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Household food consumption patterns in Addis Ababa, Ethiopia

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ABSTRACT

Overweight and obesity are rising rapidly in Ethiopia's urban areas, constituting a major public health concern. Dietary choices can be one of the key drivers of adult body-weight. Using data collected from a large household survey in Addis Ababa, we provide a snapshot of dietary patterns in Ethiopia's largest urban area. We find that starchy staples (cereals, roots, and tubers) are prominent in household food baskets, taking up 25 percent of the food budget and providing more than 50 percent of consumed calories, on average. In contrast, the consumption of all kinds of fruits and vitamin A-rich vegetables is very low. For the average household, meat products account for nearly 18 percent of the food budget but provide only 2 percent of total calories. Richer households consume relatively less starchy staples than poorer households, but more animal-source foods and vegetables. However, the importance of fruits in household diets rises very slowly with household incomes. Together, these findings suggest that further income growth will result in drastic changes in the composition of food demand in Addis Ababa. Considering projections for increasing incomes, especially in urban areas, this will have major implications for agricultural production in rural areas connected to Ethiopia's cities. There is also an urgent need to design cost-effective public health campaigns to reduce the emerging overweight and obesity crisis in urban Ethiopia.

1. INTRODUCTION

Many sub-Saharan African economies are undergoing rapid socio-economic transformations. Living standards are improving and the labor force is gradually moving away from agriculture in rural areas to service and manufacturing occupations, typically located in urban areas (Arndt, McKay, & Tarp 2016; Diao, Harttgen, & McMillan 2017; McKay 2013; McMillan & Harttgen 2014; McMillan, Rodrik, & Verduzco-Gallo 2014; Radelet 2010; Young 2012). This type of socio-economic transformation usually coincides with a nutrition transformation that involves major changes in physical activity and dietary habits. As a result of higher incomes, people begin to shift away from diets heavy in calorie-dense starchy staples to those containing more animal-sourced and processed foods and increase their intake of saturated fats (Pingali 2007; Pinstrup-Andersen 1986; Popkin 1998, 2003; Popkin & Bisgrove 1988).[1] Moreover, with urbanization, energy needs typically decline as people move from strenuous agricultural activities to low-activity occupations and more sedentary lifestyles. Together these changes are likely to result in unfavorable imbalance between energy intakes and expenditures (Hall et al. 2011; Hill 2006) and, therefore, an increase in the risk of overweight and obesity (Monda et al. 2007; Popkin, Adair, & Ng 2012).

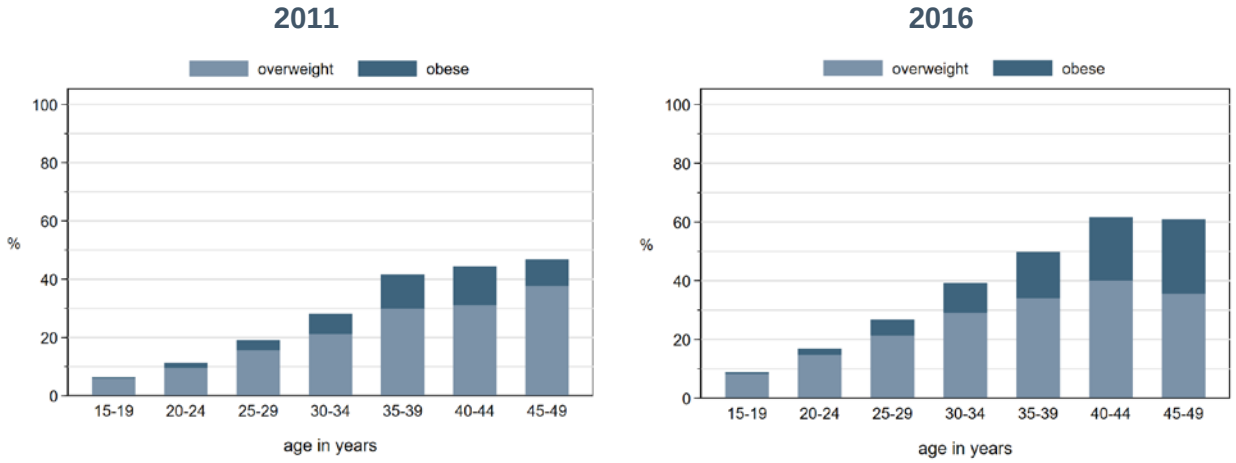
Overweight and obesity are a growing global public health concern, now also affecting most low and middle income countries (NCD Risk Factor Collaboration 2019; Popkin, Corvalan, & Grummer-Strawn 2019). It is widely acknowledged that overweight and obesity increase the risk of non-communicable diseases, such as diabetes, cardiovascular diseases and certain types of cancers, which in turn increase the risk of premature death (Wells et al. 2019).

