Feed the Future Innovation Lab for Food Security Policy

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# Nutritional Implications of Dietary Patterns in Mali

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## The *Triple Burden* of Malnutrition

Although low-income countries of Sub-Saharan Africa are severely hit by undernutrition, many also have rapidly growing obesity rates. Inadequate micronutrient intake poses a third challenge. As elsewhere, Mali's population is experiencing lifestyle and dietary changes that are driven in part by urbanization and income growth. Yet, UNICEF reports that in Mali, stunting, caused by chronic malnutrition, affects more than one in four children. Paradoxically, the rate of stunting is highest in the Sikasso region—the so-called *breadbasket* of the country[1]. Obesity rates remain lower in West Africa than in other regions of the continent. Since diet transformation has more recently begun in West Africa, policymakers in this region may have the opportunity to "bend the curve" toward healthier diets (Haggblade et al. 2016; Thériault et al. 2018).

Copyright: UNICEF Mali/2019/Keita. Source: Fatou Diagne, "A magical powder for the children of Sikasso." A role model mother educates a fellow farmer-mother as part of UNICEF's home fortification program.

We conducted several related studies to investigate the nutritional implications of dietary patterns in Mali. In the first (Smale et al. forthcoming), the team analyzed macro data to bring new empirical evidence concerning whether diets in Mali are shifting toward more highly processed foods, food purchased away from home, or sugary foods. At a micro-scale, they also examined the extent to which the diets of rural women, in particular, meet minimum adequate standards, contain key sources of micronutrients, and include elements such as fats, sugars, and food purchased away from home. The second study (Smale et al. 2019) tested the overall effects of the fertilizer subsidy on the dietary diversity of women in farming households of the Delta and the Koutiala Plateau. The third study (Assima, Zanello, and Smale 2019) compared the effects of the fertilizer subsidy on dietary diversity of women in the Delta and Koutiala Plateau by food supply source (farm production, gifts, market purchases).

Taken together, the three studies inform us regarding current dietary patterns in Mali. Diet diversity has been widely used as a proxy for food and nutrition security in previous studies. Based on interviews with key experts in Mali (Traore 2020;

### Key Findings

- Rural and urban households are net food buyers.
- Processed food shares are greater in urban (60%) than rural areas (48%), but consumption of meals outside the home remains low.
- Average household dietary diversity scores are higher in urban than in rural areas.
- Women's and household diet diversity vary by season in urban and rural areas.
- About half of farm women interviewed did not meet minimum adequate dietary diversity during the lean season.
- Women's consumption of sugary foods in rural areas appears to remain slight.
- The effect of fertilizer subsidies on women's dietary diversity is significant overall but small in magnitude.
- By food source, the effect of fertilizer subsidies on the component of women's dietary diversity produced on farm is nil. The contribution of gifts to women's dietary diversity declines. The influence of the fertilizer subsidy on women's dietary diversity through market purchases is positive in the Delta but negative on the Koutiala Plateau.

[1] https://www.unicef.org/mali/en/nutrition, accessed March 20, 2020.

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Kone 2020; Bagayoko 2020), we suggest some policies that might be helpful to coax nutritional paths toward favorable outcomes.

## Data

We utilized Mali's 2014/15 LSMS-ISA data to analyze the demand for food groups (macro-scale analysis). Although nearly nationally representative, the final sample includes about 3,804 households as compared to the planned sample of 4,218, due to insecurity in the northern region. Data on food consumption were collected during the period of July to August (lean season) and during the period of October to December (harvest season).

We also utilized the PREPOSAM dataset that was collected by the Institut d'Economie Rurale (IER) and Michigan State University (MSU) in repeated visits from October of 2017 through February of 2019. The stratified random sample was drawn from the full list of enumeration areas in the agroecological zones of the Delta du Niger and the Plateau de Koutiala. Diet information was collected in July of 2018 and February of 2019. Seasonal diet comparisons are based on the subsample of 1026 women interviewed in both July of 2018 and February of 2019. The subsample was drawn from the original sample of 2400 households and over 5000 women of reproductive age (15-49 years). Mean values were not significantly different between the larger and smaller sample in the same season (July 2018).

To examine dietary diversity (micro-scale analysis), we utilized both the 2014/15 LSMS/ISA dataset and the 2018/19 PREPOSAM dataset.

