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ORIGINAL ARTICLE

Consumption of healthy and unhealthy foods by the African poor: Evidence from Nigeria, Tanzania, and Uganda

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Abstract

We use national Living Standards Measurement Study (LSMS) datasets from Nigeria, Tanzania, and Uganda to examine consumption by the rural and urban poor of "unhealthy foods" (including ultra-processed foods such as sweets and sugary beverages) versus "healthy foods" beyond starchy staples (such as vegetables, beans, animal products, and fruits). Consumption of processed foods and nonstaples is often associated in policy discussion in Africa with middle-class urban consumers rather than the poor. We analyzed household food consumption expenditure with Locally Weighted Scatterplot Smoothing (LOWESS) curves and augmented Engel regressions. We found that substantial shares of the consumption expenditure of the poor, both rural and urban, are on healthy and unhealthy foods. We found, surprisingly, that the poor's food consumption patterns do not differ sharply from the middle classes', in rural and urban areas, except for the case of ultra-processed foods of which the poor still consume much less than the middle class. We found that the poor dedicate 25% of their food consumption expenditure to the category vegetables/beans, versus 22% and 17% by the lower-middle and upper-middle-income strata. Fruits/animal products constitute 17% of the poor's consumption expenditure compared to 23% and 27% by the lower- and upper-middle strata. Ultra-processed food (e.g., sugar-sweetened beverages) form 12% of the consumption of the poor, versus 20% and 32% for the lower- and upper-middle strata. Shares are increasing with income starting at incomes well below the poverty line. Nonincome factors play important roles: e.g., rural off-farm employment is associated with more consumption expenditure of processed foods by the poor due to the opportunity cost of time.

KEYWORDS
Africa, consumption, expenditure, fish, food away from home, fruit and vegetables, meat, processed food, rural, the poor, urban

JEL CLASSIFICATION
D12, J20, O12, O18, Q12, Q18

1 | INTRODUCTION

The double burden of undernutrition (leading for example to underweight) and overnutrition (leading for example to obesity) is a major theme of food consumption and nutrition debates concerning low- and middle-income countries (LMICs), including Sub-Saharan Africa (SSA). For cross-country evidence and literature reviews see, for example, Headey and Alderman (2019), Hirvonen et al. (2020), Masters et al. (2018a, 2022), Popkin (1998, 2008), and Ruel et al. (2008).

Undernutrition is associated with, among other factors, inadequate consumption of nonstarchy-staples such as fruits and vegetables, beans, and animal products. There is widespread concern about under-consumption and high costs for example of fruits and vegetables in SSA (Anderson & Birner, 2020; Miller et al., 2016; Vermeulen et al., 2020).

Overnutrition, leading to obesity and chronic diseases such as diabetes, is associated with (among other factors) excessive consumption of processed foods, in particular ultra-processed foods rich in oil, salts, and sugar (Popkin, 1998, 2008; Popkin & Reardon, 2018). There is ample evidence of the rise of consumption of processed food in general including ultra-processed food and prepared food (restaurant food consumed away from home) in SSA over the past 50 years, with an acceleration observed in the past several decades. This has been spurred by rising opportunity costs of women's time for home processing–preparation and men and women's time for returning home for meals, both due to increasing employment away from home (Reardon et al., 2021). There is evidence of processed food penetrating diets in rural areas (Tschirley et al., 2015) and spatialized analysis showing its penetration even in remote rural hinterland areas such as in Tanzania (Sauer et al., 2021).

We believe that there are two reigning views in the literature and debate on the double burden of malnutrition in SSA (and other LMIC regions). First, overnutrition has been cast mainly as a problem of the urban middle class rather than of the poor (Ruel et al., 2008). This implies a hypothesis that the poor are consuming less processed diets, with that changing as one comes to the middle class. Second, we believe that there has been a reigning view that compared with the middle class, in share terms, the poor consume less healthy foods such as protein-rich animal products and beans and vitamin-rich vegetables and fruits.

But to our knowledge, these two views have not been systematically tested with household data over a range of healthy and unhealthy foods and over the spectrum of levels of income in urban and rural SSA. In this article, we test those views with detailed data from three SSA countries. We analyze the shares of various healthy and unhealthy foods in household consumption expenditure (from purchases, own-production, and gifts/transfers received of food) over the income gradations of households below the poverty line as well as the gradations of the middle class (above the poverty line).[1] We also explore the nonincome determinants of these shares. Our analysis relies on the most recent LSMS datasets for Tanzania and Uganda (to provide a view of Eastern and Southern Africa) and Nigeria for West Africa.

We find that the shares of both ultra-processed (unhealthy) and high protein and vitamin (healthy) foods are surprisingly high among the poor and even the ultra-poor in both rural and urban areas. These shares of healthy and unhealthy foods are sensitive to increments of income and other variables such as employment. We structure the article in several steps. First, we present descriptive analyses including a detailed set of Locally Weighted Scatterplot Smoothing (LOWESS) curves using household data relating gradations of income and other variables to the shares of healthy and unhealthy foods.[2] Second, we present regressions of these shares on correlates such as incomes, employment proxies for opportunity cost of time, and education. We then present conclusions and implications.

2 | DATA AND DEFINITIONS

To evaluate consumption behavior in Western and Eastern/Southern Africa, we used data from the three most recent nationally representative Living Standards Measurement Study (LSMS) surveys in Nigeria, Tanzania, and Uganda. The LSMS captures household food consumption using 7-day recall. The data are from the Nigeria 2018/2019 General Household Survey (World Bank, 2021a, with 4926 household observations), the Tanzania 2019/2020 National Panel Survey (World Bank, 2021b, with 1164 household observations), and the Uganda 2019/2020 National Panel Survey (World Bank, 2021c, with 3000 household observations).[3]

[1] Recent work (cited above) on the problems of affordability of healthy foods also points to the issue of under-consumption, relative to nutritional norms, of healthy foods. We do not further address that issue in this article but recommend in our conclusions, continued and further research on the relative prices paid by the poor for healthy versus unhealthy foods.

[2] Similar curves have been estimated for SSA but used national and rural and urban level aggregates such as of diet quality over country level GDP per capita (Masters et al. 2018b). By contrast, our analysis uses household level data.

[3] To exclude outliers, we trimmed the data to only include households with daily per capita total expenditure greater than $0.50 and less than $20 in constant 2017 PPP international dollars. This resulted in trimming

The Nigeria GHS collected food consumption data in two 7-day periods, whereas the Tanzania NPS and the Uganda NPS collected these data in one 7-day period. The Uganda NPS data include food consumption values from all sources––purchased, gifts, and own production. The Nigeria GHS and the Tanzania NPS data include food consumption values for purchased food, but only quantities of food consumption when sourced from own production or received as gifts/in-kind. We use the value of purchases (in currency) and the physical quantities of purchased food to calculate market prices to estimate the value of own production and food received as gifts/in-kind payments for labor. The prices of food items were estimated using the median calculated price at the smallest spatial level with a minimum of 10 calculated prices of the specific food item. To impute the value of own-production and in-kind gifts of foods, we multiplied the derived market prices by the physical quantities. All reported food consumption expenditure shares include both purchase values and estimated market values of own production and gifts/in-kind transfers. All three surveys collected nonfood purchases.

We aggregated the hundreds of food items observed in the datasets in categories based on food source, processing level, and product. The four food sources are food from own production, food purchased for at-home consumption, food purchased for consumption away-from-home, and food received as a gift or payment-in-kind for labor.

The food processing level aggregates shown in Table 1 are based on the level of processing that the food items have undergone at the point of household acquisition. First, the food items are separated as unprocessed and processed, where processed food items have undergone some processing. Second, under the unprocessed aggregate, we separate own production from purchased. Third, the processed foods are split by the relative amount of processing that the food items have undergone. Low-processed foods are primary ingredients for food prepared at home, and ultra-processed foods are primarily prepared foods that are ready for consumption. The intent is to aggregate food items in such a way that allows for the analysis of a household's desire to consume foods that contain varying levels of value added prior to their acquisition.

This processing level classification has similarities to the NOVA Food Classification System (NOVA) developed by the University of São Paulo (Monteiro et al., 2019), but with the following differences. First, we separate group 1 of NOVA (unprocessed and minimally processed foods), isolating unprocessed as a single category and aggregating minimally processed foods with other low-processed foods. Second, the minimally processed foods from group 1 (flours and dried foods) are aggregated with group 2 (processed ingredients) and group 3 (processed foods) of NOVA to create a low and minimally processed foods aggregate. Finally, we use group 4 (ultra-processed foods) from NOVA, and, noting that bread, beer, and canned fruit are typically industrially processed in the African countries of this study, we aggregate these food items with the ultra-processed food as opposed to the low and minimally processed food.

The food product level classification shown in Table 2 shows five food aggregates based on the primary ingredient of the food items. "Starchy Staples" are raw or processed grains, roots, tubers, and plantains. "Sweets and beverages" are a subset of ultra-processed foods with primary ingredients including sugars and processed grains. Sweets include cookies or biscuits, candy, cake, and so on, and beverages include alcoholic and nonalcoholic nondairy beverages. The final aggregate is "meals away from home," an aggregate that would not be able to be allocated to the other product aggregates.

"Vegetables/beans" includes raw or processed vegetables (in which we include tomatoes, greens, and so on), and beans, other pulses, nuts, and edible oils. "Fruits/animal products" includes raw or processed fruits, meat, fish, and dairy. Although both of these two nonstaple categories, vegetables/beans, and fruits/animal products, are relatively high-value products from the perspective of income earning potential for farmers, we separate them as they differ in the consumption "foodways" of the countries studied. First, vegetables and beans tend to have lower income elasticities and fruits and animal products higher income elasticities in SSA (e.g., see McCullough et al., 2022 for Tanzania). Second, vegetables and beans/nuts are basic condiments used in traditional sauces and soups that accompany various forms of cooked starchy staples in the study countries (and in much of the rest of SSA). Fruits are traditionally for stand-alone consumption, as sometimes are animal products, although the latter are also incorporated into some sauces. Third, in the nutrition literature, vegetables and beans (pulses in general) are considered, without controversy, "healthy," but the healthiness of red meat (beef, mutton, goat, pork) that comprises 29% of the value of consumption expenditure in fruits/animal products is considered unhealthy by some nutritionists as it contains significant saturated fat. However, Bromage et al. (2021: 76S) note in their new diet quality scoring methodology that a modest consumption of red meat is an important source of nutrients.

A rough approximation is that many highly processed products, and in particular sweets and beverages, can be classed as "unhealthy." Many (but not all) nonstaples (such as in our vegetables/beans and fruits/animal products

fewer than 2% of the observations in any country and left us with the sample sizes noted.