While excess body-mass does not currently constitute a major public health concern in rural Ethiopia, the prevalence of overweight and obesity is rising rapidly in urban areas, especially among adult women (Golan et al. 2019). In 2011, 15 percent of urban women between the ages of 15 and 49 years were overweight or obese (body-mass index, BMI > 25 kg/m^2). By 2016, this share had

[1] While animal-source foods are excellent sources of essential amino acids that are not naturally synthesized within the body (Headey, Hirvonen, & Hoddinott 2018), some of them (e.g., red and processed meat) contain high levels of saturated fats and N-nitroso compounds, and polycyclic aromatic hydrocarbons, which are associated with a number of adverse health outcomes (Etemadi et al. 2017). Moreover, processed foods often contain large amount of added fats or sugars to maximize self-life and consumer appeal (Weaver et al. 2014).

increased to 21 percent. These prevalence rates are even higher in the capital, Addis Ababa, where 20 percent of such women were overweight or obese in 2011, rising to 29 percent by 2016. The overweight and obesity risks increase sharply with age (Figure 1).

Figure 1. Rise of overweight and obesity among prime-age women in Addis Ababa between 2011 and 2016



Source: Authors' calculation from 2011 and 2016 Demographic and Health Surveys for Ethiopia.

Against this backdrop, we report on household dietary patterns in Addis Ababa – the largest and most affluent urban area in Ethiopia. The analysis is based on a large household survey administered in 2019. While we did not collect data on physical activity levels or measure body-weight, a careful look into current dietary patterns constitutes a first important step into understanding the emerging overweight and obesity crisis in urban Ethiopia.

2. DATA AND METHODS

The primary purpose of the household survey was to serve as a baseline (or pre-intervention) survey for a randomized controlled trial testing the effectiveness of video-based behavioral change communication to increase fruit and vegetable consumption in Addis Ababa (see Abate, Baye, de Brauw, & Hirvonen 2019). The project is funded by the Food Systems for Healthier Diets flagship of the CGIAR Research Program on Agriculture for Nutrition and Health (A4NH) and is managed by the International Food Policy Research Institute (IFPRI).

The sampling frame for the 2019 survey was based on a 2017 survey with the same households[2] (see Melesse et al. 2019) and followed a multi-stage sampling approach. First, a stratified random sampling method was used to select sub-cities and districts (woredas) of Addis Ababa for the survey. More specifically, sub-cities were grouped according to their welfare level after which six sub-cities were randomly drawn from these groups. A similar welfare-based stratification was applied when 20 districts (woredas) were randomly selected from these sub-cities. Second, two urban neighborhoods (ketenas) from each selected woreda were then randomly selected and from each ketena, 25 households were randomly selected for interviewing. In total, 930 households were interviewed in September and October 2019.

The survey instrument collected information on households' food consumption over the 7 days or 24 hours prior to the survey interview. Both food consumed inside and outside the house were considered. In this paper, we report on the household food consumption over the previous 7 days. The quantity of each food items consumed was reported in standard units (grams, kg, liter, etc.).

[2] A replacement household was randomly drawn if the household interviewed in 2017 was not available in 2019.

These amounts were converted to calories using food consumption tables provided by the Ethiopian Public Health Institute (EPHI undated) with estimates of item-specific edible portions obtained from USDA (2013). We also valued in Ethiopian birr the amounts of food consumed using monthly retail price data for Addis Ababa provided by the Central Statistical Agency of Ethiopia.

Before the analysis, the consumption data were carefully cleaned from implausible values. First, we applied a winsorization method at the food item level in which all reported values above the 99th percentile were set to the value of the 99th percentile of the item specific distribution. Second, six households had implausibly high total per capita calorie consumption – even after the item-level winsorization. These households were dropped from the analytical sample. As a result, the final analysis was carried out with a sample of 924 households.

