. The poverty line encompasses the expenses for fulfilling essential nutritional needs (referred to as the food poverty line) as well as provisions for other fundamental necessities (known as the non-food poverty line) (NSO 2021).

2 An individual with consumption below the food poverty line is termed **ultra-poor**. The food poverty line is computed as the cost per calorie multiplied by the daily caloric requirement per capita (set at 2215 kcal) (NSO 2021).

Table 1. The size and composition of the typical household/family used for the CotD analysis

Household member (type)	Kcal per day
1 x Child (either sex) 12-23 months	894
1 x Child (either sex) 9-10 years	1,913
1 x Child (either sex) 11-12 years	2,250
1 x Man, 30-59y, 50 kg, moderately active	2,740
1 x Woman, 30-59y, 45 kg, moderately active (1 x Lactation, 7-12 months)	2,718
Total Energy Requirement of the family/ household	10,515

ily members, also kept to the lowest possible cost. When the cost of diets is represented in USD, the conversion was conducted using a rate of 821.642 MWK per USD (the rate prevalent on May 11th, 2022).

While estimating the EO diet, the CotD software computed a list of food that meets only the average energy requirements of the selected family at the lowest possible cost. In contrast, the FHAB diet was calculated to meet the recommended intakes for energy, protein, fat as well as nine vitamins (Vitamin A, Vitamin C, Thiamine/Vitamin B1, Riboflavin/Vitamin B2, Niacin/Vitamin B3, Pantothenic acid/Vitamin B5, Pyridoxine/Vitamin B6, Folic Acid, Cobalamin/Vitamin B12) and four minerals (Calcium, Iron, Magnesium, Zinc) for all the family members at the lowest possible cost (Dash et al. 2022; Rana 2019, 2022b, 2022c, 2022a). Calculating the FHAB diet also involved considering the staple food, foods commonly consumed, and food taboos to reflect the typical dietary patterns.

Ethical Considerations and approvals: This study primarily relied on secondary data. The monthly food price data were obtained from the World Food Programme (WFP), and the average income/expenditure for different household types was taken from the latest Malawi Poverty Report published in August 2021. During both cases, data were de-identified before the research team received it; it was reasonably presumed that study subjects' consent was obtained, and the outcome of our study analysis did not allow re-identifying participants.

RESULTS

COST OF THE DIETS AND CHANGE OVER TIME

The lowest cost diet for a standard five-person household in Malawi, which only meets their energy requirements, ranges from MWK 426 (≈$0.5) in May-July 2021 to MWK 639 (≈$0.8) per day in Jan-March 2022 (see *Figure 1*). Compared to the beginning of the study period in April 2021, the cost of the EO diet has increased by 30% by the end of the year. The annual cost of the EO diet for the whole household was MWK 187,738.

Within the household (Table 2), the cost of the diet of a child aged 12-23 months was 8,726 kwacha per year, and the annual cost of an EO diet for a breastfeeding mother was 56,441 kwacha, MWK 7,677 higher than the adult male family member. During the calculation of the EO diet, the software considered breastmilk to be the exclusive source of energy for children below two years old. For the other household members, it identified only maize and sorghum to fulfil their energy requirements.

The FHAB diet was derived by utilizing 'prices and portions' constraints during analysis and incorporating information about a typical household's dietary practices. This diet identified the lowest cost way for a typical family to meet the specified macro and micronutrient requirements using all available market foods (in this case, 28 food items).

The daily cost of the FHAB diet for a standard five-person HH in Malawi ranges from MWK 2,377 (≈$2.9) to MWK 3,323 (≈$4.0) per day (see *Figure 2*). Compared to the beginning of the study period in April 2021, the cost of the FHAB diet had increased by 25% by the end of the year. The annual cost of the FHAB diet for the whole household was MWK 1,015,893. The software designed the FHAB diet using 19 food items, with breastmilk included for children under two years. The other food items incorporated in the diet were: maize, cassava, rice, sorghum, sweet potatoes, amaranth leaf, cowpea leaf, *Khwanya* leaf, blackjack leaf, pumpkin leaf, mustard leaf, rape leaf, Chinese cabbage, *Bonya* fish, onion, tomatoes, chicken eggs, and vegetable oil.