## Methods

Dietary diversity refers to the number of different food items or food groups that a household or an individual has consumed over a specified period (over the preceding 24 hours or week). Nutritionists have documented a positive correlation between anthropometric measures in adults and children and the diversity of energy, macro and micronutrient intakes. Diets composed of a narrow range of food items, such as starchy staples, often lack macro and micronutrient adequacy even though they meet caloric requirements.

The household diet diversity score (HDDS) measures food access of a household to a number of different food groups, but sheds no light on intrahousehold distribution of dietary diversity, its equity or equality.

Individual dietary diversity indicators, such as the women's dietary diversity score (WDDS) and minimum dietary diversity for women (MDD-W), provide information on individual household members. The MDD-W is a binary variable (0-1) measuring whether or not the respondent's consumption exceeded 5 out of 10 food groups in the recall period. Food groups are defined slightly differently in the WDDS and MDD-W

Information on ten food groups collected by the LSMS-ISA team in Mali was used to calculate the HDDS during the seven days preceding the survey. We utilized information collected from female individual household members to compute both individual dietary diversity indicators. Only nine food groups were employed to compute the WDDS. In particular, fats and oils were not included because previous research suggested that this group did not contribute to micronutrient density in the diet. Similarly, the sugars group and the group consisting of spices and condiments were not considered to be important for this indicator. We also derived indices for micronutrient adequacy, including vitamin A and iron, from the same survey instrument. These indices were constructed as counts only over the food sources that are rich in either source of nutrients.

Several econometric models were used to test the effects of fertilizer subsidies on diet quality of women of reproductive age and even by source of food supply (on-farm production, purchase, or gifts). Analysis by component provides information about the channel through which the subsidized fertilizer program affects diet quality outcomes.

At a macro-scale, we analyzed food group intake patterns across areas of residency following an approach similar to that applied by Tschirley et al. (2015). Food expenditure categories were defined by source (own production; purchase). Own production was divided between perishable and non-perishable items. The purchased category is then differentiated by degree of processing (none, low, high) and perishability. Food away from home was considered separately among purchased items (or as highly processed, non-perishable).

## Results

Purchased foods represented 96% of the average food budget of urban households in either season; in rural areas, purchased food represented 72% of budgets during the hungry season and 60% during the harvest season. Both urban and rural households are net food buyers. Highly processed food composed 15% of the urban diet—in the form of refined wheat products, liquid and dried milk, and oils—and only 7% of the rural diet. Products with sugar (sugary foods, soft drinks, sugar for tea or coffee) represented 4-6% of the average budget. Maize is less important than we expected, at 2% only in urban areas during either period and twice that share in rural areas. Gifts were more common in rural than in urban areas. Rural households allocated about one-fifth of their food budget to rice during the harvest season. The share of the budget allocated to millet and sorghum remained relatively stable across the two seasons at 11-12% in rural

areas, and only 4-5% in urban areas. Meat, followed by vegetables, fish and oil are the other large budget items.

Mean HDDS scores differ statistically at a significance level under 1% between urban (8.62) and rural (6.84) areas in the "hungry season," and also in the post-harvest season (9.01 and 7.45, respectively) (Table 1). They also differ by season in both urban and rural areas, attesting to continued strong linkages between towns and countryside. While these finding may convey information concerning access to food, it provides limited nutritional information since groups include spices and condiments, fats and oils. These are included in small quantities in the sauces consumed daily in Mali. Under the LSMS/ISA dataset, fish and meat have been combined into a single group, as have dairy and eggs.

**Table 1. Household Diet Diversity Scores in Mali, by Residence and Season (2014-15)**

| | Obs | Mean | SD | Obs | Mean | SD |
|---|---|---|---|---|---|---|
| | | Urban | | | Rural | |
| Sept | 1405 | 8.62 | 1.88 | 2399 | 6.84 | 2.32 |
| Feb | 1405 | 9.01 | 1.55 | 2399 | 7.45 | 1.98 |

Source: Authors, based on LSMS-ISA Mali 2014-15.

Seasonal differences observed in household access to food in both urban and rural areas are also observed in the micronutrient adequacy of farm women in Mali (Table 2). Respondents surveyed consumed one fewer food group during the lean season and the percentage of them consuming at least 5 out of 10 food groups dropped by 34% (from 79.5% to 45.1%).