Following FAO (2012) guidelines for assessing household consumption, we grouped food items into 12 food groups. We then assessed the share of households consuming items from each food group and disaggregated households' total consumption by these 12 food groups.

Finally, we report our estimates by expenditure quintiles that group households into five equally sized groups based on their per capita expenditure level: poorest, poor, middle, rich, and richest.

3. RESULTS

Over the 7 days prior to being interviewed, households consumed items from an average of 9.2 of the 12 food groups (Table 1). As expected, richer households generally consumed a more diverse diet than poorer households; the mean household dietary diversity score was 7.5 in the poorest quintile and 10.5 in the richest quintile.

Table 1. Percent of households consuming items from each food group, by expenditure quintile

	All	Poorest	2nd quintile	Middle	4th quintile	Richest
No. of households:	924	185	185	185	185	184
Cereals	99.9	99.5	100.0	100.0	100.0	100.0
Roots and tubers	85.3	66.5	84.9	91.4	90.8	92.9
Vegetables (all)	99.8	99.5	99.5	100.0	100.0	100.0
Vitamin A rich	*83.1*	*60.0*	*80.1*	*89.7*	*91.4*	*94.0*
Other	*99.8*	*99.5*	*99.5*	*100.0*	*100.0*	*100.0*
Fruits (all)	76.6	48.1	69.7	88.7	86.0	90.8
Vitamin A rich	*13.1*	*1.6*	*5.4*	*17.3*	*18.9*	*22.3*
Other	*76.4*	*47.6*	*69.7*	*88.7*	*85.4*	*90.8*
Meat and poultry	59.1	15.1	45.4	63.8	78.4	92.9
Eggs	51.7	21.1	41.1	51.4	64.3	81.0
Fish	2.6	0.0	0.5	2.7	2.7	7.1
Nuts and pulses	98.6	96.7	98.9	99.5	97.8	100
Dairy	54.3	17.3	42.7	57.3	69.2	85.3
Oils and fats	98.1	96.8	97.3	98.9	98.9	98.4
Sugar and honey	96.7	93.0	96.2	98.9	97.3	97.8
Coffee and tea	99.1	97.8	98.4	100.0	99.5	100.0
Dietary diversity score (max: 12)	9.2	7.5	8.7	9.5	9.8	10.5

Source: Analysis of 2019 Addis Ababa household survey data.

The average household in our sample had five members. Table 2 shows that for this average household, the estimated food expenditures were 315 birr per person on food, out of which 24 percent was spent on cereals (e.g., wheat, teff, maize, rice), 20 percent on vegetables, and 18 percent on meat (e.g., beef, mutton, poultry). These shares varied considerably across

expenditure quintiles with poorer households allocating more of their food budget to cereals and pulses and less to meat products than did richer households. These patterns are in line with previous work on Ethiopia (Hassen Worku et al. 2017) and with Bennett's law (1941) – as income levels increase, people allocate less of their income to starchy staples and more to animal-source foods. Food consumed outside the home accounted for about 7 percent of total food expenditure with only marginal variation across household income levels.

Table 2. Household food expenditures, by food group (birr per capita per week) and expenditure quintile

