INTERNATIONAL JOURNAL OF DEVELOPMENTAL ISSUES IN EDUCATION & HUMANITIES (IJDIEH)
Volume 2, Issue 2 March–April 2026, pp. 167-178
DOI: https://doi.org/10.5281/zenodo.20201380
www. ubueajournals.org

INCOME BETWEEN HARVESTS AND ILLNESS: SEASONAL AGRICULTURAL EARNINGS AND HEALTHCARE UTILISATION IN RURAL CAMEROON

Fabien Sundjo
Department of Economics, HTTC, University of Bamenda
Catholic University of Cameroon, Bamenda
Email: sundjofabien(at)rocketmail(dot)com

Abstract

In agrarian economies, income does not arrive smoothly across the year. It comes in waves, often tied to the harvest calendar. Yet illness does not wait for harvest. This study examines the effect of seasonal agricultural income fluctuations on healthcare utilisation in rural Cameroon using nationally representative secondary data. The main objective is to determine whether variability in farm income across seasons significantly influences the likelihood that rural households seek formal healthcare when faced with illness. Specifically, the study seeks to estimate the effect of seasonal income variability on outpatient visits, use of public and private health facilities, and health expenditure patterns. The analysis draws on data from the Fourth Cameroon Household Survey, employing a logistic regression framework and robustness checks using probit and instrumental variable specifications. The findings reveal that households experiencing higher seasonal income volatility are significantly less likely to utilise formal healthcare services during lean seasons. The negative effect is more pronounced among smallholder households without access to savings or credit. The results suggest that income smoothing mechanisms play a critical role in protecting health-seeking behaviour. The study recommends that the Ministry of Public Health, in collaboration with the Ministry of Agriculture and Rural Development and the Ministry of Finance, design seasonal health financing schemes and agricultural income stabilisation policies to reduce vulnerability in rural communities.

Keywords:

Seasonal income; Agricultural households; Healthcare utilisation; Rural Cameroon; Income volatility; Health economics; Logistic regression.

1. Introduction

In high-income economies, health expenditure decisions are typically insulated from short-term income shocks due to comprehensive insurance systems and social protection mechanisms. Evidence from Europe and North America shows that although income shocks may affect preventive care utilisation at the margin, universal or near universal health coverage cushions most households from severe disruptions in healthcare access (OECD, 2023; World Health Organisation, 2022). Seasonal employment patterns still exist in sectors such as agriculture and tourism, yet well-developed financial systems and social insurance frameworks moderate their impact on healthcare utilisation. As a result, healthcare-seeking behaviour in developed countries is more strongly associated with demographic and insurance characteristics than with short-term income variability.

The situation differs markedly in low and middle-income countries, where out-of-pocket payments account for a large share of total health expenditure. The World Health Organisation (2024) reports that in many developing countries, households finance more than 40 percent of healthcare costs directly from current income. In such contexts, income volatility can translate directly into fluctuations in healthcare utilisation. Agricultural households are particularly vulnerable because farm income is inherently seasonal, often concentrated around harvest periods and sharply reduced during lean seasons. Recent global evidence indicates that income seasonality remains a major driver of consumption smoothing challenges in rural economies (World Bank, 2023).

In Sub-Saharan Africa, agriculture employs approximately 54 percent of the labour force, and smallholder farming dominates rural livelihoods (FAO, 2023). Income from crop sales is typically realised once or twice a year, depending on the cropping cycle. During pre-harvest months, rural households often face liquidity constraints, which may lead to deferred medical treatment or reliance on informal care. Studies across the region highlight the vulnerability of rural households to seasonal poverty traps that affect nutrition, education, and health outcomes (Beegle, Coudouel, & Monsalve, 2016; African Development Bank, 2024). Despite the recognition of seasonal vulnerability, relatively limited empirical attention has been devoted to its effect on healthcare utilisation at the national level.

Within the CEMAC region, structural dependence on primary commodities and limited diversification of rural incomes amplify seasonal risks. Health systems remain underfunded, and insurance coverage is minimal. According to the Central African Economic and Monetary Community Commission (2023), out-of-pocket payments remain the dominant mode of health financing across member states. Rural households in Chad, the Central African Republic, and Cameroon face similar patterns of income seasonality linked to rain-fed agriculture. However, systematic empirical evidence connecting seasonal agricultural income fluctuations to healthcare utilisation decisions remains scarce in the region.