Within the household (*Table 3*), the cost of the diet of a child aged 12-23 months was 55,041 kwacha per year, and the annual cost of an FHAB diet for a breastfeeding mother was 295,619 kwacha. The cost of the FHAB diet for an adult man was lower than the breastfeeding women and the adolescent children (i.e. 11-12 years old).

AFFORDABILITY OF DIETS AND THE AFFORDABILITY GAP

To assess affordability, the total household income was subtracted from the combined cost of the FHAB diet and non-food expenditure. The study estimated the affordability of the diets for five distinct income groups or household types: (i) ultra-poor households with income below the food poverty line, (ii) poor households with income below the national poverty line, (iii) rural households, (iv) urban households, and (v) typical Malawian households.

As depicted in *Figure 3*, the average annual income of a five-member household in Malawi was 1,091,110 Malawian Kwacha (USD 1,328). The urban households showed significantly higher income levels compared to rural households, while households below the poverty line, namely the poor and ultra-poor households, reported annual incomes of 829,395 Kwacha and 506,465 Kwacha, respectively.

Figure 4 presents the disparities between estimated income and expenditure for five different household types with varying levels of income and non-food expenditure. The affordability gap in this stacked bar chart is depicted as a percentage of the total household income. Only when the height of the stacked bars is at or below the 100% threshold can the household can afford both the nutritious diet and non-food expenses. Among the household types, only av-



Figure 1. Change in the daily cost of an energy-only (EO) diet for the standard five-person family in Malawi between April 2021 and March 2022

Table 2. The lowest annual cost of an energy-only (EO) diet for the standard five-person family in Malawi

Household members	Annual Cost (MWK)	Annual Cost (USD)
Baby (either sex) 12-23 months	8726	11
Child (either sex) 9-10 years	33980	41
Child (either sex) 11-12 years	39809	48
Man, 30-59y, 50 kg, moderately active	48764	59
Woman, 30-59y, 45 kg, moderately active	56441	69
Total HH Cost of EO Diet (five members)	187738	228

erage urban households, with a surplus of 9.7%, possessed sufficient income to afford a nutritious diet.

Table 4 displays the affordability of the diets and non-food expenditures presented in monetary terms. As can be seen, ultra-poor, poor, and rural households can only afford to fulfil their energy requirements (and non-food expenditure) with their current income levels. they experience annual shortfalls of MWK 706,623, MWK 509,428, and MWK 449,771, respectively, in their ability to afford an FHAB diet. The average Malawian household, with a slightly higher income level, can potentially meet the macronutrient requirements and household energy needs. However, they still lack sufficient income to cover the annual food and non-food costs, resulting in an annual shortfall of MWK 349,613 (≈$426).

DISCUSSION

The present study exemplifies the feasibility of conducting a CotD analysis even with a condensed food list and monthly food price data. By considering the monthly costs of a nutritious diet and food prices, it not only calculated the annual cost of the diet but also revealed seasonal fluctuations. Additionally, it demonstrated monthly variations in the cost, affordability, and composition of the nutritious diet due to fluctuations in food item prices over time.

This study utilised the cost-of-diet (CotD) approach within the context of Malawi to address significant knowledge gaps concerning the affordability and accessibility of nutritious diets, as well as the potential impact of food price inflation on affordability over time. For a standard five-member household, an energy-only (EO) diet amounted to MWK 187,738 (approximately $228) annually. Notably, this cost is significantly lower than the yearly expense of an EO diet in Nigeria (Rana et al. 2023) and India (Dash et al. 2022) but on par with Liberia (Shepperdley 2019) for a similar-sized household. On the other hand, the annual cost of a food-habit-based nutritious diet per household stood at MWK 1,015,893. This cost was considerably higher than in India (Dash et al. 2022) and Liberia (Shepperdley 2019) but lower than in Nigeria (Rana et al. 2023).