No. of households:	All 924		Poorest 185		2nd quintile 185		Middle 185		4th quintile 185		Richest 184	
	birr	%	birr	%	birr	%	birr	%	birr	%	birr	%
Cereals	76.8	24.4	58.2	35.9	69.1	29.4	76.9	26.3	83.3	22.5	96.7	18.7
Roots and tubers	5.3	1.7	4.2	2.6	4.4	1.9	5.1	1.7	6.4	1.7	6.6	1.3
Vegetables (all)	61.8	19.6	31.5	19.4	47.5	20.2	61.6	21.0	74.0	20.0	94.6	18.3
Vitamin A rich	*7.7*	*2.4*	*4.5*	*2.7*	*7.2*	*3.1*	*7.9*	*2.7*	*8.1*	*2.2*	*10.9*	*2.1*
Other	*54.1*	*17.1*	*26.9*	*16.6*	*40.2*	*17.1*	*53.7*	*18.3*	*65.9*	*17.8*	*83.8*	*16.2*
Fruits (all)	16.0	5.1	3.9	2.4	8.3	3.5	17.8	6.1	19.7	5.3	30.5	5.9
Vitamin A rich	*1.6*	*0.5*	*0.1*	*0.1*	*0.5*	*0.2*	*2.0*	*0.7*	*2.3*	*0.6*	*2.9*	*0.6*
Other	*14.4*	*4.5*	*3.8*	*2.3*	*7.7*	*3.3*	*15.6*	*5.3*	*17.4*	*4.7*	*27.4*	*5.3*
Meat and poultry	55.6	17.6	7.8	4.8	26.4	11.2	41.0	14.0	68.2	18.4	134.7	26.1
Eggs	4.9	1.6	1.5	0.9	3.9	1.7	4.3	1.5	6.1	1.6	8.8	1.7
Fish	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.2	0.0
Nuts and pulses	22.5	7.1	17.0	10.4	20.7	8.8	22.5	7.7	24.7	6.7	27.6	5.3
Dairy	12.5	4.0	2.2	1.3	4.9	2.1	10.5	3.6	17.9	4.8	26.9	5.2
Oils and fats	11.9	3.8	8.6	5.3	9.0	3.8	9.9	3.4	13.0	3.5	19.0	3.7
Sugar and honey	4.3	1.4	3.7	2.3	4.1	1.8	4.3	1.5	4.7	1.3	4.7	0.9
Coffee and tea	20.4	6.5	12.2	7.5	13.8	5.9	18.6	6.3	24.0	6.5	33.6	6.5
Foods consumed outside home	23.3	7.4	11.8	7.2	23.0	9.8	20.3	6.9	28.7	7.7	32.8	6.4
Total	315.4	100.0	162.3	100.0	235.2	100.0	292.9	100.0	370.8	100.0	516.7	100.0

Source: Analysis of 2019 Addis Ababa household survey data.

Table 3 reports household food consumption patterns in terms of calories. Average daily per capita calorie consumption was 1,918 kcal.[3] Out of this total, more than 50 percent came from cereals and 15 percent from oils and fats, which are among the cheapest sources of calories in Ethiopia (Hassen Worku et al. 2017). The most commonly consumed vegetables were onion (51 kcal on average), green pepper (13 kcal), and tomatoes (13 kcal), together accounting for more than 60 percent of all calorie consumption in the vegetables food group. As for fruits, bananas (13 kcal), avocados (10 kcal), and oranges (4 kcal) were most popular, together accounting for more than 80 percent of the calories consumed in the fruits food group. Food consumed outside the home accounted for only about 1.5 percent of total calorie consumption with limited variation across household expenditure levels.

[3] Our mean estimate (1,918 kcal per capita per day) is somewhat smaller than the estimate for Addis Ababa using the 2016 Household Consumption Expenditure survey of 2,202 kcal (CSA 2018). However, the mean estimate for middle quintiles are very similar. The CSA's estimate is 1,969 kcal per person per day, which is close to our corresponding estimate of 1,907 kcal. The differences in the overall mean between our estimate and the CSA's estimate could be due to (a) different survey year or months, (b) differences in how extreme values were dealt with, (c) differences in survey instruments, or (d) differences in the calorie conversion and refusal factors.

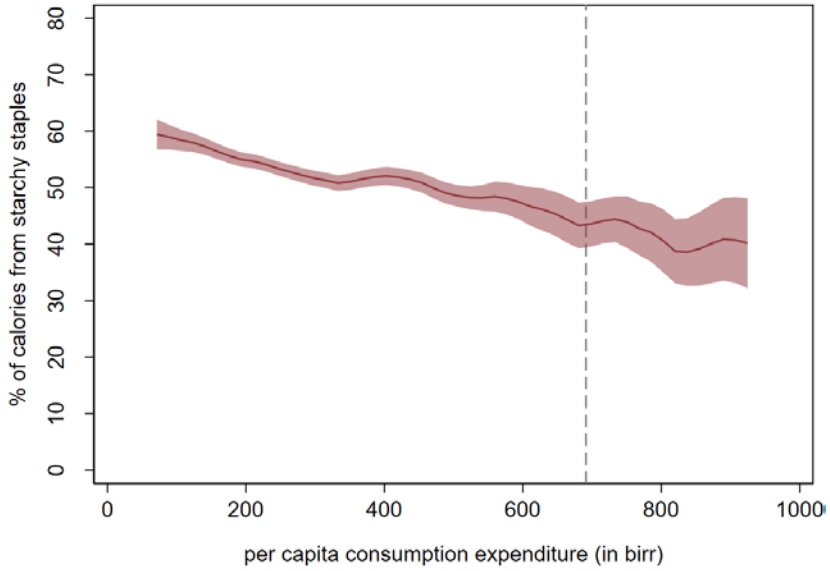
Table 3. Calorie consumption, by food group (kcal per capita per day) and expenditure quintile