Cameroon presents a particularly compelling case. Agriculture contributes approximately one-fifth of gross domestic product and employs more than 60 percent of the rural population (National Institute of Statistics, 2023). The agricultural calendar varies across

agroecological zones, but in most regions, income peaks during harvest periods and declines sharply during planting seasons. At the same time, the country's health financing structure remains heavily reliant on household payments, with insurance coverage below 10 percent of the population (Ministry of Public Health, 2024). This combination of seasonal income flows and high out-of-pocket payments creates a structural vulnerability for rural households.

Recent data indicate that healthcare utilisation in rural Cameroon remains uneven. While immunisation coverage has improved, curative care seeking for illness episodes remains below optimal levels, particularly among low-income households (World Health Organisation, 2023). Rural communities often rely on informal providers, traditional healers, or self-medication during lean periods. Yet national policy discussions frequently overlook the role of agricultural income seasonality as a determinant of these patterns.

In many rural communities, illness coincides with the agricultural calendar in complex ways. The rainy season, which often corresponds with planting periods and low cash availability, is also associated with a higher incidence of malaria and water-borne diseases. Consequently, the demand for healthcare may increase precisely when liquidity constraints are most binding. If households defer care due to lack of cash, short-term illness can escalate into more severe conditions, thereby increasing long term health expenditure and productivity losses.

Despite these dynamics, most existing studies in Cameroon examine healthcare utilisation through the lens of income level, education, or distance to facilities. Few studies explicitly consider intra-annual income variability or seasonal agricultural income fluctuations as explanatory variables. As a result, policy interventions aimed at improving healthcare access may fail to address a key structural constraint faced by rural households.

Moreover, while agricultural policies often focus on boosting productivity and annual income, less attention is paid to stabilising income flows across seasons. Without income smoothing mechanisms, households remain exposed to cyclical liquidity shortages that undermine health-seeking behaviour. The absence of integrated analysis linking agricultural income seasonality to healthcare utilisation represents a significant gap in the literature.

Against this background, the major objective of this study is to examine the effect of seasonal agricultural income fluctuations on healthcare utilisation in rural Cameroon. Specifically, the study seeks to estimate whether income variability across agricultural seasons significantly affects the probability that households utilise formal healthcare services when illness occurs. It also aims to assess whether access to credit, savings mechanisms, and household characteristics moderate this relationship.

This study is both scientifically and policy relevant. Scientifically, it extends the literature on health economics and rural development by integrating seasonal income dynamics into models of healthcare utilisation. From a policy perspective, the findings provide evidence to inform coordinated interventions between agricultural and health

authorities, particularly within the framework of Cameroon's National Development Strategy 2030.

The rest of the paper is organised as follows, section two reviews the theoretical and empirical literature. Section three presents the methodology and econometric specification. Section four discusses the empirical findings. Section five concludes and outlines policy implications.

2. Literature Review

Understanding how seasonal agricultural income affects healthcare utilisation requires integrating several theoretical perspectives from development and health economics. Two frameworks are particularly relevant: the life cycle permanent income hypothesis and the household production theory of health. The permanent income hypothesis suggests that households plan consumption based on expected long-term income rather than current cash flows (Friedman, 1957). However, in contexts where credit and savings markets are incomplete, deviations from expected income, such as seasonal agricultural fluctuations, can constrain household spending on essential services, including healthcare (Deaton, 1997; Morduch, 1995). Consequently, households may defer medical treatment during lean periods, even when health risks are high. Complementing this perspective, the household production theory of health posits that households allocate time and resources to produce health outcomes through nutrition, preventive measures, and formal healthcare consumption (Grossman, 1972; Strauss & Thomas, 1995). Seasonal income volatility influences the household's ability to allocate resources efficiently, potentially reducing healthcare utilisation in low liquidity periods.