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TABLE 1 Food processing level aggregates

Unprocessed	Low and minimally processed	Ultra-processed
Grains (rice, maize, wheat, barley, millet, sorghum)	**Cereal flours** (maize, wheat, millet, sorghum)	**Meals at restaurants**
Roots and tubers (cassava, Irish potatoes, sweet potatoes, arrow root)	**Roots and tuber flour** (cassava, sweet potato)	**Milk products** (cheese, powder, canned)
Plantains	**Seasonings** (spices, salt, sugar, honey)	**Fruit products** (juice, canned, jam/marmalade)
Legumes (groundnuts, soya beans, peas, beans, lentils, nuts, seeds, pulses)	**Fats and oils** (cooking oil, butter, margarine, ghee, shea butter, groundnut oil, coconut oil)	**Beverages** (beer, wine, spirits, soft drinks, cocoa)
Vegetables (onions, tomatoes, carrots, green pepper, spinach, cabbage, eggplant, okra, cocoyam, pumpkins, garlic, mushroom, ginger)	**Pastes and purees** (groundnut, tomato, sesame)	**Baked products** (bread, buns, cakes, biscuits, pastries, cornflakes, macaroni/spaghetti, pancakes, samosas)
Fruit (bananas, oranges, lemons, tangerines, mangos, avocados, apples, coconut)	**Dried/Smoked fish**	**Meat products** (canned beef, corned beef, sausages)
Meat and eggs (beef, goat, pork, chicken, other poultry, eggs, wild game)	**Low processed milk** (fermented, unsweetened/tinned)	**Infant formula food**
Fish and seafood	**Coffee**	**Sweets and confectionary**
Bottled water	**Tea**	**Ice cream**

TABLE 2 Food product level aggregates

Starchy staples	Vegetables/Beans	Fruits/Animal products	Sweets and beverages	Meals away from home
Grains (rice, maize, wheat, barley, millet, sorghum)	**Legumes** (groundnuts, soya beans, peas, beans, lentils, nuts, seeds, pulses)	**Fruit** (bananas, oranges, lemons, tangerines, mangos, avocados, apples, coconut)	**Baked goods** (cakes, biscuits, buns)	**Meals at restaurants**
Roots and tubers (cassava, Irish potatoes, sweet potatoes, arrow root)	**Vegetables** (onions, tomatoes, carrots, green pepper, spinach, cabbage, eggplant, okra, cocoyam, pumpkins, garlic, mushroom, ginger)	**Meat and eggs** (beef, goat, pork, chicken, other poultry, eggs, wild game)	**Sugars** (honey, syrups, jams, marmalade, jellies, ice-cream)	
Plantains		**Fish and seafood**	**Nondairy beverages** (coffee, tea, soft drinks, wine, spirits, beer)	
		Dairy		
Products: Bread, grain flour	Products: cooking oils, paste, spices	Products: cheese, sausages, juice		

categories) can be classed as "healthy". We are not, however, attempting a rigorous nutritional analysis but using rough approximations of sets of food to indicate healthy(ier) and unhealthy foods within the range of product types and degrees of processing that we analyze.

We use an income classification that separates the households into three groups: poor, vulnerable middle class (a term used by Ncube et al. (2011)), and upper middle class. The poor include households with total expenditure (TE) per capita, as a proxy for income, of less than

2.1 constant dollars in PPP (purchasing power parity) per person per day in 2017. The commonly referenced international poverty line of 1.9 PPP USD is defined in 2011 constant dollars, and 2.1 PPP USD is the equivalent value in 2017 constant dollars (Atamanov et al., 2020). TE includes total purchases of food and nonfood products and the total consumption value of food (both purchased value and imputed value of own production and gifts/transfers received as described above). The vulnerable middle class is the "lower middle class,", which includes households above the poverty line but below the upper middle class. The vulnerable middle class has TE/person/day between 2.1 and 4.0 PPP USD. Finally, the upper middle class includes households with TE/person/day between 4 and 20 PPP USD.

3 | DESCRIPTIVE STATISTICS AND LOWESS CURVES

3.1 | Descriptive statistics

Table 3 shows descriptive results for TE per capita as a proxy for income, and the shares of sources, processing levels, and product types in overall food consumption expenditure (purchase value plus own-production value plus gifts-in value), per country, for the overall sample, rural, and urban areas.[4] Tables 4–6 show the results for the poor, the vulnerable middle class, and the upper-middle-class subsets of the overall sample, respectively. The data report food consumption values at the household level, so all shares reported here are at the household level. The following results stand out.[5]

First, Table 3 shows that urban per capita TE exceeds rural by 50% (1.5–1) in Nigeria, and 100% in Tanzania and Uganda. Table 4 shows that, when averaging the three countries, the spatial distribution of poor households is primarily rural with 90% of the poor in rural areas, and 10% in urban. Table 5 shows that 74% of the vulnerable middle class are rural, and 26% are urban. Table 6 shows that 47% of the upper middle class are rural, and 53% are urban. Looking across these last three tables, we find that rural households are 51% poor, 33% vulnerable middle class, and 16% upper middle class, and the urban households are 16% poor, 33% vulnerable middle class, and 51% upper middle class.

Second, the data display Engel's Law (which predicts that the share of food in TE falls with income), but modestly, reflecting that most of the nonpoor are in the vulnerable middle class, with incomes not much above the poverty line, and still have a high marginal propensity to spend on food. Table 3 shows the shares of food in TE averaging 58% for the overall sample. Table 4 shows for the poor it is 64%, surprisingly not much above the overall sample (and even of the upper middle class who consume 51% of their TE on food). The food share in the overall sample for urban areas is 11% lower than in rural areas (50% vs. 61%). The difference is partly due to urban incomes being higher but Tables 4–6 show that the food shares in urban areas are 5%-8% lower than rural areas within the corresponding income groups.

Third, the data show that purchases are an important share of food consumption of the rural poor as well as the overall rural sample. Table 3 shows that own-production only forms on average 31% of rural total food consumption expenditure, with some differences over countries: 22%, 32%, and 39% of food consumption expenditure in rural Nigeria, Tanzania, and Uganda respectively; 72%, 58%, and 50% (on average 60%) of food consumed in rural areas is purchased. Gifts and in-kind payments are 6%, 10%, and 11% of food in the rural areas (on average 9%). Purchases can be divided into food consumed at home (which purchases form 57%, 45%, and 44% of food consumption), versus food away from home (FAFH) (both meals and other items such as snacks and sodas and beers), which purchases from 14%, 12%, and 6% of food consumption expenditure in the rural areas.

Table 4 shows that the rural poor depend on own farming for only 38% of their food consumption expenditure, not far from the 31% among the overall sample. The rural poor derive only 9% of their food from gifts/transfers (nearly equal to the 8% for the overall). Tables 4–6 show a stepwise increasing share of purchased food in the value of food consumed when comparing rural poor to rural vulnerable middle class to rural upper middle class (53%, 61%, and 71%). Important here is that the rural poor purchase over half of their food consumption expenditure. Note that only 8% of the poor in our sample are "landless" (do not own, have traditional rights to, or rent farmland).

For urban households on average over the three countries, own-farming accounts on average for only 8% (urban agriculture is minor) of food consumption expenditure, as shown in Table 3. Purchases form 85% (just 1.4 times the rural share). FAFH averages 22%, twice the rural share,

[4] Note that consumption expenditure shares of nongrains tend to show a larger role for these items in consumption than do nutrient-based measures of their shares in consumption because nonstaples tend to be becoming more expensive than food grains over time (Meenakshi, 2016). As our emphasis is on comparison between the poor and the nonpoor, for a given year, this issue does not directly affect the utility of our results, but the issue should be considered for any extension of our analysis over years, and extension to analysis of nutrient shares of the food items we analyze.

[5] Note that by "average" when writing of patterns over countries, we mean a simple average, not weighted by country population.

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TABLE 3 Descriptive statistics for the overall samples

	Nigeria			Tanzania			Uganda		
	National	Rural	Urban	National	Rural	Urban	National	Rural	Urban
Household sample size	4926	3368	1558	1164	676	488	3000	2284	716
Population from LSMS (millions)	149	108	40	43	33	10	40	29	11
Food consumption/cap ($PPP)	864	796	1,014	761	644	1,037	664	560	895
Annual TE (total expen.)/cap ($PPP)	1415	1226	1832	1380	1057	2142	1528	1170	2324
Daily TE/cap ($PPP)	3.88	3.36	5.02	3.78	2.90	5.87	4.19	3.21	6.37
Share of food in TE	65	68	58	60	63	51	49	52	42
Shares in food consumption expenditure									
Food source									
Own production	17	22	5	25	32	8	31	39	12
Purchased, at home	61	57	70	49	45	58	50	44	63
Food away from home	16	14	20	18	12	30	9	6	15
Gifts/In-kind payment	6	6	5	8	10	4	10	11	10
Processing level									
Unprocessed	60	63	53	59	64	48	70	74	61
Own production	17	22	5	25	32	8	31	39	12
Bought and gift-in	43	41	48	34	32	40	39	34	49
Processed (bought and gift)	40	37	47	41	36	52	30	26	39
Low processed	16	16	18	17	17	15	13	13	13
Ultra-processed	24	21	30	24	18	37	17	14	26
Product									
Starchy staples	35	38	30	37	41	27	40	42	36
Vegetables/Beans	22	23	21	20	21	17	22	23	18
Fruits/Animal products	24	22	26	20	20	20	24	23	25
Sweets and beverages	9	8	10	9	8	12	5	5	6
Meals away from home	10	9	13	14	10	24	9	7	15

Note: Total consumption is total expenditure (as a proxy for TE), own-produced plus purchased plus received as gifts. Starchy staples = grains and roots and tubers and plantains; vegetables/beans = pulses, nuts, vegetables, oils, spices; fruits/animal products = fruits, meat, dairy, fish; sweets and beverages = baked goods, candy, sodas, alcoholic beverages, sugar.

as expected. But taken together, the differences of urban households' food sources with rural are far less sharp than the traditional image.

Fifth, the data show the importance of processed food in urban and rural areas and for the poor and the middle class. Table 3 shows that overall processed food has made inroads in the diets of all three countries, ranging 30%–40% of total food consumption expenditure. It is striking that the shares in urban areas do not differ much from those of rural areas, only by a ratio of 1.3 in Nigeria and 1.5 in the other two. Table 4 shows that the shares of all processed food in the diets of the poor: (1) average 32%, 30%, and 24% of the rural poor's diets in Nigeria, Tanzania, and Uganda respectively; (2) average 39%, 37%, and 23% of the urban poor's diets in Nigeria, Tanzania, and Uganda, respectively. The striking result is that the shares of processed food in the diets of the rural and urban poor are similar and are approximately 75% of the shares (ranging from 60% to 81%) observed for the upper middle class in their respective countries and spatial area (Table 6).

However, while the poor have similar shares to the middle class in overall processed food, they have lower shares than the upper middle class in ultra-processed foods. Over the countries, the rural and urban poor averages are 12% and 16%, compared to the upper middle class's 27% in rural areas and 36% in urban areas, with the vulnerable middle class splitting the difference (19% and 25%).

Sixth, the data show that the poor as well as the middle class have diets diversified well beyond starchy staples in rural and urban areas. Table 3 shows that starchy staples account for only 35% of consumption expenditure in Nigeria, 37% in Tanzania and 40% in Uganda. The latter is similar to rural Asia, while those in Nigeria and Tanzania are like urban Asia (Reardon et al., 2014).