In Malawi, the cost of food-habit nutritious diet reached nearly 5.4 times higher than the cost of EO diet. In comparison to cost of the diet assessments conducted in other countries, the FHAB diet's cost in Bangladesh was 2.6 times higher than the EO diet (Rana 2022c). In India, it ranged from 2.1 to 2.6 times higher (Duffy and Worldwide 2017; Dash et al. 2022); in Liberia, it was 2.9 times higher (Shepperdley 2019); and in Nigeria, it ranged from 2.17 to 4.9 times higher (Hockenhull and Damu 2019; Rana 2022a; Rana et al. 2023). These findings suggest that fulfilling all nutrient requirements (beyond energy) comes at a substantially higher cost in Malawi compared to other countries.



Figure 2. Change in the daily cost of a Food Habits Nutritious (FHEB) diet for the standard five-person family in Malawi between April 2021 and March 2022

Table 3. The annual cost of a food-habit nutritious (FHAB) diet for the standard five-person family in Malawi

Household members	Annual Cost (MWK)	Annual Cost (USD)
Baby (either sex) 12-23 months	55041	67
Child (either sex) 9-10 years	191975	234
Child (either sex) 11-12 years	241141	293
Man, 30-59y, 50 kg, moderately active	232117	283
Woman, 30-59y, 45 kg, moderately active	295619	360
Total HH Cost of FHAB Diet (five members)	1015893	1236

If the software program had utilised a more comprehensive food list, it might have been able to select more affordable alternative food sources.

Another contributing factor to this ratio could be the low cost of energy-rich food in Malawi. For example, during the CotD analysis, "red sorghum" (along with maize) was identified as a highly affordable energy source and chosen as a staple in the EO diet. However, while sorghum is occasionally consumed as a staple instead of maize, it is unrealistic to assume that people would rely on it daily throughout the year. Relying solely on these inexpensive options while estimating the FHAB diet would lead to an unrealistic cost calculation. Consequently, we may have underestimated affordability gaps. The primary purpose of this comparing the cost of EO diet with FHAB diet is to show the cost difference between a culturally acceptable, healthy diet (i.e., the FHAB diet) and other diet types. While the non-nutritionists in the development and humanitarian sector often use and quote the calorie requirements (or the cost of calorie) in planning, policy influencing and project design, this finding clearly demonstrates what a difference it would make if the cost of the FHAB diet were utilized instead. This would be by far a better choice from the health and nutrition perspective.

One of the most common uses of the cost of the diet analysis is to assess the household affordability of the nutritious diet. The analysis of the affordability gap/surplus in the cost of the diet analysis can show whether a household or individual can follow the food-based dietary recommendations if knowledge and attitudes are not a barrier. Also, monitoring the affordability gaps over time might be quite useful for a nutrition programme to check whether the programme is likely to achieve its objectives (especially the nutrition-sensitive programmes to improve HH income through livelihoods or social protection interventions).

This study, like others on diet cost and affordability (Bwanaisa and Hendriks 2023; Dash et al. 2022), underscores the urgency of reevaluating the poverty threshold. It suggests that policy and programs should aim to empower individuals to escape poverty, thus improving nutrition. Furthermore, we advocate for using the cost of the FHAB diet as a benchmark in future socio-economic assessments to gauge the impact of new initiatives and track changes in the affordability gap.

