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REGULAR ARTICLE

Material and nonmaterial impacts of the COVID-19 pandemic: Evidence from a low-income country

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Abstract

How have COVID-19-related restrictions affected consumption levels and life satisfaction in low-income countries? We conducted phone surveys with 577 households in Liberia to compare consumption patterns across three points in time: November 2019 (pre-COVID-19), May 2020 (short term), and September 2020 (medium term). This article analyzes the impacts of the Covid-19 pandemic and the related restrictions on food and nonfood consumption, which we categorize as “material” welfare and life satisfaction, which we categorize as “nonmaterial” welfare. We find differences between food and nonfood consumption patterns under pandemic conditions. In particular, consumption by households dependent on food and labor markets was negatively affected by the pandemic. In terms of life satisfaction, we find that most respondents perceived their lives to have worsened due to the pandemic.

KEYWORDS

Africa, COVID-19, household welfare, Liberia, livelihoods, well-being

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1 | INTRODUCTION

Since March 2020, most countries of the world have implemented restrictions to protect themselves against the global spread of SARS-CoV-2. Africa has not been a virus hotspot in terms of the number of those affected: In the first 2 years of the pandemic, only less than 3% of global cases have been registered on the African continent (WHO, 2021). Nonetheless, lockdown measures and disruptions to food supply chains have impacted most African countries—and the prospects for the next few years are pessimistic in this regard, as international institutions expect large declines in food security resulting from higher retail prices and reduced levels of income (World Bank, 2021). At the same time, vaccination rates remain low across the continent, mainly due to the limited availability of doses but also to vaccine hesitancy (Aminatou, 2021).

Evidence for the impact of COVID-19 containment measures on the population's welfare is steadily growing: Regional and country-specific case studies show that the repercussions of such policies are heterogeneous (Bloem & Farris, 2022) and depend on various factors, for example on the structure of supply chains (Reardon, 2021), the level of subsistence (Aggarwal et al., 2020), and the types of employment people engage in (Mahmud & Riley, 2021). Some studies focusing on rural Africa find economic impacts to have been less severe in the countryside as compared to in urban settings: in rural areas, a larger share of the population depends on subsistence farming meaning that there is less reliance on food markets and wage income (Aggarwal et al., 2020). A recent literature review on COVID-19-related changes in food security in low-or middle-income countries finds that most of these works detect increases in food insecurity seemingly tied to disruptions in income and food markets; nevertheless, results vary across countries (Bloem & Farris, 2022). Besides economic well-being, life satisfaction has come under threat too (Brogårdh et al., 2021; de Pedraza et al., 2020). Yet, empirical evidence on the impact of COVID-19 containment measures on life satisfaction or related factors is scarce for low-income countries—and particularly for rural areas in sub-Saharan Africa. The few studies that do exist on these matters have found decreased life satisfaction and increased stress levels under pandemic conditions in Ethiopia (Abate et al., 2020) and Uganda (Mahmud & Riley, 2021), respectively. Deterioration in subjective well-being can be long-lasting (Alem et al., 2014; Rojas, 2008) and negatively impact both the economic situation and the decision-making of those affected (Lund et al., 2013).

In this article, we thus focus on two questions: (1) How have containment policies affected the material welfare—measured by consumption levels—of rural populations? (2) How are these policies related to nonmaterial-welfare measures, such as life satisfaction? We exploit data from a face-to-face survey conducted in late 2019 with 2072 households across 73 villages, thereby covering three counties of rural Liberia. We use this data as a baseline and compare it to newly collected computer-assisted phone interviews with 577 of these households. The survey addresses their socioeconomic conditions, with a focus on household consumption levels. We use data on consumption patterns collected at three points in time: November 2019, May 2020, and September 2020. We also gathered data on individual perceptions of how COVID-19 has impacted our respondents' lives.

We make herewith three major contributions to the scholarship: First, we go beyond material-welfare markers in adding perception-based measures to the analysis of the impacts of pandemic-related containment policies. Second, we analyze some of the transmission channels that explain material-welfare outcomes, namely dependence on food- and labor markets. Third, we collected in-depth, disaggregated consumption data pre- and post-lockdown measures in a

context that has not been covered by previous surveys: rural Liberia. This allows us to compare changes in material living standards with those also in life satisfaction.¹

We find that overall levels of consumption are not significantly different in the short term (May 2020) or in the medium term (September 2020) compared to pre-COVID-19 levels. In the short term, we observe a decline in nonfood consumption by 46%. In the medium term, nonfood consumption exceeded pre-COVID-19 levels. Short-term food consumption increased by 11% compared to pre-pandemic levels—possibly because money usually spent on nonfood items such as clothing and footwear was used to sustain food consumption—and was not significantly different in the medium term compared to before COVID-19's onset. In terms of transmission channels, we find that (1) households that are dependent on food markets and (2) households that are dependent on labor markets have been affected more severely than independent households.

These findings suggest that households able to resort to subsistence agriculture and that do not strongly depend on wage income are better able to cope with these types of public-health crises. This is a particularly relevant discovery as two highly contagious diseases have affected West Africa in the space of the last 5 years alone (Ebola and COVID-19), with experts pointing out that such health crises are only likely to reoccur (Marani et al., 2021); the risk hereof might even increase with climate change's progression (Mills et al., 2010; Rodó et al., 2021). Furthermore, 67% of respondents feel that their lives have worsened due to the pandemic. When looking at the factors driving this perception, it is particularly households experiencing a decline in consumption that feel this way. However, other factors (e.g., community relations) also matter here. Thus, there is a discrepancy between the objective and subjective effects of COVID-19, and we recommend taking subjective perceptions seriously as they can signify enduring negative consequences.

The remainder of this article is structured as follows: In Section 2, we discuss the related literature and relevant case studies. Section 3 provides background information on COVID-19 and related containment policies in Liberia in 2020. Section 4 covers our methodology and empirical strategy. The empirical results are discussed in Section 5, leading to the obtention of our main results. In Section 6, we conclude by summarizing findings and discussing their implications for policy design.

2 | LITERATURE REVIEW

Even though the situation has calmed down in recent months, the scientific and societal processing of the impact of the COVID-19 pandemic continues to evolve. Its effects on public health, food security, and household welfare are among the main concerns for academics, policymakers, and civil society organizations (Ravallion, 2020). In a recent policy brief, the World Bank warned that the pandemic could lead to “growing levels of acute food insecurity, reversing years of development gains” (2021, 1)—namely, due to disrupted supply chains, rising food prices, and reduced levels of income.

However, a growing number of regional and country-specific case studies have shown that food prices in the world's poorest countries seem to have been less affected by the pandemic than they have been in emerging economies. This is because “traditional” supply chains that cater to local markets are less prone to disruption than longer (“transitioning”) supply chains catering to international markets are. By their nature, the latter rely more heavily on infrastructure and hired labor (Erokhin & Gao, 2020; Reardon, 2021).

Moreover, subsistence agriculture seems to help mitigate the negative impacts of restrictive containment policies. For instance, a study on the effects of preventive measures in Liberia and Malawi detected severe disruptions in market activities and income declines for rural market vendors, but no evidence of a decline in general food security (Aggarwal et al., 2020). The authors explain their findings by way of a high level of subsistence combined with little to no evidence for stark price increases. But this does not mean that food security is not a cause for concern. It rather signifies that the *source of income* and the *level of subsistence* might make the difference here: when households depend on nonfarm income and businesses close or dismiss employees, many households respond with a decrease in food expenditure—as shown by Mahmud and Riley (2021) for Uganda, anecdotally by Buonsenso et al. (2020) for Sierra Leone, by Rozelle et al. (2020) for China, by Amare et al. (2020) for Nigeria, and by Sassi and Trital (2022) for Malawi. These effects persist over time: Even 2 years after the first lockdown, former workers in India had not gotten back into formal employment according to a study by Chakravorty et al. (2023).

In contrast, households that are less dependent on wage- or business income and have access to farms for self-sustenance are less likely to experience an acute deterioration in food security. Analyzing the short-term effects of COVID-19 in 31 developing countries, Bundervoet et al. (2022) find that self-reported income losses are highest for the nonfarm self-employed. Maredia et al. (2022) assert that the impacts of COVID-19 were below predicted ones in four of the five studied countries, but they found food consumption to be similar in rural and urban areas. Mahmud and Riley (2023) note that households with a business also recover more slowly from lockdowns compared to ones reliant mainly on farm income. A drawback of many of the early case studies is that they lack detailed data on food and nonfood household expenditure before and after the pandemic's commencement (Lanjouw & Tarp, 2021). Instead, they rely on respondents' self-reported perceptions (e.g., Le Nestour et al., 2020). Thus, it is not clear whether they account for the actual availability of food/consumption levels or rather negative subjective impressions thereof.