Additionally, vulnerability and risk coping frameworks provide insight into why seasonal income fluctuations matter for healthcare decisions. Households in rural agrarian economies face predictable and unpredictable risks, including crop failure, illness, and price shocks. Access to informal insurance, savings, and credit determines the ability to smooth consumption across these shocks (Dercon, 2002; Rosenzweig & Wolpin, 1993). In the absence of such mechanisms, households must prioritise essential expenditures, often leading to delayed or forgone healthcare. Feminist economic perspectives also emphasise the role of intra-household decision-making, highlighting that women often manage healthcare allocation within households. Seasonal income deficits can amplify gendered disparities in access to care (Agarwal, 1997; Kabeer, 1999). Together, these theoretical frameworks suggest a strong negative effect of seasonal income volatility on healthcare utilisation, particularly for vulnerable rural households.

Empirical evidence from developed countries shows that income seasonality has modest but measurable effects on healthcare utilisation. For instance, studies in the United States and parts of Europe report that households with seasonal or irregular income are slightly less likely to attend preventive appointments or fill prescriptions on time, despite insurance coverage (Lundberg et al., 2019; Blom et al., 2020). Seasonal labourers in agricultural regions in Spain and Italy experience temporary reductions in outpatient visits during off-season periods (Eurostat, 2021). However, the effects are partially

mitigated by social security transfers and credit availability, highlighting the importance of institutional buffers.

In less developed countries, the relationship between seasonal income and healthcare is more pronounced. Evidence from rural India, Bangladesh, and Indonesia indicates that households with high agricultural income variability are significantly less likely to seek formal care during lean periods, often substituting informal care or self-medication (Malapit et al., 2017; Sraboni et al., 2018; Johnston et al., 2018). These studies show that seasonal liquidity constraints reduce outpatient visits, delay treatment, and can exacerbate morbidity. In some contexts, households' smooth consumption by selling assets or borrowing, but credit access is uneven, and coping strategies may be insufficient to prevent negative health outcomes.

Sub-Saharan African evidence underscores similar patterns. In Ethiopia, smallholder households experiencing pre-harvest income shortages are less likely to attend clinics or purchase medicines for children (Kassie et al., 2020). In rural Kenya, households report deferring adult healthcare and limiting preventive care during lean seasons, leading to seasonal spikes in untreated illness (Amolegbe et al., 2021). Cross-country analyses further confirm that regions with higher agricultural income seasonality also exhibit lower healthcare utilisation rates among rural populations (World Bank, 2022; FAO, 2023). Seasonal patterns interact with disease incidence; for example, malaria and diarrheal diseases often peak during rainy seasons when cash availability is low, compounding health risks.

Within the CEMAC zone, the empirical literature is less developed but consistent with broader Sub-Saharan patterns. In Chad and the Central African Republic, rural households experiencing high intra-annual income variability report delaying medical care until harvest periods, often relying on traditional healers (World Food Programme, 2023; African Development Bank, 2024). Structural constraints, including limited rural infrastructure, low insurance coverage, and informal markets, exacerbate the negative effects of income seasonality on health access. Seasonal food insecurity, overlapping with income fluctuations, further affects health outcomes and household prioritisation of expenditure.

In Cameroon, recent studies have documented the strong seasonality of rural income and its implications for consumption and health behaviours. Smallholder households in the North West and Far North regions earn up to 70 percent of their annual income within a three-month harvest window (INS, 2023). Out-of-pocket expenditure remains the main mechanism of health financing, with insurance coverage below 10 percent. Survey data indicate that rural households are more likely to seek formal healthcare in post-harvest months, while self-medication and informal treatment dominate during planting and pre-harvest periods (World Food Programme, 2024; Ministry of Public Health, 2024). Micro-level evidence also shows that households with access to savings, informal credit networks, or cooperatives are better able to maintain healthcare utilisation during low-income periods (Ngome & Tchamyou, 2022).

Despite this growing body of evidence, gaps remain. First, most studies examine either income seasonality or healthcare utilisation independently, without explicitly modelling the causal relationship at a nationally representative scale. Second, limited attention has been paid to heterogeneity within households, such as the role of household size, education, gender of the household head, and access to formal or informal risk coping mechanisms. Third, few studies in Cameroon have employed econometric models that allow for robust estimation of the effect of intra-annual income variability on the probability of seeking formal healthcare, accounting for confounding socioeconomic and geographic factors.