No. of households:	All 924		Poorest 185		2nd quintile 185		Middle 185		4th quintile 185		Richest 184	
	kcal	%	kcal	%	kcal	%	kcal	%	kcal	%	kcal	%
Cereals	998.1	52.0	753.0	54.8	906.3	54.4	1025.2	53.4	1081.7	51.1	1225.6	48.7
Roots and tubers	53.1	2.8	40.3	2.9	46.0	2.8	51.7	2.7	61.8	2.9	66.1	2.6
Vegetables (all)	123.4	6.4	65.4	4.8	97.4	5.8	124.4	6.5	143.4	6.8	186.6	7.4
Vitamin A rich	22.5	1.2	13.1	1.0	20.9	1.3	23.1	1.2	23.7	1.1	31.8	1.3
Other	100.7	5.3	52.1	3.8	76.4	4.6	101.0	5.3	119.6	5.7	154.9	6.2
Fruits (all)	32.1	1.7	9.2	0.7	17.4	1.0	36.4	1.9	37.7	1.8	59.7	2.4
Vitamin A rich	2.1	0.1	0.2	0.0	0.7	0.0	2.7	0.1	3.1	0.1	3.7	0.1
Other	29.8	1.6	9.0	0.7	16.7	1.0	33.3	1.7	34.5	1.6	55.4	2.2
Meat and poultry	39.0	2.0	4.9	0.4	18.0	1.1	31.1	1.6	47.6	2.3	93.8	3.7
Eggs	11.5	0.6	3.5	0.3	9.2	0.6	10.1	0.5	14.2	0.7	20.5	0.8
Fish	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.3	0.0
Nuts and pulses	33.8	1.8	6.2	0.4	14.9	0.9	29.0	1.5	49.4	2.3	69.8	2.8
Dairy	170.3	8.9	123.9	9.0	153.0	9.2	170.8	8.9	190.3	9.0	213.9	8.5
Oils and fats	284.9	14.9	232.4	16.9	243.0	14.6	272.8	14.2	301.3	14.2	375.3	14.9
Sugar and honey	111.2	5.8	95.8	7.0	107.0	6.4	112.0	5.8	120.6	5.7	120.9	4.8
Coffee and tea	32.2	1.7	23.0	1.7	22.8	1.4	28.8	1.5	36.1	1.7	50.4	2.0
Foods consumed outside home	28.2	1.5	16.0	1.2	30.4	1.8	25.9	1.4	32.6	1.5	35.9	1.4
Total	1917.8	100.0	1373.4	100.0	1665.3	100.0	1918.2	100.0	2116.8	100.0	2518.7	100.0

Source: Analysis of 2019 Addis Ababa household survey data.