In addition to their adverse material impacts, COVID-19 containment measures are also likely to negatively impact life satisfaction. This may persist regarding subjective well-being even after the material damage has been repaired, as examples from Ethiopia (Alem et al., 2014) and Mexico (Rojas, 2008) show. Further, the economic situation and decision-making of those affected may suffer too (Lund et al., 2013).

So far, there is little evidence regarding the impact of COVID-19 on life satisfaction. Exceptions here are two (nonrepresentative) online surveys conducted during the pandemic. Both find that life satisfaction decreased due to COVID-19's onset (Brogårdh et al., 2021; de Pedraza et al., 2020). Other studies in Organisation for Economic Co-operation and Development (OECD) countries (Scarpetta et al., 2021), the United States (Marroquín et al., 2020), and China (Rozelle et al., 2020) show that containment measures have impacted various dimensions of subjective well-being likely to be correlated with life satisfaction, such as mental health.

Related research on the African continent remains scarce, as two recent literature reviews demonstrate (Kar et al., 2020; Semo & Frissa, 2020). One exception is a study on rural Uganda by Mahmud and Riley (2021), who note a decrease in life satisfaction, a higher likelihood of having a major argument with one's spouse, and evidence for increased levels of domestic violence as a result of the pandemic. Similarly, Abate et al. (2020) find evidence for higher stress levels—independent of the degree of wealth—in their study on (urban) Ethiopia. A longitudinal study on Nigeria shows a decrease in food security negatively associated with individual well-being (Orjiakor et al., 2023). Case studies from South Africa and Uganda indicate that support

structures such as healthcare providers and groups offering assistance had to reduce their services, affecting the most vulnerable particularly (Onyango & Veale, 2021).

This short review of the existing literature shows that the material-welfare impacts of COVID-19 containment measures might be less severe in very poor rural settings than in regions with higher levels of dependency on food- and labor markets. Thus, while the average effects on consumption may be moderate, we expect the effects of containment measures to be heterogeneous. Specifically, we anticipate households that are less reliant on food markets due to high subsistence levels are coping better with the situation. Moreover, households that are less dependent on wage labor and therefore not as affected by business closures or job losses are likely to have been less severely affected by lockdown measures. As it has been shown that COVID-19 can impact subjective well-being in industrialized countries (e.g., Marroquín et al., 2020; Scarpetta et al., 2021), we examine whether this is the case in our chosen setting as well.

3 | COVID-19 CONTAINMENT POLICIES IN LIBERIA

In mid-March 2020, the first two cases of COVID-19 were confirmed in Liberia (AfricaNews, 2020). A third case, whose origin could not be traced, was confirmed a few days later. A peak was reached on June 29, when 94 new cases were confirmed in 1 day. From July onward, however, the number of new cases decreased significantly and from August to October the daily number of new ones remained below 20. As of October 1, 2020, the total number of recorded cases was 1343 (WHO, 2020).² Thus, with an overall rate of 43 infections per 100,000 people, case numbers in Liberia were among the lowest in West Africa (only Niger had fewer per 100,000 people).

Figure 1 below details COVID-19 cases in Liberia and the preventative measures initiated in response. The relatively low case rates have been partly attributed to a very swift government response, potentially due to prior experiences with the Ebola epidemic: The first measures to contain the spread of SARS-CoV-2 were announced on March 17 and included the week-long closure of all schools and universities and a ban on entry from countries with more than 200 recorded cases of COVID-19. On March 21, Liberia's Ministry of Health declared a national health emergency and the closing of churches, mosques, bars, and beaches in two counties (Montserrado and Margibi), further banning gatherings of more than 10 people. Maintaining a minimum distance of two meters and a nationwide school closure was then ordered (Aljazeera, 2020). A ban on traveling between all 15 counties and a curfew between 3 pm and 6 am for four counties in particular (Grand Kru, Margibi, Montserrado, and Nimba) was adopted on April 8. Handwashing was made mandatory in all homes and all public and private establishments (Goitom, 2020). From April 17, "all persons appearing in public streets and buildings must wear a protective device that covers at least the nose and mouth" (COVID-19 Africa Watch, 2020). On April 24, the curfew was extended to all counties nationwide.

From mid-May, shops, churches, and mosques were allowed to reopen with a limited number of visitors at a time (GardaWorld, 2020). The state of emergency ended on July 21 and was replaced by a set of "National Health Emergency Guidelines" that included compulsory mask-wearing in public places (including a "no mask, no entry" policy for government institutions), mandatory handwashing, limits on the number of people allowed in gatherings, banks, supermarkets, and public transport (among other sites), while schools and nightclubs had to remain closed too. Violation of these measures could see a fine of up to USD 200 handed out (Executive Mansion, 2020).

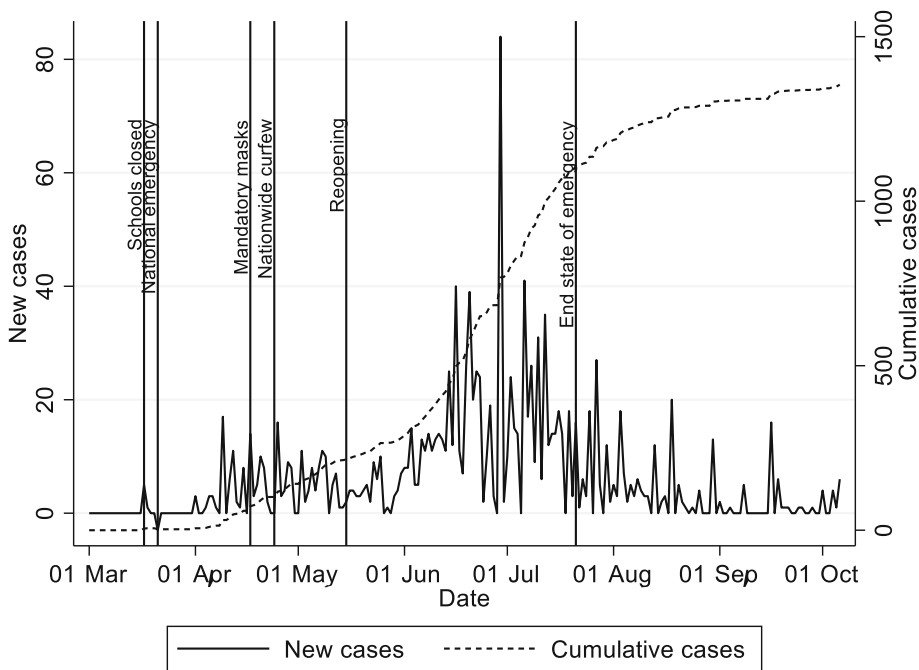


FIGURE 1 New and cumulative cases of COVID-19 and preventative measures in Liberia, March–October 2020. Authors' own compilation, based on data from the WHO (2020).

While we expected that containment policies were less adhered to in Liberia's remote rural areas, where monitoring and enforcement are more difficult than in the country's urban centers, the information from our survey reveals the opposite to be true in fact: A broad set of measures against the spread of COVID-19 were reported in all villages, including a four-week closure of markets during May 2020, school doors remaining shut, and the suspension of religious services. Other restrictive measures that were widely reported (>99% of respondents) included people only being allowed to leave their homes to get essential supplies or medical help, people with symptoms having to quarantine, gatherings in public spaces being banned (as was traveling), and personal hygiene (such as handwashing) being emphasized. Additionally, about 68% of respondents reported that masks, soap, and gloves were distributed in their communities. The responsible parties were the government or politicians, nongovernmental organizations, or respondents' own relatives. Essentially, all respondents (98%) named the town chief as the main person overseeing the implementation of these measures, with 96% believing that the chief had done a (very or fairly) good job in that regard. In terms of coping mechanisms, 80% of respondents stated that they had to use their savings, 52% bought fewer inputs than planned for their own businesses or farms, 20% borrowed money, and 8% had to sell off assets.

4 | METHODOLOGY

4.1 | Data

Between November and December 2019, we collected data in 73 villages in the proximities of two large-scale oil palm plantations in Bomi, Grand Bassa, and Grand Cape Mount. The dataset

was collected in person and included information about socioeconomic conditions, livelihoods, as well as perceptions regarding political and social matters. We surveyed 2072 respondents. Originally, the survey was designed to identify the impact of large-scale land acquisitions on rural-household welfare. We used a geographical-distance cutoff point of a 1.6-kilometer radius around the oil-palm plantations to assess exposure to the latter. The distance for this cutoff point was determined during the pilot phase in Liberia; beyond this limit, people were usually not recruited to work on the plantations. Beyond the treatment zone, we introduced a 1 km buffer zone from which we did not draw any villages. Control villages are drawn from a 5 km radius around the buffer zone. Within these zones, 39 treatment and 34 control villages were randomly drawn from all villages located within the respective zones. Given our random selection of villages and respondents within them, we believe that our sample is largely representative of the average person in rural Liberia.