Vegetables/beans represent 21% of the overall food consumption expenditure of the full sample (and 25% for the

TABLE 4 Descriptive statistics for the poor

	Nigeria			Tanzania			Uganda		
	National	Rural	Urban	National	Rural	Urban	National	Rural	Urban
Household sample size	1482	1279	203	358	290	68	1003	930	73
Population from LSMS (millions)	64	54	9	21	19	2	14	13	1
Food consumption/cap ($PPP)	375	372	395	333	330	369	304	307	275
Annual TE (total expen.)/cap ($PPP)	537	525	604	501	493	584	542	541	556
Daily TE/cap ($PPP)	1.47	1.44	1.66	1.37	1.35	1.60	1.49	1.48	1.52
Share of food in TE	70	71	66	66	66	64	57	57	51
Shares in food consumption expenditure									
Food source									
Own production	26	29	9	40	42	30	42	43	31
Purchased, at home	58	55	73	42	41	51	43	42	53
Food away from home	12	11	13	6	5	11	4	4	6
Gifts/In-kind payment	5	5	5	12	12	8	10	10	10
Processing level									
Unprocessed	66	68	61	69	70	63	75	76	67
Own production	26	29	9	40	42	30	42	43	31
Bought and gift-in	41	39	52	29	28	33	33	33	36
Processed (bought and gift)	34	32	39	31	30	37	25	24	33
Low processed	17	17	21	20	20	21	15	14	20
Ultra-processed	16	16	19	11	10	16	10	9	13
Product									
Starchy staples	45	45	41	51	51	43	46	46	47
Vegetables/Beans	26	26	26	23	23	25	27	27	27
Fruits/Animal products	16	16	17	15	15	16	18	19	13
Sweets and beverages	6	6	6	6	6	6	5	5	5
Meals away from home	7	6	9	5	4	10	4	3	7

Note: The poor are households with expenditure less than 2.10 USD PPP per capita per day. Total consumption is total expenditure (as a proxy for TE), own-produced plus purchased plus received as gifts. Starchy staples = grains and roots and tubers and plantains; vegetables/beans = pulses, nuts, vegetables, oils, spices; fruits/animal products = fruits, meat, dairy, fish; sweets and beverages = baked goods, candy, sodas, alcoholic beverages, sugar.

poor overall). Their share is only slightly higher in rural than urban areas, 10% more in Nigeria, and under 30% more in the other two countries.

Fruits/animal products form 22% of overall food consumption expenditure of the full sample, close to that of 17% for the poor and 27% for the upper middle class. Again, contrary to the traditional images, urban areas do not rely much more than rural on these products, with a ratio of shares (urban/rural) of only around 1.1 in Nigeria and Uganda and 1.0 in Tanzania.

A key point is that nonstaples, most of which are rated as "healthy" by nutritionists, average around 43% of overall consumption expenditure for the overall sample (and 42% for both the rural poor and the urban poor); these shares rival the shares of starchy staples which are 37% for the overall sample (and 48% for the rural poor and 44% for the urban poor). The rural versus urban difference is far less than what we think is the conventional view. Moreover, the poor do rely about a fifth to a quarter less on nonstaples than do the nonpoor, but that difference is more modest than one would expect from the traditional image of the poor focusing on the consumption of starchy staples.

Finally, only 8% of food consumption expenditure of the overall sample (and 6% of the poor's) is on sweets and beverages. This is probably more than it was 50 years ago but is yet still small. Again, the urban areas are, as expected, more reliant on these products, but without as much of a gap between urban and rural as one might have imagined: an average ratio of 1.33 over the countries.

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TABLE 5 Descriptive statistics for the vulnerable middle class

	Nigeria			Tanzania			Uganda		
	National	Rural	Urban	National	Rural	Urban	National	Rural	Urban
Household sample size	1728	1232	496	378	241	137	1070	876	194
Population from LSMS (millions)	52	37	15	12	9	3	14	11	3
Food consumption/cap ($PPP)	715	734	667	641	652	608	532	541	505
Annual TE (total expen.)/cap ($PPP)	1086	1072	1120	1071	1053	1125	1071	1065	1089
Daily TE/cap ($PPP)	2.98	2.94	3.07	2.93	2.88	3.08	2.93	2.92	2.98
Share of food in TE	66	69	60	60	62	54	50	51	47
Shares in food consumption expenditure									
Food source									
Own production	16	21	5	24	29	8	35	41	14
Purchased, at home	63	59	72	51	45	66	49	43	65
Food away from home	15	14	17	17	15	22	6	5	9
Gifts/In-kind payment	6	6	5	9	11	4	11	10	12
Processing level									
Unprocessed	61	63	55	59	62	50	73	75	65
Own production	16	21	5	24	29	8	35	41	14
Bought and gift-in	44	42	50	36	34	42	38	34	51
Processed (bought and gift)	39	37	45	41	38	50	27	25	35
Low processed	17	16	19	17	16	19	13	12	15
Ultra-processed	23	22	26	24	21	31	14	13	20
Product									
Starchy staples	36	37	33	33	34	31	42	41	42
Vegetables/Beans	22	23	22	21	21	20	23	23	21
Fruits/Animal products	24	23	25	22	23	19	24	24	22
Sweets and beverages	9	8	10	10	9	12	5	5	5
Meals away from home	9	9	11	14	13	18	7	6	10

Note: The vulnerable middle class are households with expenditure between 2.10 and 4.00 USD PPP per capita per day. Total consumption is total expenditure (as a proxy for TE), own-produced plus purchased plus received as gifts. Starchy staples = grains and roots and tubers and plantains; vegetables/beans = pulses, nuts, vegetables, oils, spices; fruits/animal products = fruits, meat, dairy, fish; sweets and beverages = baked goods, candy, sodas, alcoholic beverages, sugar.

3.2 | LOWESS curves

The hypotheses corresponding to what we believe to be the conventional wisdom is that below the poverty line consumers tend toward traditional consumption behaviors, as follows.

1. Our hypothesis for rural areas is that sources other than own production will be at low levels and stable over the gradations of poverty (income levels below the poverty line); then only above the poverty line, into the "rural middle class," will one see rising and substantial shares of purchases in total consumption expenditure.
2. Inspired by Bennett's law, for rural and urban areas, our hypothesis is that the shares of nonstaples will be low and will not start to rise and be substantial until above the poverty line.
3. Inspired by the idea that processed and prepared foods are bought by households whose employment patterns and lifestyles drive them to save time from cooking, our hypothesis for both rural and urban areas is that the shares of processed and prepared purchased foods, including ultra-processed foods such as sweets and industrialized beverages, will be low and stable below the poverty line and only rise in the middle class.

We estimated LOWESS curves to discern the correlation between daily income (proxied by TE per capita in 2017 PPP USD terms) and the consumption expenditure behaviors noted in the hypotheses. LOWESS is a nonparametric

TABLE 6 Descriptive statistics for the upper middle class

	Nigeria			Tanzania			Uganda		
	National	Rural	Urban	National	Rural	Urban	National	Rural	Urban
Household sample size	1716	857	859	428	145	283	927	478	449
Population from LSMS (millions)	33	17	16	10	4	6	12	5	6
Food consumption/cap ($PPP)	1438	1468	1406	1329	1314	1341	1070	1004	1122
Annual TE (total expen.)/cap ($PPP)	2510	2409	2622	2611	2294	2857	2730	2364	3024
Daily TE/cap ($PPP)	6.88	6.60	7.18	7.15	6.28	7.83	7.48	6.48	8.29
Share of food in TE	58	62	54	52	58	48	41	44	38
Shares in food consumption expenditure									
Food source									
Own production	9	14	3	9	17	4	19	30	10
Purchased, at home	63	59	67	55	55	56	57	48	63
Food away from home	22	19	24	31	22	37	15	10	19
Gifts/In-kind payment	6	7	5	5	6	4	10	11	9
Processing level									
Unprocessed	53	56	49	49	55	44	63	67	59
Own production	9	14	3	9	17	4	19	30	10
Bought and gift-in	44	42	46	39	38	40	44	37	50
Processed (bought and gift)	47	44	51	51	45	56	37	33	41
Low processed	15	15	16	13	14	12	11	11	11
Ultra-processed	32	29	35	38	31	44	26	21	29
Product									
Starchy staples	27	29	25	25	29	22	33	35	32
Vegetables/Beans	19	19	19	15	17	14	17	19	16
Fruits/Animal products	30	30	29	22	25	21	28	28	28
Sweets and beverages	11	10	12	13	12	14	6	5	7
Meals away from home	14	12	16	24	18	30	16	13	18

Note: The middle class are households with expenditure between 4.00 and 20.00 USD PPP per capita per day. Total consumption is total expenditure (as a proxy for TE), own-produced plus purchased plus received as gifts. Starchy staples = grains and roots and tubers and plantains; vegetables/beans = pulses, nuts, vegetables, oils, spices; fruits/animal products = fruits, meat, dairy, fish; sweets and beverages = baked goods, candy, sodas, alcoholic beverages, sugar.

estimation, which is a robust form of local polynomial smoothing (Cleveland, 1979; Cleveland & Devlin, 1988). LOWESS does not impose a functional form on the relationship between dependent and independent variables. Rather it uses locally weighted least squares estimation on subsets of the data to form a curve that represents the relationship between the variables. Compared with other forms of local polynomial smoothing, this form is less sensitive to statistical outliers because it applies smaller local weights to estimates with large residuals.[6]

Estimation was conducted using a bandwidth of .4. To appropriately represent the sample population, the LOWESS analysis was conducted on expanded data where duplicate observations were recognized according to household weights. The LOWESS results are presented with figures in the body of the article. The online appendix presents the data as consumption expenditure shares per stratum of TE in Appendix Tables 1–3 for the three countries.

Figure 1 shows a set of LOWESS curves relating daily income (TE) per capita in 2017 PPP USD and shares of sources of food consumption expenditure in total food

[6] For robustness, we estimated alternative local polynomial curves using a variety of kernel regressions and repeatedly found results consistent with our reported results. While the results are effectively the same, we preferred to use LOWESS curve estimation for ease of presentation and interpretation.