This study addresses these gaps by combining nationally representative secondary data with rigorous econometric modelling. Using indicators of seasonal income variability and healthcare utilisation from the Fourth Cameroon Household Survey, the study estimates the marginal effect of seasonal income fluctuations on formal healthcare utilisation. By including demographic, socioeconomic, and institutional controls, the analysis captures heterogeneity across households and regions, providing robust evidence to guide policy interventions in rural Cameroon.

3. Methodology

This study adopts a quantitative research design using secondary data from the Fourth Cameroon Household Survey (ECAM4) conducted by the National Institute of Statistics (INS, 2017). The survey is nationally representative and provides detailed information on household demographics, income sources, agricultural production, expenditure, health, and access to services. It follows a two-stage stratified sampling approach, selecting enumeration areas in the first stage and households in the second stage. For this study, the analysis is restricted to rural agricultural households, yielding a final sample of 7,632 observations after data cleaning and accounting for missing values. The dataset includes variables essential for constructing indicators of seasonal agricultural income, healthcare utilisation, household characteristics, and access to risk coping mechanisms, making it suitable for rigorous econometric analysis.

The dependent variable is healthcare utilisation, measured as a binary indicator equal to one if at least one household member sought formal healthcare, public or private, during an illness episode within the survey reference period, and zero otherwise. Alternative specifications include counts of outpatient visits and health expenditure as robustness checks. This operationalisation reflects both the access and utilisation dimensions of healthcare, consistent with the household production theory of health (Grossman, 1972) and prior empirical studies in similar contexts (Malapit et al., 2017; Sraboni et al., 2018).

The primary explanatory variable is seasonal agricultural income fluctuations. It is operationalised as the coefficient of variation of monthly or quarterly agricultural income within the last 12 months, derived from reported crop and livestock sales. A higher coefficient of variation indicates greater intra-annual income volatility. Additional measures include the difference in income between harvest and lean months, which captures the liquidity gap faced by rural households. These measures are grounded in permanent income and risk coping frameworks, which emphasise that variability in

income, not just the level, constrains household expenditure decisions, including healthcare (Deaton, 1997; Dercon, 2002).

Control variables are included to account for household demographics, socioeconomic status, and institutional context. These comprise household size, age and education level of the household head, gender of the household head, dependency ratio, total landholding, access to credit, access to savings mechanisms, access to extension services, and regional dummies capturing agro-ecological and infrastructural differences. These covariates align with theoretical expectations and prior empirical studies, ensuring that the estimated effects of seasonal income are not confounded by other factors influencing healthcare utilisation (Johnston et al., 2018; World Bank, 2022).

The econometric model is specified as a logistic regression due to the binary nature of the primary dependent variable. The model is expressed as:

$$P(\text{Health Use}_i = 1) = F(\beta_0 + \beta_1 SAI_i + \beta_2 X_i + \varepsilon_i)$$

where Health Use_i represents the healthcare utilisation status of household i, SAI_i denotes seasonal agricultural income fluctuation measures, X_i is a vector of control variables, β_0 is the intercept, β_1 and β_2 are parameters to be estimated, and ε_i is the error term. F(.) is the logistic cumulative distribution function. Marginal effects are computed to interpret the practical impact of income volatility on healthcare utilisation. Robust standard errors are employed to account for heteroskedasticity. Variance inflation factors are checked to ensure multicollinearity does not bias the results.

Endogeneity is a potential concern because unobserved household characteristics, such as risk preference or unmeasured health shocks, may simultaneously affect income seasonality and healthcare utilisation. While the cross-sectional design limits causal inference, the inclusion of a comprehensive set of controls, regional fixed effects, and robustness checks with alternative model specifications, including probit regression and instrumental variable approaches using lagged rainfall and crop yields as instruments, mitigates this concern. Sensitivity analyses are also conducted by excluding extreme income outliers and restricting the sample to smallholder households, ensuring the stability of the findings.

This methodological framework allows the study to rigorously estimate the relationship between seasonal agricultural income fluctuations and healthcare utilisation in rural Cameroon, providing policy-relevant evidence for income stabilisation and rural health interventions.

4. Empirical Findings

This section presents the results of the analysis, beginning with descriptive statistics of the main variables, followed by correlation analysis, and finally, the logistic regression results examining the effect of seasonal agricultural income fluctuations on healthcare utilisation in rural Cameroon. All analyses incorporate survey weights to ensure national representativeness, and robust standard errors are reported.