In September 2020, during the pandemic, we re-contacted those households for which phone numbers had been recorded in the baseline survey. Of these 947 households, we were able to get back in touch with 662 (69.9%). The remaining 285 (30.1%) were not reached either because the line did not work or because the respondent did not pick up. Enumerators were instructed to call a given number a maximum of five times over five consecutive days (i.e., equivalent to once a day) if they did not reach the respondent.

Of the 662 households reached, 577 (87.2%) agreed to participate in a phone interview. The main reasons for refusal were “no time” (68.2%), “health reasons” (18.8%), or “wrongly recorded phone number” (10.6%). There was no monetary incentive provided to participate. Enumerators were instructed to interview the same respondent as in the in-person interviews if possible. This was the case in 90.5% of the interviews (521 out of 577). The final sample includes households from 73 villages: namely 102 from Grand Cape Mount, 206 from Bomi, and 213 from Grand Bassa. The phone interviews included questions about respondents' current circumstances but also ones about the situation during the first phase of the pandemic (May 2020). This allowed us to construct a panel dataset for three points in time (see Figure 2 below): the data collected in November/December 2019 form the baseline, while that amassed during the phone interviews serves as midline and endline data.

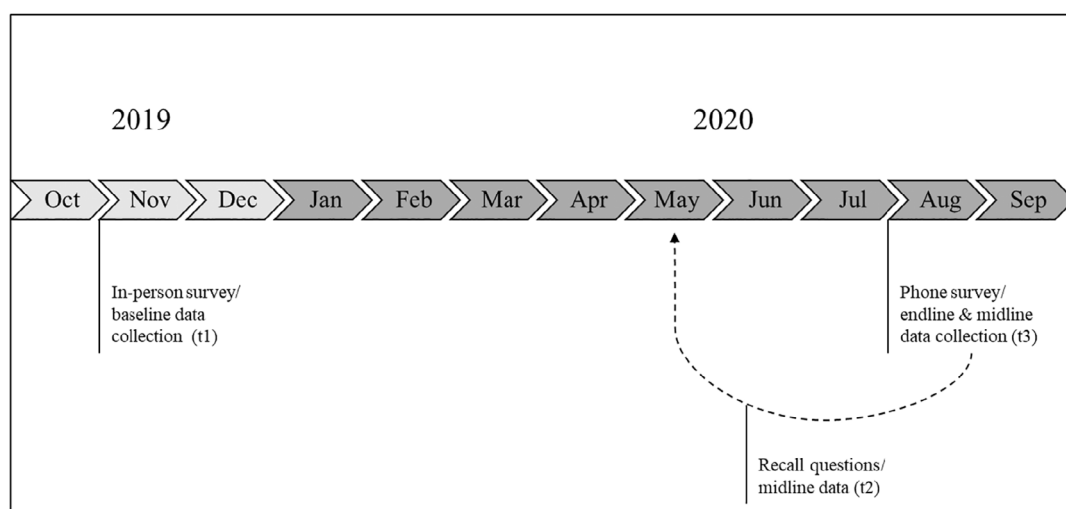


FIGURE 2 Timeline of data collection.

One key concern regarding our study design is the switch from face-to-face data collection in the baseline survey to remote phone interviews in the midline and endline periods. This change in survey mode could potentially impact (1) sample selection and (2) measurement error. In terms of sample selection, according to several studies specific groups—for example, women and more remote households—are often underrepresented in phone interviews as compared to in face-to-face surveys (e.g., Carletto et al., 2021). Table A1 offers a comparison of personal characteristics for those respondents whose phone numbers were (not) recorded in the face-to-face baseline and those who were (not) reached during the phone survey. The table shows that households whose phone numbers were recorded have slightly fewer members and are less likely to be headed by a female. On average their food consumption per adult equivalent is slightly lower, while their nonfood consumption per adult equivalent is significantly higher than those households for whom a phone number was not recorded.

Thus, our sample is special in that it is rather male and slightly wealthier compared to our full baseline respondent sample. We address this shortcoming by calculating inverse probability weights: we estimate regressions with and without variables that are significantly associated with attrition (phone number recorded versus not recorded) and use the ratio of predicted probabilities from these regressions to reweight our observations.³ Attrition between respondents whose phone number was recorded but who could (not) be reached turned out to be random.

A common argument concerning measurement error is that any potential difference in responses across survey modes may be due to social-desirability bias. Phone surveys seem to be less prone to such bias than face-to-face ones are (e.g., Henderson, 2020). For example, Boznice et al. (2017) find lower levels of reported well-being on phone- as compared to face-to-face surveys but no systematic response bias for purchased (nonfood) goods. Similarly, Lamanna et al. (2019) detect no evidence for differences in reporting on diet for adults but only of inadequate diets for children in phone surveys. But, are consumption goods prone to social-desirability bias? In general, we cannot be sure as study results are scarce (Carletto et al., 2021). Yet, we believe that in our case it is unlikely as this does not constitute sensitive data. It could be the case that goods such as tobacco are underreported in our face-to-face baseline data—however, such items only account for 1% of total household consumption and would therefore not significantly impact our results anyway.

4.2 | Methods

4.2.1 | Estimating short- and medium-term effects of COVID-19 containment measures on consumption levels

To appropriately estimate the short- and medium-term effects of COVID-19 containment measures on consumption levels and mitigate potential endogeneity issues, we employed a fixed-effects regression model in our analysis. The fixed-effects specification was chosen due to its ability to control for time-invariant unobserved heterogeneity, providing a more reliable estimation of the causal effects of COVID-19 containment measures on consumption levels.

Accordingly, we estimate fixed-effects models of the following form,

$$y_{it} = \beta_0 + \beta_1 \text{SHORT} + \beta_2 \text{MED} + \nu_i + \varepsilon_{it} \quad (1)$$

where y_{it} represents logged consumption per adult equivalent in USD of household i for the time period t . The coefficients β_1 and β_2 , respectively, identify the short-term (May 2020, recall period) and medium-term (September 2020, second survey wave) effects of COVID-19 containment policies compared to the pre-COVID-19 baseline. Accordingly, SHORT and MED are dummy variables that equal 1 if the data was collected in the respective recall period and 0 otherwise. ν_i is a household-specific error term, which allows us to account for unobservable household characteristics that are constant over time but vary across households. This approach effectively removes any time-invariant heterogeneity, such as individual preferences, cultural factors, or unobserved household-specific characteristics, that may confound the estimated effects. ε_{it} is a time- and household-variant error term. We refrain from adding household characteristics as control variables since the fixed-effects specification inherently accounts for such time-invariant factors.

Given the relatively short time periods between the survey waves and the absence of substantial changes in relevant household characteristics in our dataset, the fixed-effects model is particularly suitable for capturing the variation in consumption levels directly attributable to the short- and medium-term effects of COVID-19 containment policies. There are no relevant changes in the main household characteristics detectable in our dataset.⁴

4.2.2 | Exploring heterogeneity: Subgroup analyses and differential impacts

Additionally, we test for two potential transmission channels through which COVID-19 might impact consumption levels: (1) independence from food markets and (2) independence from labor markets.

As argued by Aggarwal et al. (2020), for example, households' capacity to produce their own food might have mitigated the pandemic's effects. Therefore, we investigate the potential protective effect of households' independence from food markets on food consumption during the pandemic. We conducted subgroup analyses by splitting the sample based on households' share of self-produced items in total food consumption (subsistence share). At the same time, farmer households could not sell their produce when markets were closed. As such, it might be reasonable for them to sustain or even increase their food consumption. To test whether this explanation holds in our chosen setting, we conduct the same analysis as before (regression specification [1]) but split the sample according to households' share of self-produced items among total food consumption (subsistence share). We differentiate between households with a lower than median subsistence share and those with a higher such share. The median subsistence share is 0.09 in our sample. Tests for sensitivity to the cutoff point did not reveal strong effects here.

Additionally, we created subsamples based on households' primary income sources, such as wage employment, self-employment, or remittances. This allowed us to investigate whether the effects of COVID-19 containment measures differed depending on the main source of income.

By estimating the effects within these subsamples, we aimed to shed light on any potential heterogeneity in the impact of COVID-19 containment policies on consumption levels among different income sources and subsistence farming groups. This analysis helps provide a more nuanced understanding of how various segments of the population were affected by the pandemic and offers insights into the differential effects experienced by distinct economic groups.