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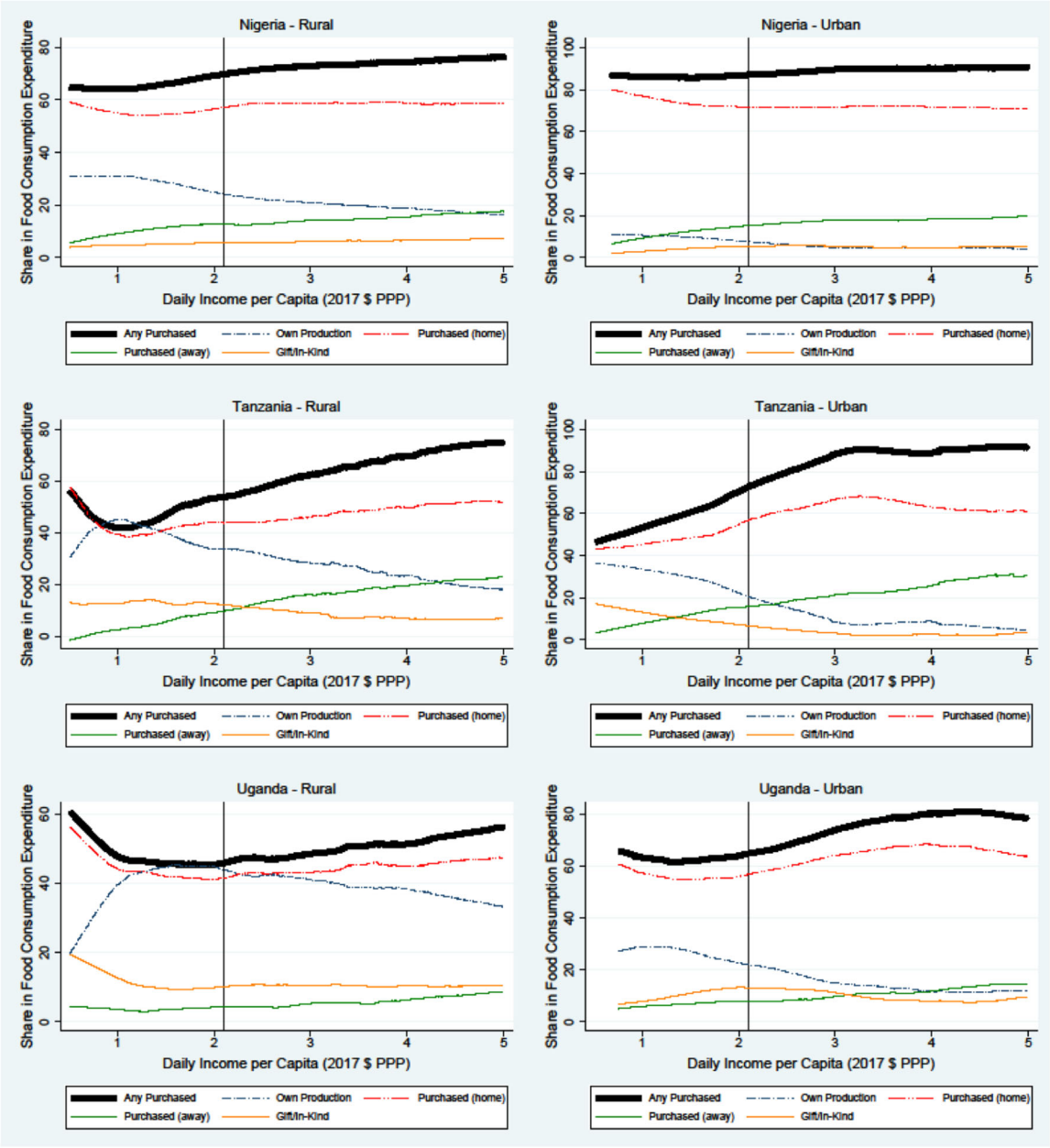

FIGURE 1 Food source LOWESS curves

consumption expenditure by rural and urban areas for each country. A vertical line is drawn to indicate the poverty line at 2.1 USD. The variable of most interest is the share of purchases. Several results stand out.

First, in all countries, the rural poor's reliance on purchases is not radically different from the nonpoor. In rural areas in all three countries, the share of purchased food is minimized at around 1 USD, with a rising slope of own production before (that is, below) that TE. In Nigeria, the slope is only slightly positive at all TEs, with the greatest slope between 1 and 2.5 USD. The slope of the purchased food share relative to TE is greatest in Tanzania; the curve has a very positive slope immediately following (that is, above) 1 USD (below which there had been a negative slope). In Uganda, the slope is relatively flat from 1 USD to 2.1 USD (the poverty line) and above that TE has a positive slope with a steepness between that of Nigeria and Tanzania. The upshot is that either the share of purchased food changes "faster" (more steeply) below the poverty line or as fast (as steeply) as for the nonpoor.

Second, the urban poor show patterns sharply different from the nonpoor only in Tanzania. In Nigeria, the purchase share is nearly equal over all income strata, poor, and nonpoor. In Tanzania, the curve is very steep before (below) the poverty line, continues as such up to 3 USD and then is nearly flat after (above). In Uganda, there is an

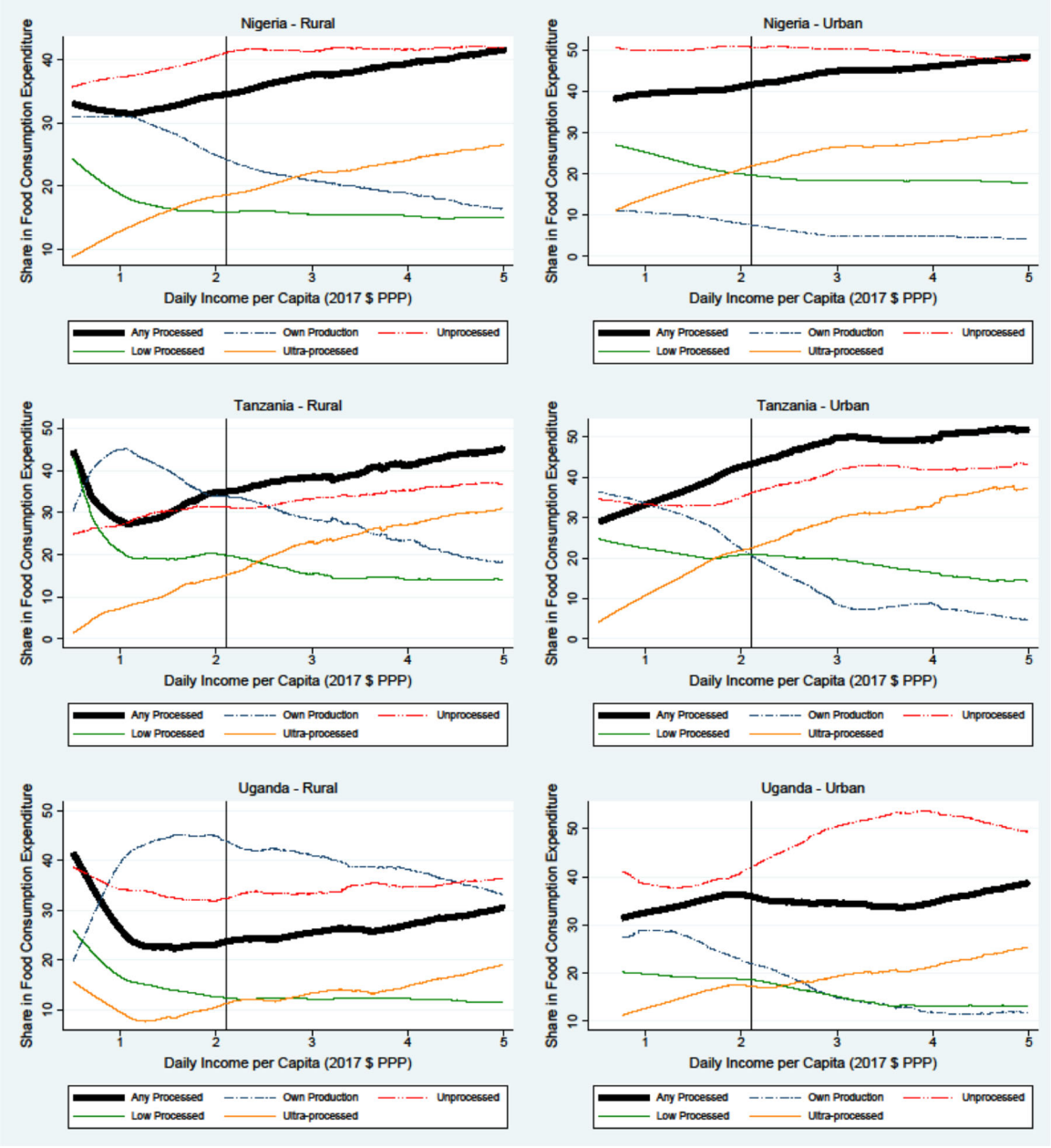

FIGURE 2 Processing LOWESS curves

initial negative slope below 1 USD followed by a strong positive slope before leveling off at expenditure above 3 USD.

Figure 2 shows LOWESS curves relating TE and the shares in food consumption expenditure of the various levels of processing of food. The variables of most interest are overall processed food share, low-processed, and ultra-processed.

First, for overall processed food in rural areas, in Nigeria, the share falls slightly with income leading up to 1 USD and then climbs slowly and steadily beyond that, with only a small difference between the poor and the nonpoor. In Tanzania and Uganda, the share falls sharply from incomes leading up to about 1 USD, and then rises fast in Tanzania and more moderately in Uganda from that TE on into the nonpoor strata. In urban areas, the curves are similar to those in the rural areas, but without the initial fall in the share in TEs lower than 1 USD, and in all countries, the shares have higher minimum values than in rural areas. The slope in urban Tanzania is notably steep at income levels below 3 USD.

Second, for low-processed food, in rural and urban Nigeria and Uganda, the shares are relatively high but declining over the TE range of the poor. Past the poverty line, the share declines slowly with rising TEs. In rural Tanzania, the share declines rapidly leading up to a TE of 1 USD and then slowly declines beyond that. In urban