**Table 2. Women's Dietary Quality Scores by AEZ, July 2018**

| Agro-ecological zone | | MDD-W | | All women | WDDS |
|---|---|---|---|---|---|
| | N | 0 | 1 | | |
| | | % | | | Mean |
| Niger Delta | 2486 | 42 | 58 | 100 | 4.55 |
| Koutiala Plateau | 3444 | 65 | 35 | 100 | 3.97 |
| All zones | 5930 | 53 | 47 | 100 | 4.28 |

Source: Authors, based on the PREPOSAM dataset.

Women's consumption of starchy staples, fruits and vegetables is season-dependent in our study zones, but less so their consumption of fish, groundnuts, milk products and oil—which they appear to rely on more than meat or eggs. Sugary foods are rarely consumed in our study zones by women of reproductive age, except in the form of sweetened tea or coffee. The intake of vitamin A-rich food dropped drastically in the lean season compared to the abundant season (Table 3).

**Table 3. Women's Diet Quality Scores and Indicators, by Season**

| | Mean | Std. Dev. | Mean | Std. Dev. |
|---|---|---|---|---|
| | July 2018 | | February 2019 | |
| MDD_W | 0.451 | 0.498 | 0.795 | 0.404 |
| WDDS | 4.32 | 1.51 | 5.61 | 1.44 |
| outside costs | 35.4 | 166 | 58.9 | 198 |
| soda or juice | 0.065 | 0.247 | 0.107 | 0.309 |
| sugars | 0.802 | 0.399 | 0.845 | 0.362 |
| fats or oils | 0.946 | 0.227 | 0.966 | 0.181 |
| iron-rich | 0.363 | 0.481 | 0.419 | 0.494 |
| vitamin A-rich | 0.140 | 0.347 | 0.737 | 0.441 |
| wild plants | 0.585 | 0.493 | 0.393 | 0.489 |

Source: Authors, based on the PREPOSAM dataset. 1087 women. All means are significantly different at <1% except fats and oils.

Smale, Theriault, and Assima (2019) found that the fertilizer subsidy had a significant and positive effect on women's dietary diversity overall across the two agro-ecological zones, but the magnitude of effect was small. A closer look at the different components of women's dietary diversity by Assima, Zanello, and Smale (2019) reveals no effects on dietary diversity from the consumption of own production in either of the two zones. The authors found a negative impact of subsidized fertilizer on dietary diversity sourced from gift food in the Niger Delta. To the extent that reliance on gifts for food indicates vulnerability to food insecurity, this finding is encouraging. Decomposing diet diversity by food source suggests that income is the main pathway linking subsidized fertilizers program to women's nutrition outcomes. The effect of subsidized fertilizer on the dietary diversity sourced from purchased food was strong and positive in the Niger Delta, but negative in the Koutiala Plateau. The negative results for the Koutiala Plateau are not entirely surprising given the history of the "Sikasso Paradox." That is, extra income does not necessarily translate into better household nutrition.

## Policy Implications

Several policy implications emerge from our study on dietary patterns. Private and public investments to minimize the rural bias and seasonality effects on the dietary diversity of Malians households and individuals are needed. At the farm level, small-scale irrigation schemes, as pursued by the Malian government and donors, can contribute to balanced nutrition by increasing crop diversity and productivity. For instance, with irrigation, horticultural products can be grown during the dry season.

Smallholder farmers need to increase their incomes if they want to improve their livelihood and nutrition. Investing in storage facilities can help farmers reduce post-harvest loses

and wait for prices to be higher to sell in the months following harvest. Yet, given the heavy dependence of both urban and rural population on purchased food, more off-farm investments are needed to achieve food and nutrition security. This requires developing food markets and the agro-processing sector to enable the provision of affordable, diversified, and nutritious food year-round in rural and urban areas.

Clearly, a fertilizer subsidy on starchy staples may have positive impacts on the availability of these crops, but does not necessarily contribute to better diet quality. With respect to on-farm production, overall availability of grain may be enhanced, but with disincentives for the production of other crops that provide key nutrients. If purchased food, rather than farm production is the primary conduit for access to higher quality diets, then income is the policy lever, reinforced by educational programs.

Educational programs to promote healthy dietary habit and lifestyle are needed to address the triple burden of malnutrition. Previous research shows that interventions targeting women through empowerment activities, such as the promotion of increased control over income from product sales, often lead to positive nutritional outcomes, especially for children. Finally, better access to safe-drinking water, sanitation, and hygiene services is critical to improve nutritional outcomes.

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