4.2.3 | Estimating effects of COVID-19 containment measures on life satisfaction

Next, we estimate an ordinary least squares (OLS) model to assess how a negative consumption shock ensuing from COVID-19 preventative measures is associated with the degree of life satisfaction. The model has the following form,

$$y_i = \alpha + \beta \text{SHOCK}_j + X_i \gamma + \varepsilon_i \quad (2)$$

where y_i takes a value of 1 if respondent i feels that their life has become worse due to the pandemic and 0 otherwise.⁵ The binary variable SHOCK equals 1 if household j experienced a decrease in consumption per adult equivalent across the baseline and short-term time periods and 0 otherwise—some 51.8% of households experienced lower consumption in May 2020 as compared to the baseline. Thus, β identifies the correlation between experiencing a decrease in household consumption per adult equivalent and reduced life satisfaction. X_i is a vector of the village, household, and individual characteristics that we expect to potentially correlate with well-being. As an alternative to the binary variable SHOCK, we also use the absolute difference between total consumption across the baseline and short-term time periods (see Table A5).⁶

Previous research has shown that an individual's economic situation positively correlates with subjective well-being at the micro level (e.g., Clark et al., 2008; Dolan et al., 2008), especially relative to others. We, therefore, expect respondents who experienced a decline in consumption to perceive their lives to have become worse due to COVID-19. Besides the economic situation, among the most important factors for well-being are one's personal relationships (Diener & Ryan, 2009). Some personal relationships are unlikely to have changed due to the pandemic (e.g., marital status), while other community relationships could well have been affected by these circumstances: social activities like labor-sharing arrangements and meetings of secret societies have probably not taken place regularly. Thus, people who usually engage in such social activities might report a decline in their well-being.

In line with the heterogeneous effects reported above, we also investigate whether respondents' well-being is correlated with dependence on food markets (approximated by the level of subsistence) and labor markets (approximated by nonfarm income). Besides, we control for some personal characteristics typically associated with well-being (cf. Dolan et al., 2008): age (usually correlated with life satisfaction in a U-shaped way), gender (women on average reporting greater life satisfaction), religion (=1 if the respondent is Muslim and 0 otherwise), and years of education. We also control for the walking distance to the closest healthcare facility (0 = farther away than 60 min.' walk, 1 = closer than 60 min.' walk), as the availability of hospitals indicates that physical health can be recovered herewith faster in times of illness.

5 | RESULTS AND DISCUSSION

5.1 | Descriptive results

Table 1 below describes our sample. On average, five people live together in one household. Household wealth at baseline (derived using a principal component analysis over 21 assets) is on average quite low: it lies at 17.66 on a scale between 0 and 100. For example, 20% of households do not own a bed and 56% do not own a radio. Only 8% of the surveyed households own

TABLE 1 Sample description.

Variable	N	Mean	Std. Dev.	Min.	Max.
“Life has become worse” ^a	577	0.67	0.47	0	1
Lower household consumption in t_2 compared to t_1 ^b	577	0.52	.5	0	1
Difference between consumption t_2 and t_1 in USD	577	−3.23	26.93	−415.25	102.46
Number of household members at baseline	577	5.12	2.09	1	18
Household-wealth score in t_1	577	17.65	14.15	0	100
Subsistence level in t_1 (share of self-produced food among total household consumption)	577	0.24	0.17	0	0.86
Monthly nonfarm income in t_1 in USD	577	62	108.46	0	930.47
Female respondent in t_1 ^b	577	0.33	0.47	0	1
Age of respondent in t_1	577	41.99	13.28	18	89
Years of education of respondent in t_1	577	5.31	5.08	0	24
Muslim respondent ^b	577	0.33	0.47	0	1
Respondent is member of Poro/Sande society ^b	576	0.26	0.44	0	1
Health center closer than 60 mins’ walk ^b	569	0.36	0.48	0	1
Household is part of labor-sharing (<i>kuu</i>) ^b	488	0.22	0.41	0	1

^aWe coded the dummy variable as 1 if the respondent answered the question “How much would you say your life has changed due to the pandemic?” with “changed completely for the worse” or “has become slightly worse.” The construction of the variable is described in more detail in Table A2. t_1 refers to the baseline, t_2 to the short-term data.

^b1 = yes; 0 = no.

a motorbike and 5% a television. Thus, our setting is very poor, with 96% of the study population living below the international poverty line with a purchasing power parity of USD 1.90 per day. The subsistence share at baseline, meaning the share of food consumption coming from own production, stands at 24% on average. Out of the respondents interviewed, one-third is female and two-thirds male. Respondents have received on average 5.3 years of schooling. Sixty-seven percent of our respondents identify as Christians and 33% as Muslims. Twenty-six percent of respondents are members of the Poro and Sande communities. Poro and Sande are informal institutions (sometimes also considered “secret societies”) and a central instrument for integration beyond tribal identity and for maintaining social control in many villages in rural Liberia (Ellis, 1999). When it comes to village characteristics, the majority are fairly geographically remote—with health centers being more than 60 min. away by foot.

In Table 2 below, we compare the overall levels of consumption of our respondents. We measure food consumption by asking respondents about self-produced and additionally about bought quantities, units, and total expenditure for a set of goods “in the last 30 days” in November/December 2019, May 2020, and September 2020 respectively. These goods include food items (bottled water, bread, bush meat, cassava, chicken, cooked meals, corn, corn dough, fish, palm nuts, palm oil, plantain, rice, soup cubes, vegetables, yam) and nonfood items (air-time, charcoal, cigarettes/tobacco, clothing and footwear, contributions to organizations, firewood, lighters, laundry soap, matches, personal care items, and transport). Expenditures were recorded in USD or Liberian dollars (LRD) and later converted to USD using the month-specific exchange rates.

TABLE 2 Pre- and post-COVID-19 levels of total consumption per adult equivalent.

	(1) Nov. 2019	(2) May 2020	(3) Sep. 2020	<i>T</i> -test <i>p</i> -value (1)–(2)	<i>T</i> -test <i>p</i> -value (2)–(3)	<i>T</i> -test <i>p</i> -value (3)–(1)
	Mean (SD)	Mean (SD)	Mean (SD)			
Total consumption per adult equivalent in USD ^a	29.96 (25.88)	26.73 (15.21)	28.39 (19.08)	0.004***	0.005***	0.192
Total food consumption per adult equivalent in USD ^b	21.85 (22.43)	22.25 (13.73)	19.53 (15.11)	0.695	0.000***	0.027**
Total nonfood consumption per adult equivalent in USD ^c	8.11 (8.64)	4.49 (5.34)	8.86 (8.53)	0.000***	0.000***	0.106
<i>N</i>	577	577	577			

Note: The value displayed for paired *t*-tests are *p*-values. ***, **, and * indicate significance at the 1, 5 and 10% critical level.

^aTotal consumption per adult equivalent in USD lies between 1.58 and 426.47.

^bTotal food consumption per adult equivalent in USD lies between 0.75 and 421.74.

^cTotal nonfood consumption per adult equivalent in USD lies between 0.15 and 165.70.

We acknowledge that a recall period of 30 days is relatively long and might make it difficult for respondents to remember consumption accurately. Furthermore, there is some evidence that survey fatigue in phone conversations can lead to underreporting of consumption items as compared to face-to-face surveys (Abate et al., 2023). On the other hand, “telescoping”⁷—and, in consequence, overreporting consumption—could also be an issue (Abate et al., 2022). With the relatively long time period elapsed, it is likely that recall error does come into play here. As such, we measure a lower bound of consumption in our data.

In November 2019, households consumed an average USD 30 per adult equivalent worth of food and nonfood goods. Consumption significantly decreased in May 2020 (to USD 27 per adult equivalent) and increased to USD 28 per adult equivalent in September 2020, after the most severe COVID-19-related restrictions had been lifted. Differentiating between food and nonfood consumption, we find that the decline herein in May 2020 was entirely driven by a drop in nonfood consumption. Levels of food consumption were not significantly different in May as compared to November 2019, but lower in September 2020 compared to May of the same year or November 2019.

One main concern when interpreting these numbers is the potentially confounding influence of seasonality on prices—but also on outcomes such as income, labor supply, and well-being. We cannot completely rule out seasonal effects regarding the data at hand. However, in the following, we systematically discuss the most important food crops in our study area (rice, oil palm, and cassava) and conclude that strong seasonal effects are unlikely. Prices did not systematically vary between November 2019, May 2020, and September 2020.