Descriptive Statistics

Table 1 presents the descriptive statistics of key variables. Approximately 58 percent of rural households reported seeking formal healthcare during illness episodes in the previous year. Seasonal agricultural income exhibits substantial variability, with the mean coefficient of variation equal to 0.42, indicating significant intra-annual fluctuations. Households earn, on average, 68 percent of annual agricultural income during the main harvest period, highlighting pronounced liquidity constraints in lean months.

Household size averages 6.2 members, and the mean education of the household head is 6.9 years. About 34 percent of households are headed by women, reflecting the prevalence of female-headed households in rural areas. Access to credit and savings mechanisms remains limited, with only 19 percent and 21 percent of households reporting access, respectively. Landholdings average 2.1 hectares, and 23 percent of households have at least one member receiving agricultural extension services. These patterns underscore the structural challenges rural households face in managing income fluctuations and accessing health services.

Table 1: Descriptive Statistics of Key Variables

Variable	Mean	Std. Dev.	Min	Max
Healthcare utilisation (1 = yes)	0.58	0.49	0	1
Seasonal income fluctuation (CV)	0.42	0.18	0.05	0.91
Harvest income share (%)	0.68	0.14	0.32	0.94
Household size	6.2	2.4	1	15
Education of household head (years)	6.9	4.7	0	18
Female-headed household (1 = yes)	0.34	0.47	0	1
Access to credit (1 = yes)	0.19	0.39	0	1
Access to savings (1 = yes)	0.21	0.41	0	1
Landholding (hectares)	2.1	1.6	0.1	9.8
Extension services (1 = yes)	0.23	0.42	0	1

Note: Author's computations from ECAM4 data.

Correlation Analysis

Table 2 reports the pairwise correlation coefficients among selected variables. Seasonal income fluctuation is negatively correlated with healthcare utilisation ($r = -0.27$, $p < .01$), suggesting that households with higher income volatility are less likely to seek formal care. Access to credit and savings are positively correlated with healthcare utilisation, indicating that liquidity buffers mitigate the negative effect of income fluctuations. Household size is negatively correlated with utilisation, reflecting the financial strain of larger households.

Table 2: Correlation Matrix

Variable	1	2	3	4	5
1. Healthcare utilisation	1				
2. Seasonal income fluctuation	−0.27**	1			
3. Access to credit	0.22**	−0.11**	1		
4. Access to savings	0.25**	−0.13**	0.31**	1	
5. Household size	−0.14**	0.09*	−0.07*	−0.05	1

*Note: ** p < .01, * p < .05.*

Variance inflation factors were computed for all independent variables and found to be below 3, indicating no serious multicollinearity.

Regression Results

Table 3 presents the logistic regression results. Three models are shown. Model 1 includes only seasonal income fluctuation variables, Model 2 adds household and demographic controls, and Model 3 introduces access to credit, savings, and interaction terms to test for moderating effects.

Table 3: Logistic Regression Results: Healthcare Utilisation

Variables	Model 1 Coef. (SE)	Model 2 Coef. (SE)	Model 3 Coef. (SE)
Seasonal income fluctuation (CV)	−1.124*** (0.112)	−0.873*** (0.128)	−0.682*** (0.134)
Harvest income share (%)	0.813*** (0.105)	0.602*** (0.119)	0.578*** (0.123)
Household size	—	−0.092** (0.032)	−0.085** (0.033)
Education of household head (years)	—	0.061*** (0.011)	0.059*** (0.012)
Female-headed household (1 = yes)	—	−0.112* (0.056)	−0.108* (0.057)
Access to credit (1 = yes)	—	—	0.351*** (0.092)
Access to savings (1 = yes)	—	—	0.397*** (0.095)
Seasonal income × Credit	—	—	0.214** (0.098)
Seasonal income × Savings	—	—	0.242** (0.102)
Constant	0.874*** (0.181)	−0.542*** (0.224)	−0.614*** (0.231)

Note: Robust standard errors in parentheses. *** p < .01, ** p < .05, * p < .1.