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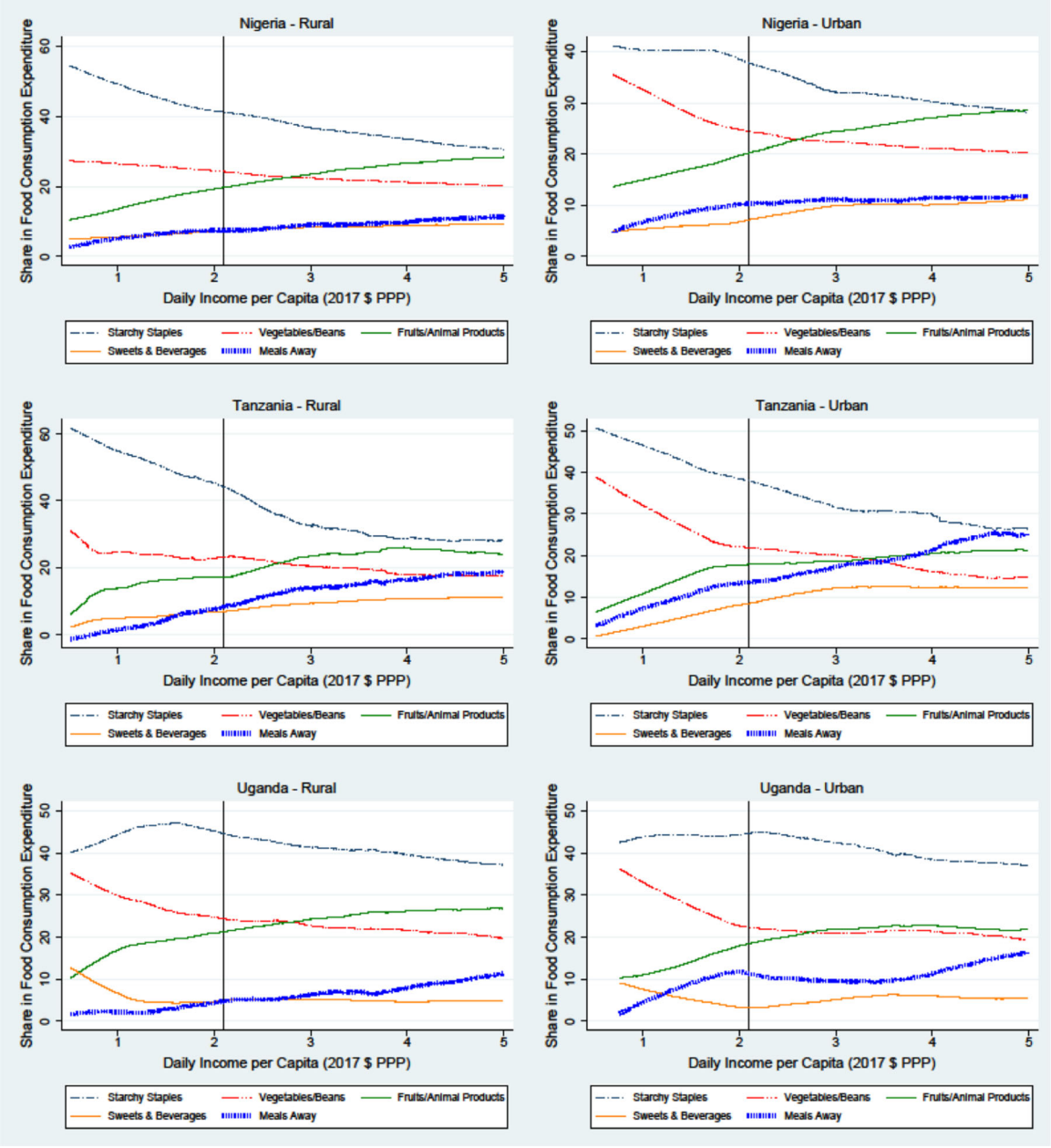

FIGURE 3 Product LOWESS curves

Tanzania, the slope is similar to those of urban Nigeria and Uganda.

Third, for ultra-processed food in rural and urban Nigeria and rural Tanzania, the share climbs rapidly over the TEs of both the poor and the nonpoor strata. In rural Uganda, the shares initially decline till expenditures just above 1 USD then climbs steadily thereafter. The relationships between ultra-processed food and TE are similar in urban areas to what we observe in rural areas, with the exception that there is not the declining share below 1 USD in urban Uganda.

Figure 3 shows LOWESS curves relating TE to product shares. The following results stand out.

First, for starchy staples, in rural and urban areas of Nigeria and Tanzania, the share starts high and then drops rapidly over both the poor and the nonpoor. This is as Bennett's Law would predict but the curves are interesting because the fall starts at very low incomes. In rural Uganda, the share at first rises to the mid-poor point and then drops as in the other cases. The initial rise depicting the poorest spending additional income on staples was also found in the Philippines by Bouis (1994). In Uganda's urban areas, the share is steady and high over the TEs of the poor and then drifts down slowly among the nonpoor.

Second, for vegetables/beans, in rural Nigeria and Tanzania, the share starts relatively high and then drifts down

over the poor and the nonpoor. In all urban areas and rural Uganda, the share starts high and then falls sharply over the poor and then gradually drifts lower over the non-poor.

Third, for fruits/animal products, in rural and urban Nigeria, the share starts low and then rises fast over both the poor and the nonpoor. In rural and urban Tanzania and Uganda, the share starts low and rises fast over the poor, and then slowly over the nonpoor.

Fourth, for sweets and beverages, in rural Nigeria, the share is low and rises only slightly from the lower-poor to the strata of the middle class. In urban Nigeria and rural Tanzania, the share starts low but rises more steeply both among the poor and the nonpoor. In urban Tanzania, the share rises steeply over the poor right up to 3 USD and then is flat beyond that. In rural Uganda, the share falls up to the poverty line and then flattens. In urban Uganda, the share falls up to the poverty line, then rises through the income range of the vulnerable middle class and flattens at incomes above 4 USD.

Fifth, for meals away from home, in both rural and urban Nigeria and rural Uganda, the share starts very low and then grows steadily over both poor and nonpoor. The pattern in Tanzania is like Nigeria's but the growth is much steeper. The shares in urban Uganda steeply rise among the poor and the upper middle class, remaining relatively flat among the vulnerable middle class.

In sum, the main findings that emerge from the detail of the LOWESS curves are the following: (1) Across countries, in rural and urban areas, in most cases, diet change (meaning diets that differ over TE levels in a cross-section sense, not over time as our data are cross-sectional) takes place among the poor as well as the nonpoor. (2) Often the diet change is steepest among the poor and even often flattens after the poverty line. (3) In most cases, the average behavior of the poor and of the nonpoor do not differ much, a point made in Tables 3 and 4 as well. The upshot is that the diets of the poor are not stagnant, not inoculated from change because of poverty itself, but are changing rapidly, converging to those of the middle class.

These results imply that although products like the nonstaples should in the future be made cheaper for the poor, in most cases, these items are already sufficiently accessible and affordable for the poor to moderately or even rapidly increase their consumption of them even over the gradations of income below the poverty line. It also goes for the convenient but not always unhealthy processed foods that save them time. Unfortunately, the same also goes for the clearly unhealthy sweets and beverages. This suggests that nonincome variables such as the opportunity cost of time from working off-farm or outside the household are probably playing a role in inducing diet change (Senauer et al., 1986) even among the poor. We turn to regression estimations of these determinants next.

4 | ENGEL CURVE REGRESSIONS

4.1 | Model and estimation methods

To examine the income and nonincome determinants of the above consumption expenditure behaviors, we used an augmented Engel curve (Banks et al., 1997) as follows:

$$C = f(Y^*, A^*, Z^*, W^*), \quad (1)$$

C refers to a set of dependent variables: shares of different sources, processing levels, and product categories in total food consumption expenditure. The determinants are as follows.

Y, income, is proxied as TE.

A are proxies for the household's access to food markets, including discrete variables that capture *city size* (residence in a primary city (more than one million) or a secondary city (between 100,000 and one million, with the excluded variable being tertiary city) (Sauer et al., 2021). We expect that the larger the city the greater the access to fruits/animal products and processed foods and be associated with employment and lifestyles correlated with the drive to save time home-processing food. The discrete variables for *ownership of a car, motorcycle, or bicycle* are included to reflect personal transaction costs to go to markets and shops.

Z are variables that reflect the preferences of the individuals in the households that theoretically impinge on consumption choices (Turrell & Kavanagh, 2006). *Nonfarm employment* is calculated as the total of household full-time equivalents of labor in off-farm employment. A household's *dependency ratio* is the number of dependents (ages below 15 and above 65) divided by the total members within the household. Nonfarm employment and the dependency ratio both would increase households' opportunity cost of time, driving them to want to save time by buying processed food and providing cash for purchases. The number of *household adult equivalents* is the number of members weighted by age (adult = 1, below age 15 = .7, and below age 5 = .5).

Independent variables that proxy for the shadow prices of the household's ability to produce, prepare, and preserve foods that contribute to household preferences are *land farmed* and *own a cooking appliance*. *Land farmed* indicates the hectares of land that a household farmed during the previous harvest season. Larger areas of farmed land are more likely to be used for commercial purposes, reducing the marginal effect on household consumption expenditure as farmed area increases. Farming one's own land is expected to lead to greater consumption expenditure of food from own production, so reducing demand for purchased foods. *Tropical livestock units* (TLUs) are

aggregate measures of household livestock ownership. Greater TLUs are expected to increase the share of nonstaple foods. Ownership of a *cooking appliance* will reduce the preparation cost of food and thus reduce purchases of processed food.

W is a set of variables for norms and beliefs and attitudes such as understanding and pursuing better nutrition. While these are intangibles, we proxy them with several socio-demographic variables: (1) *household head completing secondary school* accounts for the potential influence of education on food consumption behavior, perhaps, especially on consuming nutritious nonstaples such as fruits and vegetables and pulses. (2) *Age of the household head* as an older household might expend less energy in manual word and seek fewer calories and tend toward nonstaples, although it might also tend toward traditional staples-centered dishes. (3) *Gender of the household head* may affect consumption perhaps by putting an emphasis on healthy foods in a female-headed household (Smith et al., 2003). (4) *Married head of household* accounts for the potential impact of joint decisions on food consumption behavior; (5) *ownership of a telephone*, *television, or radio* may affect consumption choices via advertisements for purchased processed foods, but also via health information about healthy foods.

Appendix tables show the data for the independent variables by stratum.

The Engel curve regressions are estimated following the functional form of Banks et al. (1997) that includes both log income and squared log income, treating total income as exogenous in food demand analysis (Subramanian & Deaton, 1996). As the shares of consumption expenditure that serve as the dependent variables are bound between zero and one, and the data used in this analysis are primarily collected in a 1-week survey period (two separate 1-week periods in Nigeria) resulting in many households with some food aggregate shares consumption expenditure equal to zero% or 100%, we use the fractional probit method of estimation (Papke & Wooldridge, 1996, 2008). This model estimates the marginal effects of the predictors of a dependent variable that takes values of a closed set of zero to one.

4.2 | Regression results

Tables 7 and 8 show results for rural and urban regressions for the shares of food sources. We discuss only the significant results.

First, in rural and urban areas, per capita, TE has a positive effect on the share of overall purchases in food consumption expenditure in Nigeria and Tanzania (but not in Uganda) and for all countries on FAFH. By contrast, the lack of significance for purchases for consuming at home corroborates the descriptive findings that these are important for all income levels in rural areas. Interestingly, in urban areas, TE/capita has a negative effect on the purchase share for at-home consumption in all countries (insignificant in Uganda); this may be because of a greater emphasis on FAFH by the richer households.

Second, in rural areas, nearly across the board, nonfarm employment has a positive effect on all categories of food purchases. This appears to be due to both a cash income effect and substitution for own farming. The marginal effect in Tanzania is notably larger than in Nigeria and Uganda, as one would expect with lower nonfarm employment, lower incomes, and a more rural country.

Third, the household head's having completed secondary school has a positive effect on overall purchased food, specifically on purchases for at-home consumption in rural Nigeria (correlated one would think with opportunity cost of time). Furthermore, in urban areas, while it spurs purchases for at-home consumption, it is negatively correlated with the FAFH share. This may be linked to more educated households having salaried jobs that allow them to return home for lunch rather than having to take lunch near worksites or on the road on the way to work.

