GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN
RTG 2654 Sustainable Food Systems

Food Consumption Seasonality In Low- and Middle-Income Countries

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eaae 2025 BONN GERMANY
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Introduction

> *"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."*
> — Rome Declaration on World Food Security, World Food Summit

Most food consumption data in LMICs does not allow for seasonality analyses:
- FAO Food Balance Sheets provide annual values.
- Household and individual surveys are typically collected at one point in time during the year.

This can have severe implications:
- Because these data do not reveal whether individuals classified as food secure experienced periods of insecurity during the year, analyses based on them may overstate true food security.
- Identified causal relationships may be limited to certain times of the year and do not hold in general.

Seasonal malnutrition matters because:
- Important vitamins and minerals may be missing during certain times of the year (e.g. Vitamin C, Vitamin A, Zinc, Folate).
- Individuals born during certain times of the year may be systemically disadvantaged.

Food consumption seasonality may be particularly pronounced in LMICs because
- Infrastructure is poor and nutritious foods are highly perishable.
- Foods consumed are mainly locally produced and therefore depend on local weather conditions, which are seasonal.
- Incomes and prices vary throughout the year, and, thus, affordability.

⇒ **The goal of this paper is to estimate the extent to which food consumption patterns in LMICs vary throughout the year.**

Data

We compiled seasonally and nationally representative Household Consumption and Expenditure Surveys.

According to the following criteria:
- Conducted over a 12-month period with re-sampling in different seasons.
- Include an extensive food consumption module.
- Several waves must be available to distinguish between seasonality and intra-annual variation.

⟹ Yields around 470,000 households in various world regions.

We calculate Household Dietary Diversity Scores (HDDS) and Minimum Dietary Diversity Scores for Women (MDDW) at the household level.

Measurement

- We exploit the plausibly exogenous timing of the interview to estimate the variation of food consumption throughout the year.
- We move beyond (unconditional) monthly averages and control for additional potential confounding factors.
- We estimate seasonal factors to calculate two different indicators for seasonality.

Prediction of seasonal factors

We estimate Poisson and Linear Probabilty Models including survey weights and robust standard errors to obtain seasonal factors, closely following Kaminski et al. (2014):

$$C_{h,r,m,s,t} = \beta_0 + \beta_1 S_m + \beta_2 X_h + \alpha_r + \theta_s + \eta_t + \varepsilon_{h,r,m,t} \quad (1)$$

$$\widehat{C}_{h,r,m,s,t} = \beta_0 + \beta_1 \overline{S_m} + \beta_2 \overline{X_h} + \overline{\alpha_r} + \overline{\theta_s} + \overline{\eta_t} \quad (2)$$

Seasonal Gap (SG)

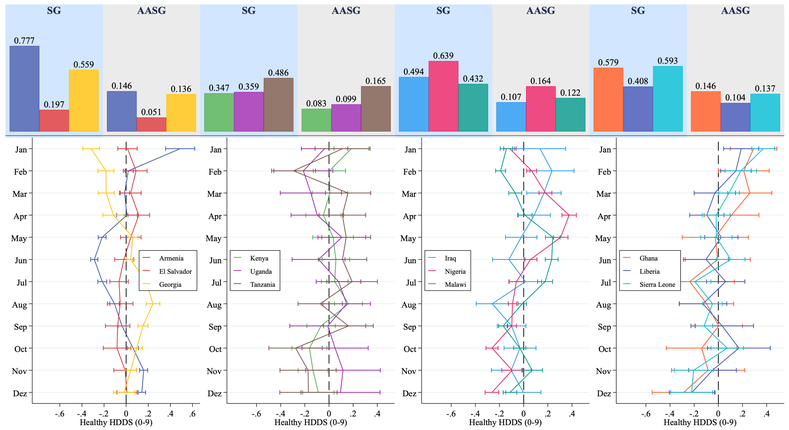
$$SG = max(\hat{c}_m) - min(\hat{c}_m) \quad (3)$$

Average Annual Seasonal Gap (AASG)