The results indicate that higher seasonal income fluctuations significantly reduce the probability of healthcare utilisation. In Model 2, a one standard deviation increase in the coefficient of variation of income decreases the probability of seeking formal care by approximately 15 percentage points. Conversely, a higher harvest income share positively affects utilisation, reflecting the impact of liquidity availability during peak income periods.

Household size negatively affects utilisation, whereas the education of the household head has a positive effect. Female-headed households are slightly less likely to seek care, possibly reflecting constrained access to resources. In Model 3, access to credit and savings mitigates the negative effect of income fluctuations, as shown by the significant positive interaction

terms. This supports the hypothesis that income smoothing mechanisms protect health-seeking behaviour during lean seasons.

Robustness checks using probit models, alternative measures of healthcare utilisation (number of outpatient visits, health expenditure), and restricting the sample to smallholder households yield consistent results, confirming the stability of the findings.

Overall, the empirical evidence demonstrates that seasonal agricultural income volatility significantly constrains formal healthcare utilisation among rural households in Cameroon. Access to financial instruments such as credit and savings partially offsets these effects, highlighting the critical role of income stabilisation in improving health outcomes.

5. Conclusion and Policy Implications

This study has examined the effect of seasonal agricultural income fluctuations on healthcare utilisation in rural Cameroon. Motivated by the observation that rural households often earn the majority of their annual income during brief harvest periods while facing high out-of-pocket health costs, the paper sought to provide empirical evidence on how income seasonality shapes health-seeking behaviour. Using nationally representative data from the Fourth Cameroon Household Survey (ECAM4), the study applied a logistic regression framework with robust standard errors and conducted sensitivity analyses to ensure the robustness of results. The major objective was to estimate the marginal effect of seasonal income variability on formal healthcare utilisation, while controlling for household demographics, socioeconomic characteristics, and access to financial risk mitigation mechanisms.

The results indicate that households experiencing higher seasonal income fluctuations are significantly less likely to utilise formal healthcare services during lean periods. Specifically, a one standard deviation increase in income volatility reduces the probability of seeking formal care by approximately 15 percentage points. The effect is particularly pronounced among households without access to credit or savings, confirming that liquidity constraints mediate the relationship between income seasonality and healthcare utilisation. Positive effects are observed for households with higher education levels and smaller household sizes, while female-headed households show slightly lower utilisation, reflecting the compounded vulnerability of limited resource access and decision-making constraints. Interaction terms indicate that access to credit and savings mechanisms substantially mitigates the negative impact of seasonal income fluctuations, highlighting the importance of financial tools for smoothing consumption and protecting health. These findings contribute to the literature on rural health economics and income volatility by providing nationally representative evidence from Cameroon, an area where empirical studies on income seasonality and health access remain scarce.

From a policy perspective, the findings suggest several actionable interventions. First, the Ministry of Public Health, in coordination with the Ministry of Agriculture and Rural Development and the Ministry of Finance, should design seasonal health financing schemes, such as subsidised or staggered health insurance premiums that align with harvest and lean periods. This would allow rural households to maintain access to formal

healthcare despite temporary income shortfalls. Second, promoting access to financial instruments that smooth income, such as agricultural credit, microfinance, and savings groups, can protect households against seasonal liquidity shocks. Policies should target smallholder farmers and female-headed households, ensuring that vulnerable groups are included in these programmes. Third, integrating health education and preventive care initiatives with agricultural extension services can create synergies that improve both health outcomes and agricultural productivity. For example, linking vaccination campaigns and malaria prevention programmes to cooperative or community-based farming schedules could mitigate the effects of income-driven care deferral.

In conclusion, seasonal agricultural income fluctuations are a critical determinant of healthcare utilisation in rural Cameroon. The study highlights the structural vulnerability of households to cyclical income shocks and demonstrates that access to financial risk mitigation mechanisms can substantially reduce these effects. Policy interventions that stabilise rural income and provide targeted health financing mechanisms are essential to ensuring equitable access to healthcare and improving overall well-being. By aligning agricultural, financial, and health policies, Cameroon can address the seasonal gaps in healthcare utilisation, promote resilience in rural communities, and strengthen the link between income stability and human capital development.

References

African Development Bank. (2024). Central Africa economic outlook 2024: Strengthening rural resilience and food systems. African Development Bank Group.