In Figure A1, we present a crop calendar with typical planting and harvesting seasons for our study regions in Liberia. We further display our own collected per-unit prices of the main crops in Figure A2 and Food and Agricultural Organization (FAO) crop price data in Figure A3.⁸ Rice is the most important crop that is consumed in our study context. As shown in the calendar in Figure A1, locally produced rice is harvested throughout the year and its availability hence seems to be rather independent of season. Locally grown rice is supplemented with imported rice, helping rein in seasonal price fluctuations. Given its independence from seasonality and given that rice prices did not increase between November 2019,

May 2020, and September 2020 according to the self-reporting of prices by our respondents as well as per FAO prices, we do not assume the seasonality of rice to have a significant impact on income, labor supply, or well-being. Similar to rice, *oil palm* can be harvested throughout the year and is very much detached from seasonality. Moreover, as oil-palm prices did not increase (again according to self-reported as well as FAO prices), we do not think that livelihood outcomes are impacted. The food crop that is most likely to be influenced by seasonal patterns is *cassava*: it is usually planted from March to June, then harvested from August to December (however, cassava is a very flexible crop and harvests can be delayed for several months if necessary). Thus, our consumption data in November 2019 (baseline) and September 2020 (endline) was collected during the usual harvesting period, while consumption data in May 2020 was collected during lean (planting) season. Therefore, cassava supply should be higher in November 2019 and September 2020, and prices, *ceteris paribus*, lower. Again, price data in Figures A2 and A3 do not reveal any systematic patterns here. Figure 3 below further indicates that cassava consumption only makes up 5.4%–12.6% of total household consumption on average. Therefore, we cannot rule out that cassava consumption as measured in our data is also driven by seasonal patterns.

Next, we investigate whether the nature of food consumption changes across the three time periods. Figure 3 below shows the shares of the recorded food items as percentages of total consumption. In Liberia, rice is the main staple in both rural and urban areas—with about 60% of the country's supply being imported. According to the FAO, cassava—which is produced by over 60% of the country's farming households—is Liberia's second-most consumed staple food

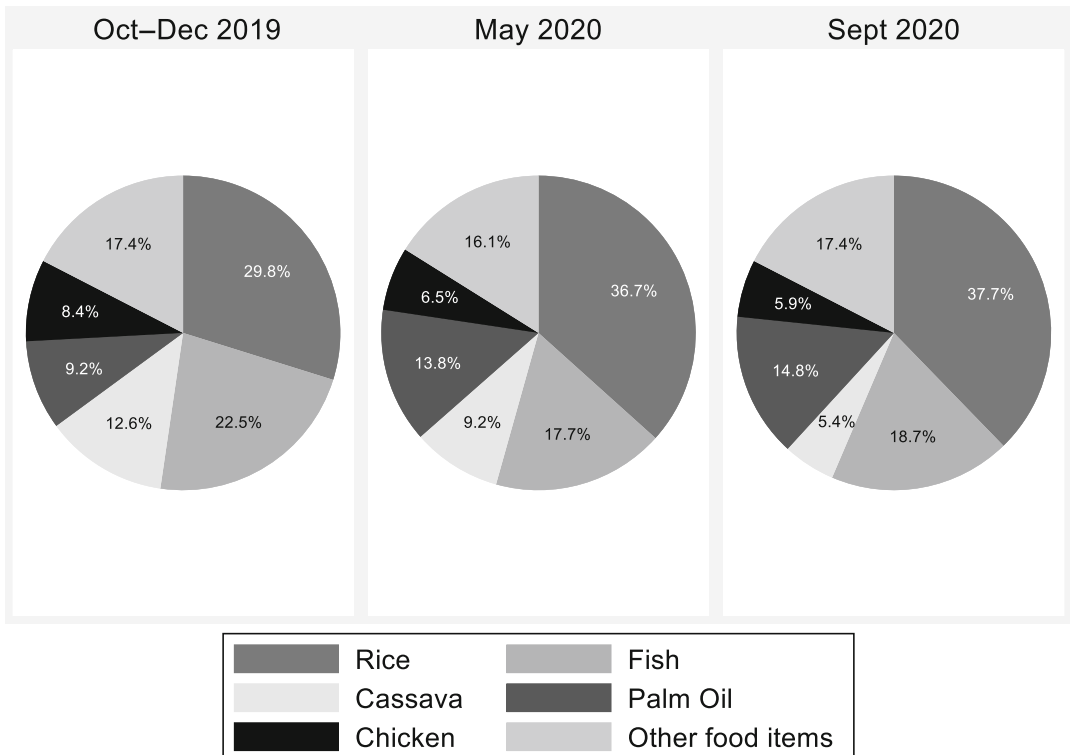


FIGURE 3 Food consumption by item.

crop, and its first staple protein. Accordingly, our sample spends the largest share of their food-consumption budget on rice. As compared to pre-COVID-19 times, there is an increase in rice and palm-oil consumption, while that of fish and chicken goes down. We also observe a decrease in cassava consumption. All in all, these descriptive statistics suggest that our participants' diet was not largely affected by the introduction of COVID-19-related restrictions; importantly, however, protein consumption did slightly decrease. The nature of nonfood consumption would change to a greater degree (see Figure A4): compared to our baseline data, in May 2020 a substantially lower proportion of money was spent on clothing and footwear as well as on transport. In September 2020, nonfood consumption was again very similar to baseline levels.

In the next step, we look at potential changes when it comes to the employment situation of our respondents. In our sample, 50% of those surveyed engage in farming as their primary occupation. About 20% stated that they were self-employed, 16% were waged, and about 5% were public servants. Most respondents experienced a reduction in work hours in May 2020 as compared to a normal year. Yet, this seems to have been compensated for by an increase in work hours in September 2020 (see Figure A5). Furthermore, 86% felt that their overall household earnings had decreased since May 2020. All in all, the employment situation seems to mirror (nonfood) consumption patterns: there was a notable reduction in work hours in the short term, which then recovered in the medium term.

Even if consumption levels—especially regarding food—were not strongly affected by the pandemic, many respondents *felt* very negatively affected by events since March 2020. A majority (67%) indicated that their lives had changed for the worse due to the pandemic and perceived themselves to have spent more compared to a normal year (85%), while earning less (86% stated that they earned less in the first pandemic year as compared to before).

5.2 | Empirical results

5.2.1 | Short- and medium-term effects of COVID-19 containment measures on consumption levels

Table 3 shows the estimated results from equation (1). There is no statistically significant difference in household consumption per adult equivalent in the short term (May 2020) or medium term (September 2020) compared to our baseline data. Differentiating between food and nonfood consumption shows that there is a substantial and statistically highly significant negative short-term effect on nonfood consumption. Given the log-linear design of regression specification (1), the coefficient of $\beta_1 = -0.459$ translates to nonfood consumption in the short term that is on average 45.9% lower compared to the figure for November 2019 (model [3]). In the medium term, however, this effect is reversed: the positive and statistically significant coefficient indicates that nonfood consumption exceeded the baseline in the medium term by 25.2%. Somewhat unexpectedly, food consumption is significantly higher (by 11.4% compared to November 2019) in the short term compared to pre-COVID-19 levels. One potential explanation is that households postpone nonfood expenditure and instead spend more on food consumption in the short term: as shown in Figure A4, households spent substantially less money on items not needed on a daily basis (such as clothing and footwear) in May 2020 as compared to the baseline.

TABLE 3 Short- and medium-term effects of COVID-19 containment measures on consumption levels, fixed-effects model.

	(1) Logged total consumption per adult equivalent	(2) Logged food consumption per adult equivalent	(3) Logged nonfood consumption per adult equivalent
May 2020 ^a	−0.0242 (0.0351)	0.114*** (0.0361)	−0.459*** (0.0599)
September 2020 ^a	0.0285 (0.0353)	−0.0313 (0.0377)	0.252*** (0.0517)
Constant	3.184*** (0.0230)	2.840*** (0.0243)	1.698*** (0.0351)
Observations	1731	1731	1731
Within r2	0.00431	0.0305	0.221

Note: Standard errors in parentheses. Standard errors clustered at the village level.

* $p < 0.10$;

** $p < 0.05$;

*** $p < 0.01$.

^a1 = yes; 0 = no.

5.2.2 | Heterogeneity of short- and medium-term effects of COVID-19 containment measures on consumption levels

The heterogeneity analyses, where we explore the variations in the effects of COVID-19 containment measures on consumption levels across different subgroups, highlight the contrasting effects on households with high and low dependence on subsistence agriculture, as well as farm and non-farm income. These insights offer a more comprehensive understanding of the differential impacts of the pandemic within our sample.