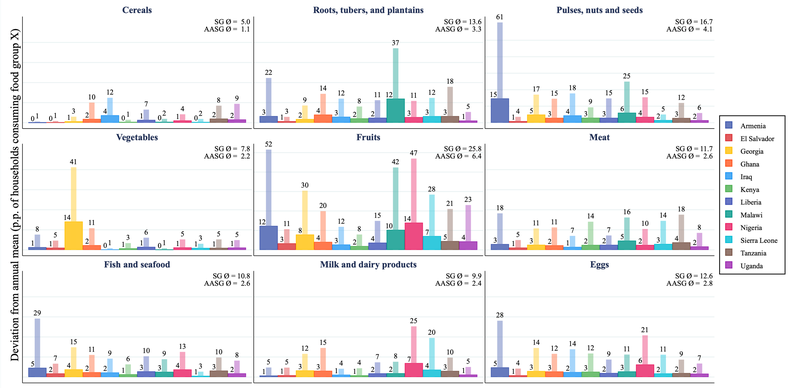
$$AASG = \frac{1}{12}\sum_{m=1}^{12} \hat{c}_m - \bar{\hat{c}} \quad (4)$$

S_m: Eleven month dummies
α_r: Region fixed effects
η_t: Interview start year $\neq$ interview year
X_h: Household characteristics
θ_s: Survey wave fixed effects
$\hat{c}_m$: Predicted consumption in month m

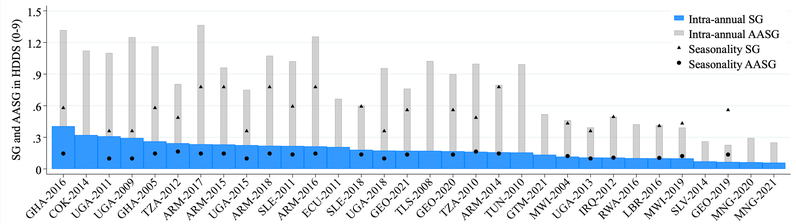
Results: Dietary diversity



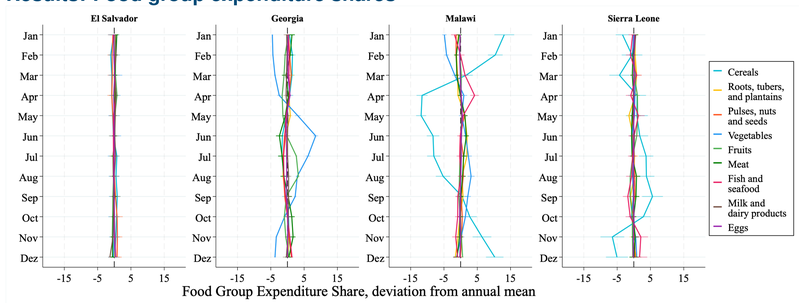
Results: Food group consumption



Results: Intra-annual variation in dietary diversity



Results: Food group expenditure shares



Heterogeneity

Rural–Urban location

- Minimal differences in the AASG in many countries—including Armenia, Ghana, Iraq, Kenya, Malawi, Mongolia, and Sierra Leone.
- Some countries even face greater seasonality in their urban areas: El Salvador (AASG: 0.125 vs. 0.044), Tanzania (AASG: 0.201 vs. 0.142), and Uganda (AASG: 0.165 vs. 0.104).

Household income

- There is no consistent evidence that higher-income households experience less seasonality in dietary diversity compared to lower-income households.
- Georgia and Malawi are notable exceptions, where wealthier terciles demonstrate lower Seasonal Gaps and Average Annual Seasonal Gaps.
- Conversely, in Ghana, Iraq, and Tanzania, higher-income households face substantially higher SG and AASG values compared to their poorer counterparts.

Food sources

- Consumption of own production and food purchases exhibit higher Seasonal Gap (SG) values compared to gifts/in-kind, indicating that these sources are primary drivers of seasonal fluctuations in dietary diversity.
- The dominant source of seasonality varies depending on the specific context.

ADM1 regions

Subnational differences in seasonality can be enormous, e.g.:
- Uganda: Western AASG = 0.45, Central AASG = 0.11 (with similar SGs)
- Malawi: Northern AASG = 0.38, Central and Southern AASG ≈ 0.15
- Georgia: Mtskheta-Mtianeti AASG = 0.73, Ajaria and Kvemo Kartli AASG = 0.12
- Kenya: Mandera AASG = 1.82, Marsabit AASG = 1.57, Baringo AASG = 0.27
- Ghana: Upper West AASG = 1.22, Ashanti, Volta, and Western AASG = 0.19

Conclusion

- Seasonality in dietary diversity is particularly pronounced in the South Caucasus, but also in West Africa.
- Extremely strong seasonality in fruit consumption, with households up to 50 percentage points less likely to consume any fruits in low versus peak months.
- Stark differences in seasonality within countries.

Implications
- Food security may be overestimated, because seasonal fluctuations are not considered.
- Studies on the causes and consequences of dietary patterns may be biased if the data was collected at a specific time of the year.

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