Other than the typical urban households, none of the household types could afford the nutritious diet plus the non-food expenditures. To cover the whole household affordability gap:

- An average Malawian household will need 29134 kwacha (≈$35.5) per month.
- A typical rural HH will need 37,481 kwacha (≈$45.6) per month.
- The poor households will need 42,452 kwacha (≈$51.7) per month;

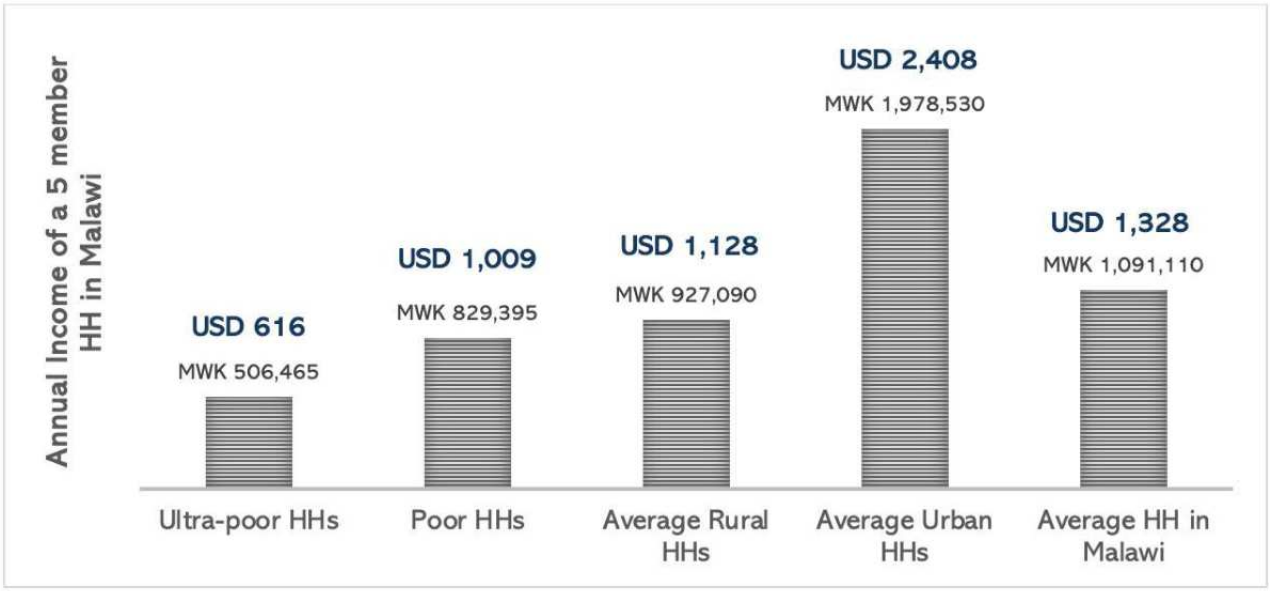

Figure 3. Average annual income of a five-member household (HH) in Malawi by HH types