Table 4 shows that neither of the household groups experienced a decrease in food consumption in the short run. On the contrary, households with a high subsistence share even experienced a statistically significant increase (by 14% compared to November 2019) in food consumption. In the medium term, the coefficients for both groups turn negative; however, the effect is not statistically significant (models [3] and [4]).

When it comes to nonfood consumption, the coefficients of the short-term effect are negative and highly statistically significant for both household groups. This indicates that, overall, households cut back on nonfood consumption in the short run. The effect is substantial for both groups, but considerably larger for those households with a lower pre-COVID-19 subsistence share (58.2% and 33.4%, respectively, compared to November 2019). For households with a high pre-COVID-19 subsistence share, the nonfood-consumption coefficient turns positive in the medium term and indicates a (highly significant) increase here per adult equivalent of 39.9% compared to pre-COVID-19 levels (models [5] and [6]).

Besides independence from food markets, independence from labor markets may also have helped counteract potential negative effects resulting from COVID-19-induced business closures or employee dismissals (Amare et al., 2020; Mahmud & Riley, 2021). Households without regular wage employment were not affected by business closures or cuts in salary. They may have postponed the purchasing of nonfood items and instead increased their food consumption.

TABLE 4 Heterogeneity of short- and medium-term effects of containment measures on consumption levels by pre-COVID-19 subsistence share.

	Logged total consumption per adult equivalent		Logged food consumption per adult equivalent		Logged nonfood consumption per adult equivalent	
	(1) Low subsistence share	(2) High subsistence share	(3) Low subsistence share	(4) High subsistence share	(5) Low subsistence share	(6) High subsistence share
May 2020 ^a	−0.0838 (0.0513)	0.0364 (0.0413)	0.0869 (0.0530)	0.143*** (0.0432)	−0.582*** (0.0882)	−0.334*** (0.0678)
September 2020 ^a	−0.0195 (0.0502)	0.0773* (0.0433)	−0.0439 (0.0548)	−0.0185 (0.0466)	0.108 (0.0785)	0.399*** (0.0599)
Constant	3.214*** (0.0332)	3.154*** (0.0276)	2.831*** (0.0356)	2.849*** (0.0294)	1.834*** (0.0535)	1.558*** (0.0393)
Observations	873	858	873	858	873	858
r ²	0.0113	0.00979	0.0223	0.0414	0.230	0.233

Note: Standard errors in parentheses. Standard errors clustered at the village level. High subsistence is defined as relatively high if it is bigger than the median subsistence share (> .09).

* $p < 0.10$;
** $p < 0.05$;
*** $p < 0.01$.
^a1 = yes; 0 = no.

Therefore, we also split our sample between those households who had nonfarm income (including self- and waged employment) at baseline and those who did not.

Table 5 (models [1] and [2]) shows that households with nonfarm income in November 2019 (i.e., those more reliant on labor markets) experienced a decrease in total consumption per adult equivalent in the short run of 14% compared to November 2019. Households without nonfarm income were able to increase their consumption by 9% in the short term and by 13% in the medium term meanwhile. In particular, food consumption (models [3] and [4]) increased for less labor-market-dependent households in the short run and returned to pre-COVID-19 levels in the medium term. For households with nonfarm income, food consumption was not affected in the short run; it did decrease in the medium term however, by 11.9% compared to pre-COVID-19 levels. Nonfood consumption (models [5] and [6]) substantially decreased among both groups in the short run and recovered in the medium term.

The results presented in Tables 4 and 5 indicate that households reacted to the COVID-19 restrictions in the short run by heavily cutting back on nonfood consumption. A similar effect was described by Rönkkö et al. (2021), who also found a cutting down on nonfood expenses to occur in their study context of Bangladesh. While this effect was apparent for all surveyed households in our study, those dependent on food- and labor markets consumed even fewer nonfood items than their more independent peers did. In contrast, households with a greater capacity to produce their own food, as well as those without nonfarm income, were even able to increase their food consumption in the short term—possibly because they postponed the purchasing of nonfood items not needed on a daily basis (such as clothing and footwear) and instead increased their food consumption. Overall, the heterogeneity analyses presented in Tables 4 and 5 show that households that are less dependent on food- and labor markets were better off in both the short and medium term. They experienced lower cutbacks in spending on nonfood consumption in the short run and larger increases therein in the medium term. They

TABLE 5 Heterogeneity of short- and medium-term effects of containment measures on consumption levels by pre-COVID-19 nonfarm income share.

	Logged total consumption		Logged food consumption		Logged nonfood consumption	
	(1) No nonfarm income	(2) Nonfarm income	(3) No nonfarm income	(4) Nonfarm income	(5) No nonfarm income	(6) Nonfarm income
May 2020 ^a	0.0907* (0.0487)	−0.140*** (0.0421)	0.211*** (0.0490)	0.0177 (0.0476)	−0.372*** (0.0803)	−0.548*** (0.0716)
September 2020 ^a	0.126*** (0.0473)	−0.0697 (0.0431)	0.0556 (0.0502)	−0.119** (0.0480)	0.377*** (0.0669)	0.126* (0.0692)
Constant	3.100*** (0.0314)	3.269*** (0.0278)	2.784*** (0.0326)	2.897*** (0.0315)	1.554*** (0.0467)	1.842*** (0.0449)
Observations	867	864	867	864	867	864
r ²	0.0256	0.0308	0.0602	0.0293	0.222	0.235

Note: Standard errors in parentheses. Standard errors clustered at the village level.

* $p < 0.10$;

** $p < 0.05$;

*** $p < 0.01$.

^a1 = yes; 0 = no.

TABLE 6 OLS regressions for “life has become worse.”

	(1) 1 = life has become worse	(2) 1 = life has become worse
1 = Lower consumption in t2 compared to t1 ^a	0.228*** (0.0406)	0.247*** (0.0420)
Grand Cape Mount ^a	−0.027 (0.0585)	0.050 (0.0596)
Grand Bassa ^a	−0.058 (0.0446)	−0.136*** (0.0501)
Household is located close to oil-palm plantation ^a	−0.007 (0.0382)	0.010 (0.0400)
Respondent is married ^a		−0.070 (0.0560)
Respondent is a member of secret society ^a		0.242*** (0.0458)
Household is part of labor-sharing group (<i>kuu</i>) ^a		0.038 (0.0436)
Number of household members in t3 ^b		0.014 (0.0100)
Share of self-produced food among total household consumption in t1 ^c		0.176 (0.1500)
Monthly nonfarm income in t1 ^d		−0.000 (0.0002)
Age of respondent at t3 ^e		0.002 (0.0016)
Respondent is female ^a		−0.001 (0.0552)
Respondent is Muslim ^a		−0.138** (0.0567)
Years of education of respondent at t3 ^f		−0.001 (0.0054)
Health center closer than 60 walking min. ^a		0.016 (0.0414)
Constant	0.583*** (0.0349)	0.392*** (0.1037)
Observations	577	488
r2	0.059	0.161

Note: Standard errors in parentheses. Standard errors clustered at the village level.

* $p < 0.10$;

** $p < 0.05$;

*** $p < 0.01$.

^a1 = yes, 0 = no.

^b1–18.

^c0–0.86.

^d0–930.47.

^e18–89.

^f0–24.

were further able to increase food consumption in the short run, compared to pre-COVID-19 levels. To put this into perspective, it is important to note that households with nonfarm income are on average wealthier than those without such revenues; households with high levels of subsistence are not wealthier than those with low levels of subsistence meanwhile.

5.2.3 | Lower life satisfaction, consumption shock, and household characteristics

The regression models in Table 6 show that households experiencing a decline in consumption were around 20% more likely to feel that their lives had changed for the worse. In model (2) we add control variables to the decline-in-consumption variables. It does not seem to be the case that personal relationships correlate with subjective well-being. When it comes to community relations, being part of labor-sharing arrangements for farming (*kuu*) and living in a village with a high degree of pooled work are not correlated with well-being. Respondents who are part of the informal institutions Poro and Sande are 24.5% more likely to have experienced a deterioration in their felt life satisfaction. On the one hand, it is possible that these associations were affected by COVID-19 restrictions (e.g., they could not hold meetings), and their members, therefore, suffered a diminished sense of well-being. On the other hand, there might also be other differences between members and nonmembers that we cannot account for in our analysis (e.g., they might be less supportive of containment policies). Older participants were found to be slightly more likely to feel their lives had worsened, while Muslim respondents were about 13% less likely to feel that way.