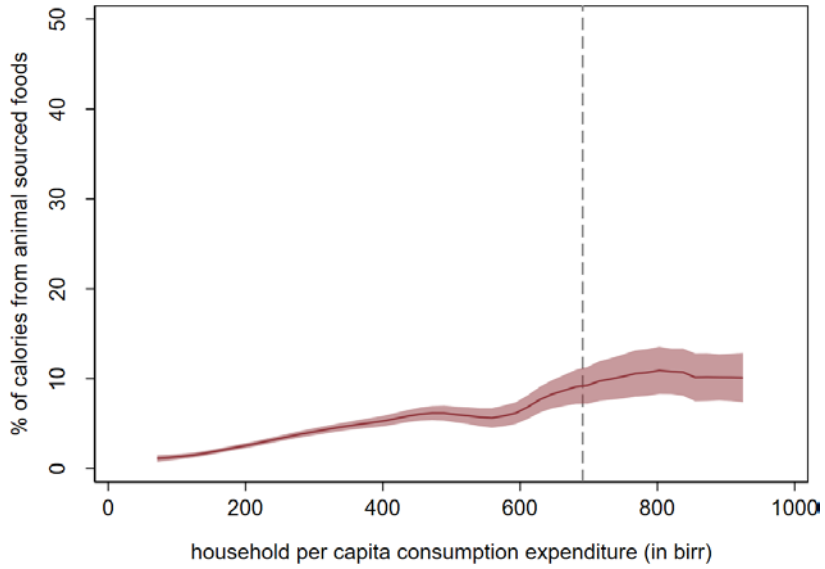
Figures 2 to 5 show a series of local polynomial regression contrasting the share of calories from cereals, animal-source foods, vegetables, and fruits on the level of household total per capita expenditure. The share of calories from cereals declines sharply with increasing household total per capita expenditures (Figure 2). In contrast, the importance of animal-source foods in total calorie intake increases with total expenditures – for the richest households, they constitute more than 10 percent of calorie intake (Figure 3). We see a similar gradient for vegetables (Figure 4), but the caloric importance of fruits increases very slowly with expenditure (Figure 5). These gradients are stronger if we measure consumption in grams instead of calorie share (Appendix Figures A1 and A2). This is because many vegetables and fruits contain considerable amount of water, which contributes to weight but not to the calorie content (Drewnowski 2020).

Figure 2. Relationship between share of calories from cereals and household total per capita expenditure



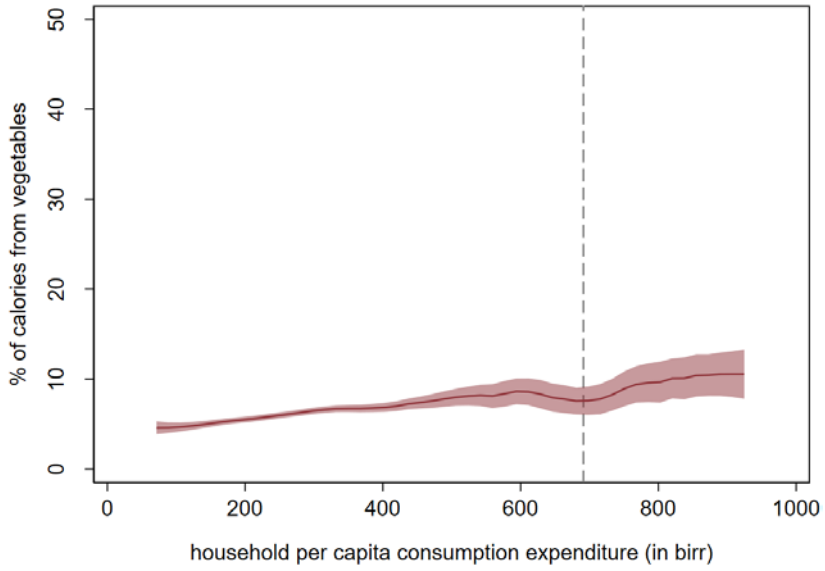
Source: Analysis of 2019 Addis Ababa household survey data.
Note: local polynomial regression. The horizontal axis is truncated at the 1st and 99th percentile of the household per capita consumption expenditure. The dashed vertical line indicates the top 95th percentile of the household per capita consumption expenditure.

Figure 3. Relationship between share of calories from animal-source foods and household total per capita expenditure