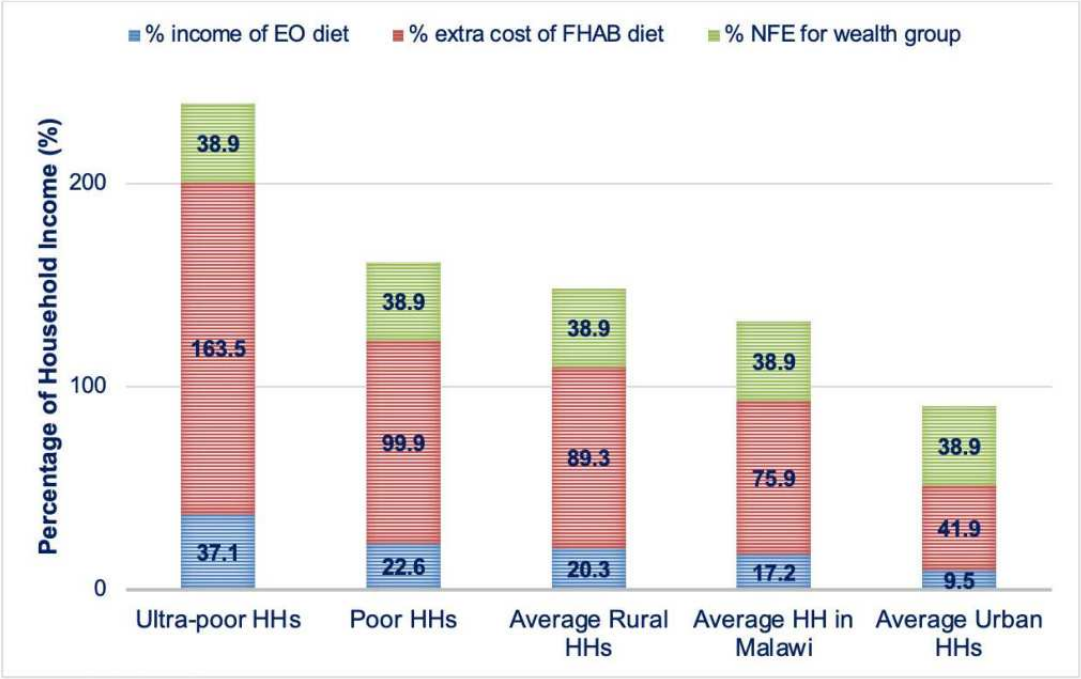

Figure 4. The affordability of an energy only, and FHAB diet by household types

- The ultra-poor households will need 58,885 kwacha (≈$71.7) per month.

There is an urgent need to assess the current policies and programs aimed at supporting these households. There may be a need to recalibrate social safety nets, subsidies, or income-generation programs to better address the affordability gap for nutritious diets (Alarcon et al. 2021; Bwanaisa and Hendriks 2023; Sarfo et al. 2020).

While the Cost of the Diet method is very useful and robust, it is crucial to acknowledge certain limitations in the analytical process and the results generated. These limitations include:

- The CotD software does not account for the requirements of certain nutrients, such as vitamin D, iodine, essential amino acids, and essential fatty acids (Dash et al. 2022; Rana 2018, 2022b). Vitamin D is omitted from consideration because the body can produce it through exposure to ultraviolet light on the skin. Iodine is not included due to variations in its presence in foods based on the soil where plants are grown, or animals are raised, resulting in a lack of data in the

Table 4. Estimated affordability of different diet types and non-food expenditure by household types in Malawi

		Ultra-poor HHs	Poor HHs	Average Rural HHs	Average Urban HHs	Average HH in Malawi
Annual Income		506,465	829,395	927,090	1,978,530	1,091,110
Annual Non-food Expenditure (NFE)		197,195	322,930	360,968	770,353	424,830
Income - NFE	(a)	309,270	506,465	566,122	1,208,177	666,280
Cost of energy only (EO) diet	(b)	187,738	187,738	187,738	187,738	187,738
Excess or shortfall (MWK)	(a) - (b)	121,532	318,727	378,384	1,020,439	478,541
Cost of food habit (FHAB) diet	(c)	1,015,893	1,015,893	1,015,893	1,015,893	1,015,893
Excess or shortfall (MWK)	(a) - (c)	-706,623	-509,428	-449,771	192,284	-349,613
Excess or shortfall (USD)		-860	-620	-547	234	-426

* Other than the last row, all the income, expenditure and cost of various diets shown in the table above are in Malawian Kwacha (MWK). The figures in the final row are in USD.

food tables (Dash et al. 2022; Rana 2018, 2022b). Additionally, essential amino acids and fatty acids are not typically available in most food tables, thus not factored into the software's calculations.