Fourth, the household head being female in rural areas strongly reduces FAFH as one would expect from the correlation of z-good (home chores) and women's time. But it has a mixed effect on the share of overall purchases, strongly positive in Nigeria and negative in Tanzania, perhaps linked to how closely women need to stay at the farm instead of working off-farm in the two countries. In urban areas of the three countries, having a female household head has a sharply negative effect on the share of FAFH and a strong positive effect on purchases of food for at-home consumption. This may suggest that these female heads of households are working outside of the home and thus purchase food, but predominately purchase the less expensive food that they would prepare at home rather than the more expensive FAFH.

Fifth, in rural and urban areas being older and married reduces FAFH and increases the share of at-home purchases as one would expect (with the image of bachelors eating away from home).

Tables 9 and 10 show regressions results for shares of food at low- and ultra-processing levels in food consumption expenditure in rural and urban areas. Regression results for unprocessed food shares can be found in Appendix Tables 6 and 7.

First, consistent with the descriptive findings, in rural and urban areas, TE/capita is negatively correlated with the share of low-processed and positively with ultra-processed. This is consistent with an image of poorer

TABLE 7 Regressions for food source shares––rural subsample

	Purchased			Purchased, at home			Food away from home		
Variables	**Nigeria**	**Tanzania**	**Uganda**	**Nigeria**	**Tanzania**	**Uganda**	**Nigeria**	**Tanzania**	**Uganda**
Annual TE/cap (PPP USD)	.075***	.145***	.014	−.004	.004	−.013	.080***	.135***	.024*
	(.009)	(.027)	(.017)	(.010)	(.031)	(.017)	(.007)	(.022)	(.012)
Nonfarm labor FTEs	.031***	.110***	.046***	.023***	.117***	.030***	.007***	−.013	.014***
	(.005)	(.022)	(.008)	(.004)	(.022)	(.008)	(.002)	(.015)	(.004)
HHH completed secondary school	.030***	.076	.021	.026**	.036	.023	.005	.005	.002
	(.010)	(.049)	(.032)	(.010)	(.050)	(.031)	(.007)	(.029)	(.017)
Adult equivalents	.000	−.008	−.015***	−.002	−.014***	−.008*	.003**	.006	−.006**
	(.002)	(.005)	(.004)	(.003)	(.005)	(.004)	(.001)	(.004)	(.002)
Dependency ratio	.064***	−.065	−.071**	.050***	−.015	.009	.018	−.014	−.061***
	(.018)	(.050)	(.035)	(.018)	(.053)	(.036)	(.013)	(.044)	(.019)
Female is HHH	.059***	−.077**	−.024	.115***	.038	.039*	−.054***	−.104***	−.056***
	(.019)	(.033)	(.022)	(.018)	(.036)	(.022)	(.016)	(.027)	(.014)
Age of HHH	−.002***	−.003***	−.004***	−.001*	−.001	−.002***	−.001***	−.002**	−.001***
	(.000)	(.001)	(.001)	(.000)	(.001)	(.001)	(.000)	(.001)	(.000)
HHH married	.062***	−.009	.026	.079***	.028	.080***	−.015	−.027	−.028**
	(.020)	(.026)	(.027)	(.018)	(.030)	(.026)	(.016)	(.022)	(.014)
HH owns cooking appliance	.023*	.093	.112	.035***	−.023	.083	−.012	.055	.019
	(.012)	(.059)	(.071)	(.012)	(.064)	(.070)	(.008)	(.039)	(.028)
Owns TV	.017	.018	.039	.041***	.079*	.058	−.024***	−.048*	−.016
	(.012)	(.042)	(.036)	(.012)	(.042)	(.037)	(.008)	(.027)	(.021)
Owns radio	.031***	−.012	.090	.032***	−.002	.115*	.000	−.014	−.021
	(.009)	(.025)	(.072)	(.010)	(.028)	(.069)	(.007)	(.020)	(.027)
Owns bicycle	−.006	−.032	.016	.002	−.042	.026	−.006	.019	−.006
	(.011)	(.027)	(.017)	(.011)	(.028)	(.017)	(.007)	(.022)	(.009)
Owns motorcycle	−.016*	−.074	.057**	−.026**	−.085*	.062**	.012*	−.003	−.007
	(.009)	(.046)	(.025)	(.010)	(.050)	(.027)	(.007)	(.034)	(.015)
Owns car	.049***	−.121**	−.071	.036**	.051	−.104*	−.003	−.156**	.035
	(.018)	(.058)	(.083)	(.018)	(.084)	(.055)	(.010)	(.072)	(.044)
Owns mobile phone	−.026***	−.008	.007	−.002	.071*	.002	−.024***	−.058*	.007
	(.010)	(.035)	(.019)	(.011)	(.037)	(.019)	(.007)	(.030)	(.011)
Farmland ha owned/cap	−.000*	−.008	.005	.000	.006	.002	−.001	−.011	.003
	(.000)	(.025)	(.016)	(.000)	(.025)	(.014)	(.000)	(.013)	(.006)
Tropical livestock units/cap	.259*	−.006	−.023***	.459***	.023	−.017***	−.204***	−.025***	-.005
	(.151)	(.022)	(.008)	(.158)	(.020)	(.006)	(.067)	(.009)	(.004)
Observations	3368	676	2284	3368	676	2284	3368	676	2284

Standard errors in parentheses.

***$p < .01$. **$p < .05$. *$p < .1$.

women seeking time-saving flour (instead of laboriously grinding raw grain themselves, a process that used to (in the 1980s and 1990s) take around 4 h a day per rural woman in African countries (Reardon et al., 2021) in order to work outside the home. As households grow richer, it appears that the buying of flour wanes and is substituted by purchases of second-stage processed products like bread and noodles, saving these women even more kitchen time.

Second, as expected, in rural areas, nonfarm FTEs are correlated with higher shares of low- and ultra-processed foods, but with only half of the correlations significant. This implies that the opportunity cost of time is not the only driver of seeking processed food presumably to save time.

Third, in urban areas, only in Nigeria does being in a primary or secondary city (compared with a town) signify a greater share for low-processed foods; but interestingly

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TABLE 8 Regressions for food source shares––urban subsample

	Purchased			Purchased, at home			Food away from home		
Variables	**Nigeria**	**Tanzania**	**Uganda**	**Nigeria**	**Tanzania**	**Uganda**	**Nigeria**	**Tanzania**	**Uganda**
Annual TE/cap (PPP USD)	.029***	.042*	.021	−.048***	−.109**	−.037	.070***	.120***	.062**
	(.009)	(.023)	(.023)	(.016)	(.043)	(.033)	(.015)	(.038)	(.027)
Nonfarm labor FTEs	.017***	.016	.003	.008*	.011	.004	.010**	.012	.011
	(.004)	(.013)	(.010)	(.005)	(.017)	(.013)	(.004)	(.014)	(.011)
Primary city	.038***	.091***	.058	.023	.049	.066	.022	.023	−.015
	(.015)	(.025)	(.041)	(.021)	(.046)	(.045)	(.018)	(.041)	(.031)
Secondary city	.055***	−.027	.067***	.069***	−.009	.069**	−.002	−.021	−.012
	(.008)	(.028)	(.025)	(.015)	(.050)	(.033)	(.015)	(.046)	(.026)
HHH completed secondary school	.003	−.042*	.001	.016	.074*	.070**	−.011	−.090**	−.076***
	(.008)	(.025)	(.025)	(.013)	(.045)	(.032)	(.011)	(.045)	(.025)
Adult equivalents	−.000	−.002	−.006	.005	−.019*	.008	−.004	.016	−.014**
	(.002)	(.005)	(.006)	(.004)	(.011)	(.008)	(.004)	(.010)	(.006)
Dependency ratio	.002	−.127**	−.039	.058**	.087	.129**	−.055**	−.228***	−.134***
	(.014)	(.050)	(.051)	(.029)	(.085)	(.060)	(.027)	(.079)	(.050)
Female is HHH	−.029*	−.068***	−.076**	.105***	.237***	.186***	−.127***	−.243***	−.258***
	(.015)	(.024)	(.034)	(.033)	(.053)	(.041)	(.033)	(.054)	(.031)
Age of HHH	−.001***	−.001**	−.004***	.000	.002*	−.003**	−.002***	−.004***	−.000
	(.000)	(.001)	(.001)	(.001)	(.001)	(.001)	(.000)	(.001)	(.001)
HHH married	−.010	−.061**	.004	.076***	.201***	.156***	−.078***	−.213***	−.105***
	(.017)	(.024)	(.035)	(.029)	(.039)	(.046)	(.028)	(.032)	(.031)
HH owns cooking appliance	.009	.068***	.042	.050***	.057	.005	−.041**	−.009	.017
	(.009)	(.025)	(.028)	(.020)	(.046)	(.042)	(.019)	(.043)	(.032)
Owns TV	.020**	.028	.070**	.027*	.063	.091**	−.002	−.019	.001
	(.009)	(.024)	(.028)	(.015)	(.048)	(.039)	(.013)	(.046)	(.029)
Owns radio	.001	.003	.006	−.008	−.014	.052	.007	.009	−.068**
	(.008)	(.022)	(.028)	(.014)	(.036)	(.040)	(.013)	(.033)	(.032)
Owns bicycle	−.025	−.019	−.032	−.020	.040	.010	−.009	−.054	−.046
	(.016)	(.026)	(.025)	(.022)	(.047)	(.034)	(.018)	(.039)	(.032)
Owns motorcycle	−.031***	.026	−.008	−.027*	.067	.029	−.005	−.016	−.040
	(.009)	(.031)	(.035)	(.015)	(.041)	(.042)	(.013)	(.037)	(.034)
Owns car	.010	−.031	−.021	.009	.201	.064	−.001	−.104	−.062**
	(.011)	(.057)	(.037)	(.017)	(.122)	(.043)	(.015)	(.091)	(.031)
Owns mobile phone	−.024*	.012	.023	.013	.157**	−.016	−.036	−.140**	.077**
	(.014)	(.034)	(.051)	(.028)	(.076)	(.068)	(.027)	(.070)	(.036)
Farmland ha owned/cap	−.000	−.058**	−.159**	.001	−.125	−.125	−.002	.016	−.028
	(.002)	(.028)	(.076)	(.004)	(.077)	(.088)	(.002)	(.047)	(.060)
Tropical livestock units/cap	−.464*	−.022*	.001	−.805**	−.056***	.026*	.051	.016	−.080***
	(.253)	(.012)	(.011)	(.404)	(.018)	(.014)	(.290)	(.019)	(.026)
Observations	1558	488	716	1558	488	716	1558	488	716

Standard errors in parentheses.
***$p < .01$. **$p < .05$. *$p < .1$.