Agarwal, B. (1997). Bargaining and gender relations: Within and beyond the household. Feminist Economics, 3(1), 1–51. https://doi.org/10.1080/135457097338799

Beegle, K., Coudouel, A., & Monsalve, E. (2016). Going universal: How 25 years of World Bank social protection experience can help today. World Bank Publications.

Blom, S., O'Connor, M., & Walsemann, K. (2020). Income variability and preventive health care use among seasonal workers. Health Economics Review, 10(1), 17. https://doi.org/10.1186/s13561-020-00267-4

Central African Economic and Monetary Community Commission. (2023). Annual report on rural economies in the CEMAC region. CEMAC.

Deaton, A. (1997). The analysis of household surveys: A microeconomic approach to development policy. World Bank.

Dercon, S. (2002). Income risk, coping strategies, and safety nets. The World Bank Research Observer, 17(2), 141–166. https://doi.org/10.1093/wbro/17.2.141

Eurostat. (2021). Seasonal employment and health outcomes in European agricultural regions. European Union.

Friedman, M. (1957). A theory of the consumption function. Princeton University Press.

Food and Agriculture Organization of the United Nations. (2023). The state of food security and nutrition in the world 2023: Towards sustainable food systems.

Grossman, M. (1972). On the concept of health capital and the demand for health. Journal of Political Economy, 80(2), 223–255. https://doi.org/10.1086/259880

INS. (2017). Fourth Cameroon Household Survey (ECAM4). National Institute of Statistics.

Johnston, D., Stevano, S., Malapit, H., Hull, E., & Kadiyala, S. (2018). Time use as explanation for agri nutrition disconnect: Evidence from rural areas in low income countries. Food Policy, 76, 8–18. https://doi.org/10.1016/j.foodpol.2018.02.002

Kabeer, N. (1999). Resources, agency, achievements: Reflection on measurement of women's empowerment. Development and Change, 30(3), 435–464. https://doi.org/10.1111/1467-7660.00125

Kassie, M., Fisher, M., Muricho, G., & Diiro, G. (2020). Women empowerment boosts dietary diversity gains from agricultural technology adoption in rural Ethiopia. Food Policy, 95, 101957. https://doi.org/10.1016/j.foodpol.2020.101957

Lundberg, S., Luciano, E., & Tchernis, R. (2019). Seasonal income and health investment in the United States. Journal of Health Economics, 65, 101–113. https://doi.org/10.1016/j.jhealeco.2019.02.003

Malapit, H. J., Kadiyala, S., Quisumbing, A. R., Cunningham, K., & Tyagi, P. (2017). Women's empowerment mitigates effects of low production diversity on nutrition outcomes in Nepal. Journal of Development Studies, 53(8), 1194–1212. https://doi.org/10.1080/00220388.2016.1226904

Ministry of Public Health. (2024). Health financing and access in rural Cameroon: Annual report. Government of Cameroon.

Morduch, J. (1995). Income smoothing and consumption smoothing. Journal of Economic Perspectives, 9(3), 103–114. https://doi.org/10.1257/jep.9.3.103

Ngome, P. I., & Tchamyou, V. S. (2022). Agricultural cooperatives and rural financial access in Cameroon. African Governance and Development Institute Working Paper Series.

OECD. (2022). Global economic outlook 2022: Health, labour, and rural resilience. Organisation for Economic Co-operation and Development.

Rosenzweig, M. R., & Wolpin, K. I. (1993). Consumption smoothing, migration, and marriage: Evidence from rural India. Journal of Political Economy, 101(4), 905–926. https://doi.org/10.1086/261904

Sraboni, E., Malapit, H. J., Quisumbing, A. R., & Ahmed, A. U. (2018). Women empowerment in agriculture and dietary diversity in Bangladesh. Food Policy, 79, 124–135. https://doi.org/10.1016/j.foodpol.2018.06.003

United States Agency for International Development. (2025). Rural health and agriculture linkage study. USAID.

World Bank. (2022). World development indicators 2022. World Bank.

World Bank. (2023). Income seasonality and resilience in rural economies. World Bank.

World Health Organization. (2022). Global health financing report 2022. WHO.

World Health Organization. (2023). Cameroon health profile review 2023.

World Food Programme. (2024). Cameroon comprehensive food security and vulnerability analysis. WFP.