- The software-generated estimated diet represents a theoretical, lowest-cost diet specifically tailored to the family size and composition used during the calculation (Deptford et al. 2017; Rana 2018). Although the software can identify a diet that meets the recommended macro and micronutrient requirements using a limited selection of foods, it assumes that all family members will consistently consume this diet at every meal (Dash et al. 2022; Deptford et al. 2017; Rana 2018, 2022b, 2022a).
- Since the precise micronutrient needs of each individual are unknown, the software establishes the Recommended Nutrient Intake (RNI) at 2 standard deviations (SD) above the mean to minimize the risk of deficiencies (Dash et al. 2022; Deptford et al. 2017; Rana 2022b). Consequently, when the CotD software selects foods that fully satisfy the RNIs of the family, it results in the nutritional needs of 97% of all individuals being surpassed.
- The CotD software calculates the family's food quantities based on the sum of Recommended Nutrient Intakes (RNIs), but food distribution within a household, though influenced by individual nutrient requirements, can be influenced by other factors, often cultural. Moreover, the CotD method does not account for the additional energy, protein, and nutrients needed by someone pregnant, ill or recovering, as there is insufficient data for such calculations (Dash et al. 2022; Deptford et al. 2017; Rana 2018). Additionally, readers should be aware that the Cost of the Diet software is not designed for diet planning and cannot analyse the nutrient content of foods in a specific diet.
- Using secondary sources for food price and availability data restricted the CotD analysis to only the 28 food items listed in the Minimum Expenditure Basket (MEB) (Rana 2022b). As a result, the minimum cost of a nutritious diet calculated in this study may be slightly overestimated compared to an analysis that considers all locally available food items. It should be noted however that in a low-income setting, diets are typically monotonous and thus it is unlikely that any but wealthier households would consume much food besides the 28 foods included.
- The software assumes that a child receives nothing but breast milk for the first two years, which is unrealistic. This is partly accounted for by increasing the cost of the breastfeeding woman's diet, but nevertheless, this results in a small underestimate of the cost of the diet.

CONCLUSIONS & RECOMMENDATIONS

The findings from this CotD assessment clearly show that the massive food price inflation over the past year preceding the study led to a substantial increase (25 per cent) in the cost of a nutritious diet. The cost of meeting the energy needs alone has gone up by 30% - signifying that the increasing cost of the nutritious diet is largely due to a considerable increase in the price of staples and non-luxury food items.

The recent 25% currency devaluation in Malawi (AfricaNews 2022) could potentially exacerbate the affordability situation in the near future. So, it is quite likely the nutritional status of the general population will be negatively affected, and potentially the most vulnerable groups (poor children, pregnant & breastfeeding women and adolescent girls) will be disproportionately affected if no immediate assistance is provided to these vulnerable groups.

In these circumstances, regular cash support, either as part of social protection or project-specific assistance, can be highly effective. The CotD modelling reveals that 42,452 kwacha (≈$51.7) per month can close the affordability gap for poor households, and 58,885 kwachas (≈$71.7) can entirely fill the gap for ultra-poor households. However, it should be noted that this amount is substantial, given that over 50% of the population lives below the poverty line (NSO 2021). Targeting mothers and children during the first 1000 days may yield a better return on investment in terms of improved nutrition outcomes (WHO 2009).

In Malawi, the poor cannot access a nutritious diet without a significant income boost. To combat undernutrition and uplift individuals from poverty, it's crucial to conduct a thorough review of benchmarking criteria and evaluate the effectiveness of existing policies and programs designed to aid these households.

Finally, this study demonstrates the feasibility of CotD analysis using a streamlined food list and monthly price data. Given the anticipated increase in diet costs and a growing affordability gap, frequent updates are vital for well-informed policymaking, project planning, and advocacy in Malawi. While the study's findings aren't universally applicable to neighbouring countries, it is advisable to replicate this research elsewhere to guide policy decisions and development program design in addressing undernutrition and poverty.

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CONFLICT OF INTEREST

None.

CONTRIBUTOR STATEMENT

Md Masud Rana was the Principal Investigator for this study, was involved in study design, supervising the data collection and entry, and undertaking the analysis and report writing. The overall design was finalised with inputs from Natalie Roschnik and Maziko project staff, including Anthony Kulemba, Deusdedit Dambuleni and Brenda Phiri. Olusegun Taiwo did data entry, cleaning and analysis under the supervision and direct inputs from Md Masud Rana and Natalie Roschnik. All the authors contributed to the drafting of this article.

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