TABLE 9 Regressions for processing level shares––rural subsample

	Low processed			Ultra-processed		
Variables	**Nigeria**	**Tanzania**	**Uganda**	**Nigeria**	**Tanzania**	**Uganda**
Annual TE/cap (PPP USD)	−.034***	−.085***	−.036***	.098***	.151***	.048***
	(.004)	(.017)	(.008)	(.007)	(.022)	(.015)
Nonfarm labor FTEs	.006***	.024**	.004	.010***	−.003	.009
	(.002)	(.010)	(.003)	(.002)	(.014)	(.006)
HHH completed secondary school	.006	.012	.015	.002	.007	.041*
	(.004)	(.026)	(.015)	(.007)	(.032)	(.022)
Adult equivalents	−.005***	−.014***	−.002	.000	.005	−.020***
	(.001)	(.003)	(.002)	(.001)	(.004)	(.004)
Dependency ratio	.014	−.054	.002	.042***	−.026	−.024
	(.009)	(.036)	(.016)	(.013)	(.046)	(.029)
Female is HHH	.026***	.007	.009	−.042**	−.106***	−.083***
	(.008)	(.025)	(.009)	(.016)	(.029)	(.018)
Age of HHH	.000***	.000	.000	−.001***	−.001*	−.001***
	(.000)	(.001)	(.000)	(.000)	(.001)	(.000)
HHH married	.007	.000	.010	−.008	−.029	−.063***
	(.007)	(.018)	(.011)	(.017)	(.024)	(.020)
HH owns cooking appliance	−.001	−.012	−.002	.006	.060	.040
	(.005)	(.029)	(.022)	(.008)	(.041)	(.042)
Owns TV	.005	.006	.005	−.013	−.038	−.005
	(.005)	(.020)	(.013)	(.008)	(.025)	(.026)
Owns radio	−.004	−.029*	.003	.005	−.008	−.028
	(.004)	(.015)	(.024)	(.007)	(.020)	(.034)
Owns bicycle	−.011**	−.040**	−.009	−.004	.009	−.009
	(.004)	(.017)	(.007)	(.007)	(.022)	(.012)
Owns motorcycle	−.008**	−.014	.010	.014**	−.011	−.009
	(.004)	(.026)	(.010)	(.007)	(.034)	(.020)
Owns car	.014	−.005	−.009	.004	−.206**	.024
	(.009)	(.052)	(.031)	(.009)	(.080)	(.059)
Owns mobile phone	.006	.026	−.004	−.015**	−.055*	−.040***
	(.005)	(.023)	(.009)	(.007)	(.032)	(.015)
Farmland ha owned/cap	.000	.010	.005	−.000***	−.014	−.006
	(.000)	(.015)	(.005)	(.000)	(.014)	(.011)
Tropical livestock units/cap	.102*	.008	−.002	−.259***	−.029***	−.012**
	(.054)	(.009)	(.003)	(.065)	(.009)	(.006)
Observations	3368	676	2284	3368	676	2284

Standard errors in parentheses.

***$p < .01$. **$p < .05$. *$p < .1$.

this urban residence pattern is uniformly insignificant for ultra-processed shares. This implies that ultra-processed food is penetrating the small towns no less than in larger cities.

Fourth, as expected, in rural areas, adult equivalents (as a proxy for labor availability, controlling for nonfarm employment), are negatively correlated with purchases of both low- and ultra-processed foods. That is consistent with opportunity costs of time as a driver of processed food purchase.

Fifth, the household head's being female is strongly correlated with greater shares of low processed food in rural Nigeria and all urban areas. The single household head is harried by household chores and her job and seeks to reduce the burden of the kitchen. Female-headed households are also linked to a lower share of ultra-processed

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TABLE 10 Regressions for processing level shares––urban subsample

	Low processed			Ultra-processed		
Variables	**Nigeria**	**Tanzania**	**Uganda**	**Nigeria**	**Tanzania**	**Uganda**
Annual TE/cap (PPP USD)	−.042***	−.085***	−.035***	.094***	.118***	.103***
	(.009)	(.015)	(.010)	(.015)	(.035)	(.026)
Nonfarm labor FTEs	−.001	.002	.001	.013***	.020	.010
	(.002)	(.006)	(.004)	(.005)	(.013)	(.011)
Primary city	.041***	.011	−.010	.001	.036	.012
	(.009)	(.014)	(.014)	(.018)	(.038)	(.032)
Secondary city	.041***	.006	.004	−.017	−.019	−.025
	(.007)	(.018)	(.010)	(.014)	(.047)	(.027)
HHH completed secondary school	−.003	.026*	.021**	−.010	−.094*	−.081***
	(.007)	(.014)	(.010)	(.011)	(.049)	(.025)
Adult equivalents	−.002	−.007*	.008***	−.005	.008	−.017**
	(.002)	(.004)	(.003)	(.004)	(.009)	(.007)
Dependency ratio	.018	.022	.013	−.037	−.180**	−.120**
	(.014)	(.029)	(.023)	(.028)	(.078)	(.050)
Female is HHH	.033**	.080***	.047***	−.128***	−.250***	−.183***
	(.014)	(.017)	(.013)	(.032)	(.060)	(.035)
Age of HHH	.001***	.001**	.000	−.002***	−.004***	−.003**
	(.000)	(.000)	(.000)	(.000)	(.001)	(.001)
HHH married	.010	.050***	.021	−.086***	−.213***	−.071*
	(.013)	(.013)	(.016)	(.028)	(.034)	(.042)
HH owns cooking appliance	.011	.001	−.018	−.018	.000	.026
	(.009)	(.013)	(.013)	(.018)	(.043)	(.033)
Owns TV	−.007	.017	.003	.017	−.009	−.029
	(.008)	(.015)	(.012)	(.013)	(.043)	(.030)
Owns radio	−.006	−.007	−.012	.006	−.002	−.051*
	(.006)	(.012)	(.012)	(.012)	(.032)	(.029)
Owns bicycle	−.009	−.012	−.002	−.008	−.037	−.053
	(.010)	(.015)	(.012)	(.019)	(.034)	(.033)
Owns motorcycle	−.011*	−.008	−.010	−.009	−.001	−.054
	(.007)	(.013)	(.018)	(.013)	(.034)	(.036)
Owns car	−.008	.022	−.017	.002	−.063	−.075**
	(.009)	(.025)	(.017)	(.015)	(.076)	(.032)
Owns mobile phone	.014	.009	.013	−.033	−.118*	−.071
	(.011)	(.027)	(.019)	(.028)	(.067)	(.065)
Farmland ha owned/cap	.002*	−.068**	−.018	−.000	.013	−.096
	(.001)	(.029)	(.026)	(.002)	(.040)	(.082)
Tropical livestock units/cap	−.429***	−.009	.004	.142	.008	−.034**
	(.133)	(.007)	(.003)	(.423)	(.021)	(.017)
Observations	1558	488	716	1558	488	716

Standard errors in parentheses.
***$p < .01$. **$p < .05$. *$p < .1$.

TABLE 11 Regressions for product shares––rural subsample

	Starchy staples			Vegetables/Beans			Fruits/Animal products			Sweets and beverages		
Variables	**Nigeria**	**Tanzania**	**Uganda**	**Nigeria**	**Tanzania**	**Uganda**	**Nigeria**	**Tanzania**	**Uganda**	**Nigeria**	**Tanzania**	**Uganda**
Annual TE/cap (PPP USD)	−.091***	−.151***	−.055***	−.054***	−.091***	−.074***	.064***	.083***	.088***	.012***	.031***	−.006
	(.006)	(.020)	(.012)	(.004)	(.017)	(.008)	(.006)	(.016)	(.010)	(.003)	(.008)	(.006)
Nonfarm labor FTEs	−.005**	−.004	−.000	−.001	−.001	−.009**	−.001	.004	.000	−.000	.009*	.004*
	(.002)	(.012)	(.005)	(.001)	(.009)	(.004)	(.002)	(.010)	(.005)	(.001)	(.005)	(.002)
HHH completed secondary school	−.015**	−.001	−.041**	.008**	−.005	.007	.006	.003	−.011	−.003	−.007	−.010
	(.006)	(.024)	(.020)	(.004)	(.016)	(.015)	(.006)	(.019)	(.016)	(.003)	(.010)	(.008)
Adult equivalents	.003***	.009***	.012***	−.004***	−.018***	−.007***	−.001	.004	.013***	−.001***	−.003	−.006***
	(.001)	(.003)	(.003)	(.001)	(.003)	(.002)	(.001)	(.003)	(.003)	(.001)	(.002)	(.001)
Dependency ratio	−.023**	−.038	.027	−.009	−.027	−.021	.011	.098***	.055***	−.006	.024	−.019*
	(.011)	(.034)	(.027)	(.007)	(.030)	(.017)	(.011)	(.032)	(.020)	(.005)	(.016)	(.011)
Female is HHH	.002	.052**	.044***	.034***	.055***	.021**	.020	−.005	.032**	.001	−.045***	−.020***
	(.014)	(.025)	(.015)	(.007)	(.017)	(.010)	(.012)	(.020)	(.012)	(.006)	(.011)	(.007)
Age of HHH	.001***	.001***	.002***	.000***	.001***	.001***	.000	−.001	−.002***	−.000*	−.000	−.000
	(.000)	(.001)	(.000)	(.000)	(.000)	(.000)	(.000)	(.001)	(.000)	(.000)	(.000)	(.000)
HHH married	.002	.029	.009	.017**	−.010	.021	.002	.011	.069***	.006	−.027***	.013
	(.013)	(.020)	(.018)	(.007)	(.014)	(.013)	(.012)	(.018)	(.015)	(.005)	(.008)	(.008)
HH owns cooking appliance	−.027***	−.021	−.023	−.003	−.018	.040*	.026***	−.021	−.052*	.017***	.004	−.013
	(.007)	(.039)	(.035)	(.004)	(.030)	(.024)	(.008)	(.031)	(.027)	(.003)	(.010)	(.010)

(Continues)

TABLE 11 (Continued)

Variables	Starchy staples			Vegetables/Beans			Fruits/Animal products			Sweets and beverages		
	Nigeria	Tanzania	Uganda	Nigeria	Tanzania	Uganda	Nigeria	Tanzania	Uganda	Nigeria	Tanzania	Uganda
Owns TV	−.015**	−.006	.016	.001	.047	−.025*	.030***	.001	.026	.008**	.001	−.007
	(.007)	(.038)	(.022)	(.004)	(.035)	(.015)	(.007)	(.022)	(.017)	(.003)	(.010)	(.007)
Owns radio	.001	−.031	.009	.008**	.014	−.007	−.006	.014	.054**	−.003	.014*	.011
	(.006)	(.019)	(.030)	(.004)	(.014)	(.022)	(.006)	(.017)	(.024)	(.003)	(.007)	(.012)
Owns bicycle	−.004	−.004	−.050***	.005	−.002	.036***	.004	.008	.030***	−.001	−.015**	.012**
	(.006)	(.018)	(.012)	(.004)	(.011)	(.009)	(.006)	(.016)	(.010)	(.003)	(.007)	(.005)
Owns motorcycle	−.005	.011	.011	.000	−.001	.011	−.009	−.013	−.005	.005**	−.006	−.007
	(.006)	(.028)	(.017)	(.004)	(.020)	(.013)	(.006)	(.025)	(.013)	(.003)	(.011)	(.007)
Owns car	−.007	.046	−.013	.010	.009	.049	−.002	.081	−.048	.006	−.028	−.009
	(.012)	(.051)	(.057)	(.006)	(.033)	(.039)	(.009)	(.069)	(.031)	(.006)	(.025)	(.016)
Owns mobile phone	−.003	−.005	.054***	.004	.015	.003	.022***	.044*	−.016	.008***	.023**	−.010
	(.007)	(.024)	(.014)	(.004)	(.017)	(.010)	(.007)	(.024)	(.012)	(.003)	(.010)	(.007)
Farmland ha owned/cap	.000**	.024	−.031**	−.000***	.000	.019***	.000***	−.007	.006	−.000***	−.010**	.010***
	(.000)	(.017)	(.014)	(.000)	(.009)	(.006)	(.000)	(.009)	(.005)	(.000)	(.004)	(.003)
Tropical livestock units/cap	.173***	−.005	−.013***	.094*	.001	.003	−.038	.023***	.017***	−.063*	.002	.001
	(.063)	(.008)	(.005)	(.056)	(.005)	(.003)	(.105)	(.005)	(.004)	(.035)	(.003)	(.002)
Observations	3368	676	2284	3368	676	2284	3368	676	2284	3368	676	2284

Standard errors in parentheses.