6 | CONCLUSION

In this article, we have investigated the impact of COVID-19-related restrictions on households in rural Liberia. We found that household consumption was on average not different in the short-term (May 2020) or medium-term (September 2020) compared to our baseline data. However, when differentiating between food and nonfood consumption, we observed a negative short-term effect on nonfood consumption due to preventative measures. Notably, food consumption was not negatively affected in either the short or medium term. In additional analyses, we discovered that households with a higher share of subsistence agriculture seemed to be better protected from the pandemic's potential negative effects as their consumption patterns remained rather stable—their food consumption even increased in the short term. Our findings show that subsistence agriculture remains an important last resort for households in very poor rural settings to mitigate idiosyncratic shocks. In line with this, households with higher levels of nonfarm income witnessed greater fluctuations in consumption patterns compared to those with no nonfarm income. A decline in consumption was also aligned with perceptions of worsened life quality as a result of the pandemic.

What, then, are the implications of our findings? COVID-19 has been a global shock severely impacting many economies worldwide. Yet, in our country setting, we uncovered evidence that less dependence on food- as well as labor markets, can help to somewhat mitigate the negative consequences hereof. Among our study partners, therefore, broader integration into more complex markets was not beneficial to rural populations—these dependencies, rather, made households more vulnerable. COVID-19 represents a special shock, for example in

comparison to those resulting from extreme weather events (less predictable rainfalls, dry seasons, and thus poorer harvests). When thinking about the latter, diversification and market integration are of the utmost importance. Still, COVID-19 has not been the first health shock experienced locally, with Ebola having spread in parts of Africa not too long ago. Therefore, farmers should think about diversifying their portfolios—they should neither totally give up their farmland nor rely too heavily on their harvests as the only means of income. While in the medium term social-protection systems may be an even better alternative, it is unlikely that such safety nets can be established immediately.

Our findings hold significant implications for policy. First, while we did not find evidence for a reduction in consumption in the short term, populations reliant on waged employment and those not producing their own food are particularly vulnerable. Thus, guaranteeing food security in the longer term remains an issue of concern. As the current economic outlook is not promising and vaccination rates remain low in most sub-Saharan African countries, of key importance seems to be stimulating the economy and ensuring work opportunities robust to COVID-19's presence. Second, the subjective well-being of our respondents is under threat, which in turn might negatively impact economic outcomes in the longer term. While we did not focus on mental health, this would be an important addition to future studies. Third, our study region is located in an area currently targeted by multinational investors seeking to acquire land rights for large-scale plantations, with oil-palm and rubber being the main crops pursued. These investments have reportedly led to land dispossessions in the past and might further reduce land access for smallholders in the future—leading to more pressure on land and less availability for subsistence farming. Overall, our findings provide valuable insights for policy formulation and underscore the need for targeted interventions to address food security, well-being, and land rights concerns in rural Liberia.

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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ENDNOTES

- ¹ The initiative “Research for Effective COVID-19 Responses (RECOVR)” is organized by Innovations for Poverty Action and covers the countries Burkina Faso, Colombia, Côte d’Ivoire, Ghana, Mexico, the Philippines, Rwanda, Sierra Leone, Uganda, and Zambia (see: <https://www.poverty-action.org/recovr>). The World Bank “High-Frequency Phone Surveys” cover Burkina Faso, Ethiopia, Malawi, Mali, Nigeria, Tanzania, and Uganda (see: <https://microdata.worldbank.org/index.php/catalog/hfps>).
- ² Due to data-reconciliation exercises whereby countries removed a large number of cases from their total counts, negative numbers regarding the new case figures in the World Health Organization dataset can occur and are valid.
- ³ The results from probit regressions assessing which characteristics are associated with phone ownership and, among those with a phone, with participating in our survey are displayed in Table A3 in the Appendix.
- ⁴ In Table A4 in the Appendix, we show the results from fixed-effects models of the same form including weights that account for attrition. The results remain unchanged.
- ⁵ The exact question posed was: “How much would you say your life has changed due to the pandemic?” We coded a dummy variable of 1 if respondents answered “changed completely for the worse” or “has become slightly worse” and 0 for “did not change,” “has become slightly better,” or “changed completely for the better.”
- ⁶ The results are in line with those reported in Table 6 below. We also show the results from logit as well as ordered logit regressions in Tables A6 and A7 in the Appendix.
- ⁷ Telescoping errors may arise when survey participants mistakenly attribute events that occurred outside the reference period to the one being recalled, leading to inaccurate results in typically overstating actual consumption.
- ⁸ Our respondents could choose in which unit they wanted to report consumption. As there is no clear way to “translate” units (e.g., for cassava we recorded such units as *pieces*, *parts*, *packs*, *small bags*, *big bags*, *piles*, *buckets*), we always present the prices for the first- and second-most mentioned unit.

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APPENDIX A

TABLE A1 Sample comparison.

Baseline mean	No. phone number available	Phone number available	T-test p-value
Total consumption per adult equivalent per household in USD ^a	47.14	53.85	0.00***
Number of household members ^b	4.32	4.95	0.00***
Household wealth score ^c	1.88	2.99	0.00***
Subsistence level in t1 (share of self-produced food among total household consumption) ^d	0.11	0.09	0.00***
Monthly nonfarm income in t1 in USD ^e	93.52	116.31	0.00***
1 = female respondent ^f	0.48	0.32	0.00***
Age of respondent ^g	38.52	37.93	0.47
Years of education of respondent ^h	2.29	4.67	0.00**
1 = Muslim respondent ^f	0.65	0.81	0.00***
1 = Health center closer than 60 mins' walk ^f	0.28	0.35	0.00***
Household is part of labor-sharing (<i>kuu</i>) ^f	0.22	0.22	0.95
Bomi ^f	0.31	0.36	0.03**
Grand Cape Mount ^f	0.15	0.20	0.01***
Grand Bassa ^f	0.54	0.45	0.00***
<i>N</i>	1125	947	
Baseline mean	Not reached	Reached and participated	T-test p-value
Total consumption per adult equivalent per household in USD ^a	63.59	53.99	0.09*
Number of household members ^b	4.94	5.01	0.78
Household wealth score ^c	3.08	2.98	0.64
Subsistence level in t1 (share of self-produced food among total household consumption) ^d	0.09	0.08	0.44
Monthly nonfarm income in t1 in USD ^e	94.69	124.22	0.11
1 = female respondent ^f	0.28	0.33	0.42
Age of respondent ^g	35.41	39.21	0.05**
Years of education of respondent ^h	4.36	4.8	0.44
1 = Muslim respondent ^f	0.64	0.86	0.14
1 = Health center closer than 60 mins' walk ^f	0.34	0.35	0.83
Household is part of labor-sharing (<i>kuu</i>) ^f	0.25	0.22	0.56
Bomi ^f	0.16	0.41	0.00***
Grand Cape Mount ^f	0.16	0.19	0.54

(Continues)

TABLE A1 (Continued)

Baseline mean	Not reached	Reached and participated	T-test p-value
Grand Bassa ^f	0.67	0.40	0.00***
N	85	577	

^aTotal consumption per adult equivalent per household in USD: 1.74–898.45.

^bNumber of household members: 1–15.

^cHousehold wealth score: 0–100.

^dSubsistence level in t1 (share of self-produced food among total household consumption): 0–0.94.

^eMonthly nonfarm income in t1 in USD: 0–930.47.

^fDummy: 1 = yes; 0 = no.

[§]0–100 years.

^h0–25.

TABLE A2 Construction of variable “life has become worse” and descriptive statistics of the original variable.

Original survey question:			
“How much would you say your life has changed due to the coronavirus?”	1	changed completely for the worse	
	2	has become slightly worse	
	3	did not change	
	4	has become slightly better	
	5	changed completely for the better	
The dummy variable “life has become worse” equals 1 if the respondent chose option 1 or 2, and 0 otherwise.			
Tabulation of the original data:			
How much would you say your life has changed due to the coronavirus?		Freq.	Percent
1	Changed completely for the worse	27	4.68
2	Has become slightly worse	359	62.22
3	Did not change	190	32.93
4	Has become slightly better	1	0.17
5	Changed completely for the better	0	0
	Total	577	100.00

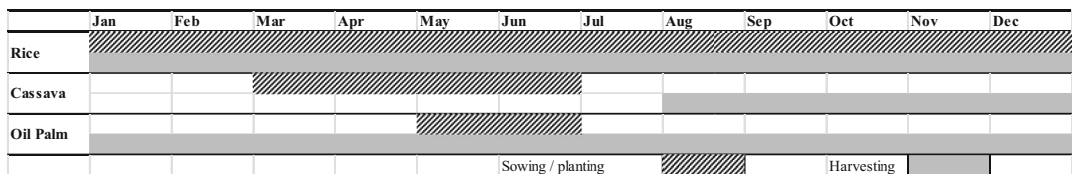


FIGURE A1 Seasonal crop calendar for coastal plains and upper highland tropical rainforest in Liberia. (a) Coastal plains: Vegetation is swampy along rivers creeks, mangroves, scattered patches of both low and high bush, and savannah belt. It begins at sea level, rising to heights of 100 feet (30 m) inland, with rainfall of 178–182 inches (4450–4550 mm) and humidity of 85%–95%. Highland tropical rainforest: It comprises the plateaus and mountain ranges located behind the rolling hills running up to an elevation of 1000 ft (300 m) and 4540 ft (1355 m) above sea level. Vegetation is semideciduous and secondary forest and high closed forest. Rainfall is bimodal, with an average of 115 inches (2900 mm) and 65" (1625 mm). The counties Bomi, Grand Bassa, and Grand Cape Mount, where the survey took place, lie within these geographical zones. Authors' own compilation, based on FAO Crop Calendar (available online at: www.cropcalendar.apps.fao.org/#/home, retrieved July 23, 2021).