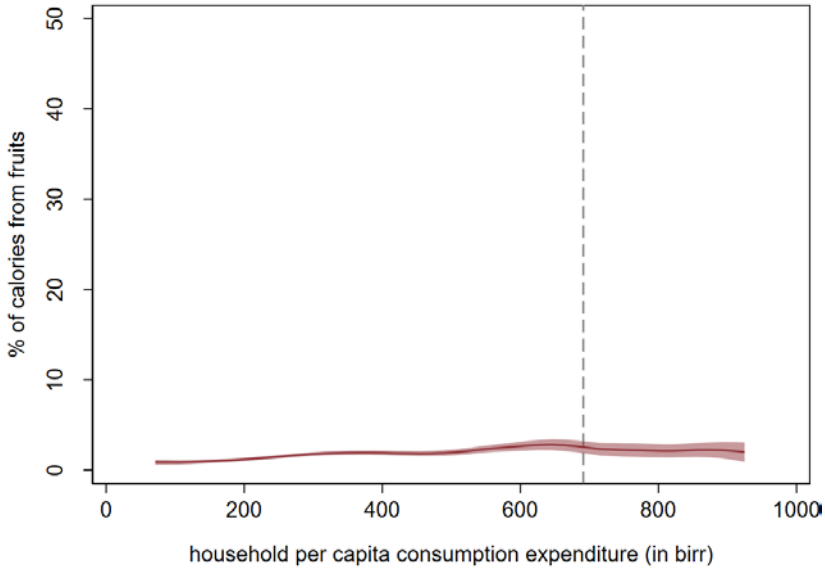
Source: Analysis of 2019 Addis Ababa household survey data.
Note: local polynomial regression. The horizontal axis is truncated at the 1st and 99th percentile of the household per capita consumption expenditure. The dashed vertical line indicates the top 95th percentile of the household per capita consumption expenditure.

Figure 4. Relationship between share of calories from vegetables and household total per capita expenditure



Source: Analysis of 2019 Addis Ababa household survey data.
Note: local polynomial regression. The horizontal axis is truncated at the 1st and 99th percentile of the household per capita consumption expenditure. The dashed vertical line indicates the top 95th percentile of the household per capita consumption expenditure.

Figure 5. Relationship between share of calories from fruit and household total per capita expenditure



Source: Analysis of 2019 Addis Ababa household survey data.
Note: local polynomial regression. The horizontal axis is truncated at the 1st and 99th percentile of the household per capita consumption expenditure. The dashed vertical line indicates the top 95th percentile of the household per capita consumption expenditure.

4. CONCLUSIONS

Rising overweight and obesity in urban areas of Ethiopia constitutes a major public health concern. They are associated with increased risk of several life-threatening non-communicable diseases, such as hypertension, cardiovascular diseases, and certain types of cancers. Dietary choice is a key determinant of adult body-weight. In this report, we take a first step into understanding dietary patterns in Addis Ababa, the capital and the largest urban area of Ethiopia.

Starchy staples (cereals, roots, and tubers) maintain a central role in household food baskets in Addis Ababa. For the average household, they make up roughly 25 percent of the food budget and

provide more than half of the consumed calories. However, their importance in the food basket declines with household income levels. The consumption of fruits and vegetables that are rich in vitamin A is low, together providing less than three percent of the calories. The consumption of other types of vegetables is more common, largely due to high consumption of onions. Meat products make up nearly 18 percent of the food budget, but provide only 2 percent of total calories, on average. While the importance of animal-source foods and vegetables in household consumption baskets increase with household income levels, this is not the case for fruits, for which the income gradient is relatively flat. Together, these findings suggest that further income growth will result in drastic changes in the composition of food demand. Since Addis Ababa produces little food, this means that neighboring rural areas may need to adjust their food production patterns and output to satisfy the rising demand for nutritious foods in the capital (Vandercasteelen et al. 2018a, 2018b; Bachewe & Minten 2019).

This study has some important limitations. First, the 7-day recall period in the food consumption module is likely to result in some measurement error due to recall bias (Beegle et al. 2012). Second, food consumption was measured at the household level, so we cannot say anything about intra-household allocation of calories and nutrients. Moreover, reporting consumption levels in per capita instead of per adult equivalent terms means that our calorie intake estimates are under-reported because children consume fewer calories than adults.