***$p < .01$. **$p < .05$. *$p < .1$.

TABLE 12 Regressions for product shares––urban subsample

Variables	Starchy staples			Vegetables/Beans			Fruits/Animal products			Sweets and beverages		
	Nigeria	Tanzania	Uganda	Nigeria	Tanzania	Uganda	Nigeria	Tanzania	Uganda	Nigeria	Tanzania	Uganda
Annual TE/cap (PPP USD)	−.081***	−.113***	−.086***	−.061***	−.069***	−.059***	.063***	.044***	.061***	.027***	.025***	.031***
	(.010)	(.018)	(.019)	(.009)	(.014)	(.011)	(.008)	(.017)	(.015)	(.007)	(.010)	(.011)
Nonfarm labor FTEs	−.006**	−.012	−.007	−.001	−.002	−.005	−.003	.003	.006	.001	.008*	.006
	(.003)	(.008)	(.008)	(.002)	(.005)	(.005)	(.003)	(.008)	(.007)	(.002)	(.004)	(.004)
Primary city	.014	−.017	−.019	.004	.005	.015	−.016	−.020	−.011	−.036***	.009	−.015
	(.011)	(.021)	(.023)	(.008)	(.014)	(.016)	(.013)	(.021)	(.021)	(.008)	(.011)	(.012)
Secondary city	.022***	.022	−.014	.011*	.014	.030***	−.018*	−.029	.008	−.027***	.001	−.005
	(.008)	(.029)	(.019)	(.007)	(.020)	(.011)	(.010)	(.020)	(.017)	(.006)	(.014)	(.010)
HHH completed secondary school	.008	.025	.021	−.000	.051**	.045***	.004	.031*	.021	−.008	−.002	−.008
	(.009)	(.023)	(.019)	(.006)	(.023)	(.012)	(.008)	(.018)	(.016)	(.005)	(.014)	(.009)
Adult equivalents	.004	−.002	.019***	−.002	−.006*	.001	.003	−.000	−.000	−.000	.001	−.005*
	(.003)	(.004)	(.005)	(.002)	(.004)	(.003)	(.002)	(.005)	(.004)	(.001)	(.003)	(.003)
Dependency ratio	.031	.060	.122***	.007	.026	.032	.017	.120***	.056*	.004	.018	−.002
	(.019)	(.046)	(.037)	(.012)	(.031)	(.023)	(.016)	(.035)	(.032)	(.011)	(.028)	(.020)
Female is HHH	.068***	.115***	.061***	.035**	.099***	.069***	.042**	.080***	.082***	−.017	−.035*	−.031**
	(.019)	(.027)	(.024)	(.015)	(.030)	(.014)	(.018)	(.023)	(.019)	(.011)	(.020)	(.013)
Age of HHH	.001*	.002***	.002***	.001***	.001*	.001	.001*	.000	−.001	−.001***	−.001**	−.000
	(.000)	(.001)	(.001)	(.000)	(.000)	(.000)	(.000)	(.001)	(.001)	(.000)	(.000)	(.000)
HHH married	.035**	.091***	.007	.010	.058***	.032*	.058***	.112***	.076***	−.007	−.033**	−.004
	(.017)	(.021)	(.026)	(.014)	(.017)	(.017)	(.016)	(.018)	(.021)	(.009)	(.015)	(.013)

(Continues)

TABLE 12 (Continued)

Variables	Starchy staples			Vegetables/Beans			Fruits/Animal products			Sweets and beverages		
	Nigeria	Tanzania	Uganda	Nigeria	Tanzania	Uganda	Nigeria	Tanzania	Uganda	Nigeria	Tanzania	Uganda
HH owns cooking appliance	−.015	.010	.010	.010	−.000	−.029**	.043***	.003	.009	.018**	.008	−.012
	(.011)	(.020)	(.024)	(.009)	(.018)	(.014)	(.010)	(.018)	(.019)	(.008)	(.011)	(.013)
Owns TV	−.013	.011	.030	−.000	−.001	.021*	.008	.005	.004	.009	.004	−.003
	(.009)	(.024)	(.022)	(.007)	(.015)	(.012)	(.009)	(.021)	(.020)	(.007)	(.012)	(.014)
Owns radio	−.001	.006	−.008	−.006	−.012	.000	.007	.005	.039**	.004	−.010	−.015
	(.007)	(.019)	(.020)	(.006)	(.012)	(.013)	(.008)	(.018)	(.018)	(.005)	(.009)	(.011)
Owns bicycle	.014	.008	−.001	−.001	.022	.031**	.008	.018	.029	−.013	−.013	.003
	(.014)	(.022)	(.022)	(.010)	(.014)	(.014)	(.014)	(.020)	(.020)	(.008)	(.010)	(.012)
Owns motorcycle	.024***	−.028	−.002	−.002	.007	−.011	−.016*	.043**	.055***	−.004	.004	.005
	(.008)	(.020)	(.026)	(.007)	(.014)	(.014)	(.008)	(.021)	(.021)	(.006)	(.011)	(.014)
Owns car	−.004	.073*	.040	−.001	−.003	.017	−.001	.049	.017	.015**	.007	−.003
	(.009)	(.043)	(.026)	(.006)	(.029)	(.019)	(.009)	(.041)	(.026)	(.007)	(.018)	(.016)
Owns mobile phone	.006	.050	.079*	.008	.039	−.020	.023	.030	.022	.007	−.000	−.031**
	(.017)	(.038)	(.042)	(.013)	(.024)	(.024)	(.016)	(.037)	(.040)	(.009)	(.027)	(.015)
Farmland ha owned/cap	.002*	.001	−.042	.000	−.000	.050	−.000	−.011	.083*	−.001*	.003	−.007
	(.001)	(.019)	(.046)	(.001)	(.016)	(.034)	(.001)	(.027)	(.042)	(.001)	(.012)	(.022)
Tropical livestock units/cap	−.117	−.003	−.009**	−.185***	−.007	.010**	.268**	−.001	.018***	−.078	−.014**	−.011**
	(.294)	(.008)	(.005)	(.062)	(.006)	(.004)	(.118)	(.013)	(.005)	(.079)	(.006)	(.005)
Observations	1558	488	716	1558	488	716	1558	488	716	1558	488	716

Standard errors in parentheses.

***$p < .01$. **$p < .05$. *$p < .1$.

food in all areas, perhaps viewed as a luxury in this category of household.

Tables 11 and 12 show regressions for different product types. Several results stand out.

First, in both rural and urban areas, TE/capita is strongly correlated in nearly all countries with a lower share of staples and vegetables/beans, a higher share of fruits/animal products, and sweets and beverages.

Second, there are notable minimal effects of certain independent variables on the product composition of expenditure. By and large, in rural areas, nonfarm employment does not have a strong effect on product composition. Also, being in a primary or secondary city (compared to a smaller town) has little effect on product composition, except for a dip in the shares of sweets and beverages in these two in Nigeria compared to small towns.

Third, in rural and urban areas, the dependency ratio (mainly the share of children in the family) has a positive and strong effect on the fruits/animal products consumption share in Tanzania and Uganda, possibly via dairy products. Moreover, female-headed households are linked with lower shares of sweets and beverages as well as meals away from home, but greater shares of vegetables/beans and fruits/animal products. This is consistent with a hypothesis of female household heads being more apt to seek healthier foods for their households (Smith et al., 2003).

5 | CONCLUSIONS

We tested the hypothesis that the African poor in rural and urban areas, in East and West Africa, are participating in the transformation of diets that are usually thought of as a phenomenon in the urban middle class. That transformation includes a shift to purchasing food, and alarmingly for nutritionists, purchasing unhealthy, highly processed food. There have also been worries that the transformation has been biased toward the spread of unhealthy foods but not enough of a spread of uptake of healthy foods such as vegetables and beans, and fruits and animal products. We had several salient findings.

First, we found that far from the poor being excluded from the transformation, the rural and urban poor are at the "cutting edge" of diet change in terms of rapid increase of consumption expenditure shares in unhealthy foods with increments to their incomes. We showed this with LOWESS curves and augmented Engel regressions. This appears linked to the poor sharing certain trends with the middle class––changes of employment (such as toward nonfarm employment) and lifestyles that emphasize the need to save time home-processing and home-cooking food to accommodate the rising opportunity costs of time: like the middle class, the poor are busy, and are consuming processed foods because they save them time, and also for the lure of their taste as their uptake of sweets also shows.

This first finding is worrying because far from the shift to unhealthy foods being a "middle class" phenomenon, its uptake is steepest among the poor. This reinforces the need for nutrition education and promotion of healthy alternatives for both the urban and rural poor, and not just in the upper stratum of the poor but even among the poorest with inflection points in diets as low as a dollar or so a day. Furthermore, it points to the need to assess the impact on the poor when evaluating policies regarding excise taxes on food (such as those recommended by Shekar and Popkin (2020)).

Second, we found that the shares of the diets of the poor tend to be increasing (with income) and not much lower than the middle class in (largely healthy) fruits and animal products. In fact, the share rises over the gradations of poverty up to a point near the share in the diets of the middle class is.

By contrast, we found that the poor depend more than the middle class on healthy vegetables and beans, and that share tends to decline going from the poor to the nonpoor. In terms of diet composition, this is good news. It also implies that supply chains in these countries are able to deliver these to the poor whether in rural or urban areas, although we did not test how food-safe or efficient the supply chains are.

Our results do not contradict the important points in the present debate about the excessive cost of nonstaples for SSA consumers, and the importance of further research on the food prices the poor pay relative to the nonpoor. Healthy food costs need to come down, and investments in better farming, wholesale markets, roads, and cold storage will all play a role for governments. But the results point to the fact that the poor pursue these products and depend on them already, and that they mainly purchase them, and that implies that further effort by governments to develop these markets will induce further gains in the path and directions the data imply the poor, and the markets, are taking.

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