With these caveats in mind, our findings have some implications for policy and future research. High and rising prices of nutritious foods are arguable an important barrier that many households must overcome to improve their diets (Bachewe et al. 2017; Headey & Alderman 2019; Hirvonen et al. 2020). A potential intervention to address this challenge is to provide income support for poorest households to increase their consumption of more nutrient-rich foods and decrease their consumption of grains. We also note that fruit consumption does not vary considerably by income level. This indirectly suggests that increasing the production of fruits and other more nutrient-rich foods would help reduce their relative prices or prevent further price hikes, thereby improving household access to these foods. Farmers could be encouraged to increase the area they allocate to fruits and vegetables, aided in improving their productivity of these crops, or a combination of both. Another constraint is arguably widespread misconceptions regarding the health implications of food choices. Considering rapidly rising overweight and obesity in urban Ethiopia, there is an urgent need for innovative behavioral change campaigns to shift diets away from excess consumption of energy-dense foods, such as starchy staples and processed foods, as well as red meats, to foods that are nutrient-rich, but low energy-density, such as fruits, vegetables, nuts, and pulses.

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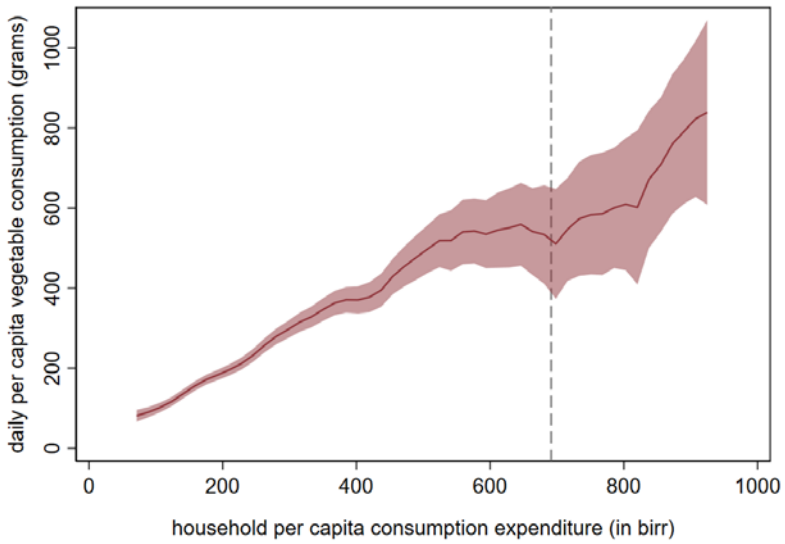
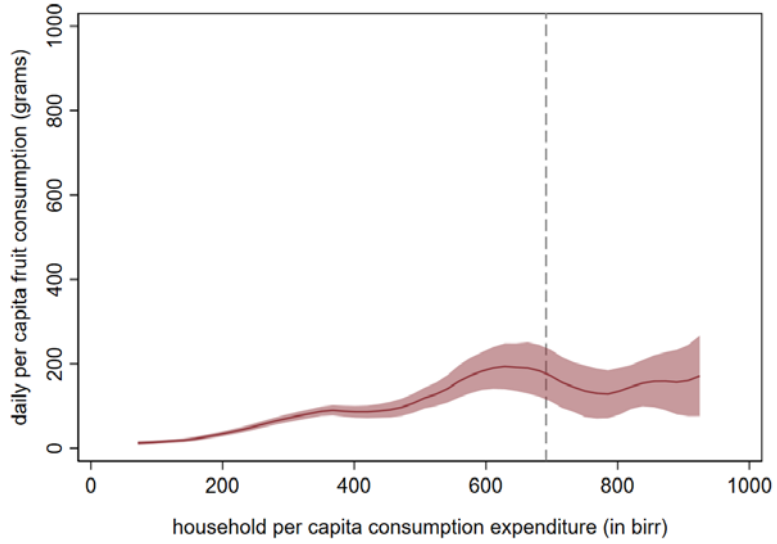
APPENDIX

Figure A1. Relationship between daily per capita vegetable consumption (grams) and household total per capita expenditure



Source: Analysis of 2019 Addis Ababa household survey data.
Note: local polynomial regression. The horizontal axis is truncated at the 1st and 99th percentile of the household per capita consumption expenditure. The dashed vertical line indicates the top 95th percentile of the household per capita consumption expenditure.

Figure A2. Relationship between daily per capita fruit consumption (grams) and household total per capita expenditure



Source: Analysis of 2019 Addis Ababa household survey data.
Note: local polynomial regression. The horizontal axis is truncated at the 1st and 99th percentile of the household per capita consumption expenditure. The dashed vertical line indicates the top 95th percentile of the household per capita consumption expenditure.

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