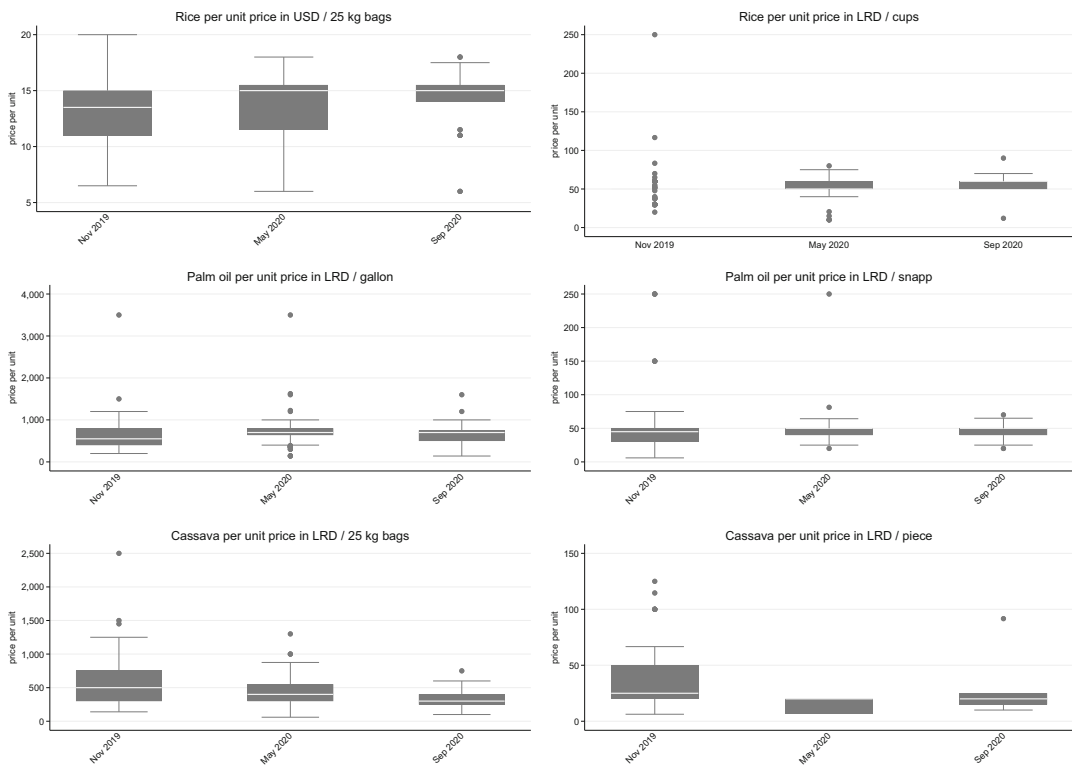


FIGURE A2 Median prices of selected food items (rice, palm oil, and cassava) as self-reported by respondents. The box ranges from the 25th percentile (lower hinge) to the 75th percentile (upper hinge) and is divided by the median (line). The whiskers are delimited by the upper/lower adjacent values. The dots mark the outliers.

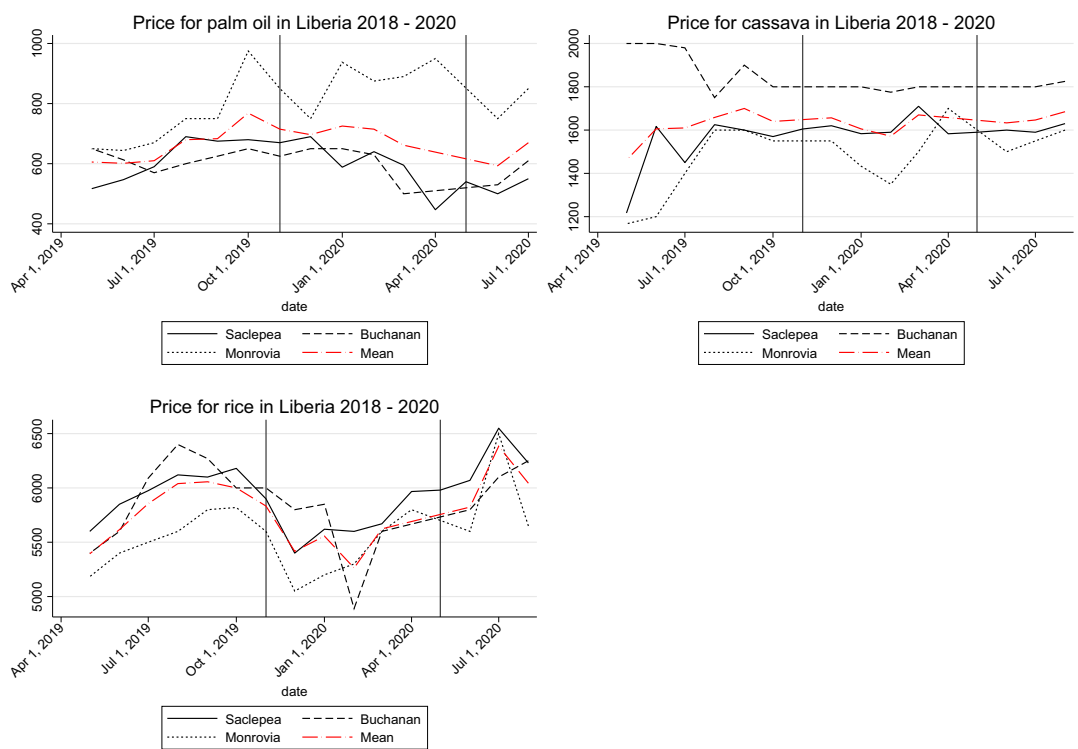


FIGURE A3 Price development of selected food items on national level, April 2019–July 2020. Horizontal lines are times of data collection (November 2019 and May 2020). The red line is the mean price across different markets in Liberia. Authors’ own compilation, based on the FAO’s Food Price Monitoring and Analysis Tool (retrieved June 25, 2021). [Colour figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]

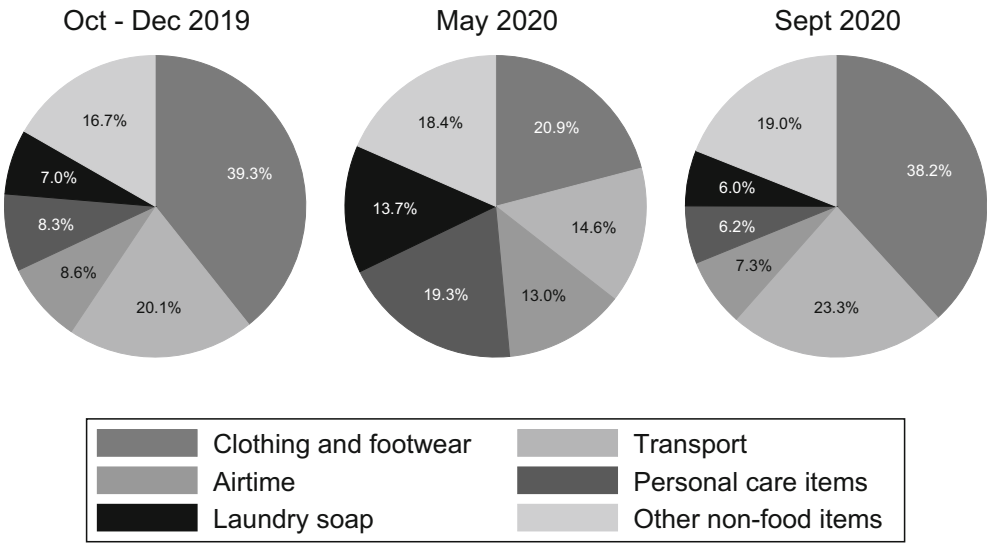


FIGURE A4 Nonfood consumption by item.

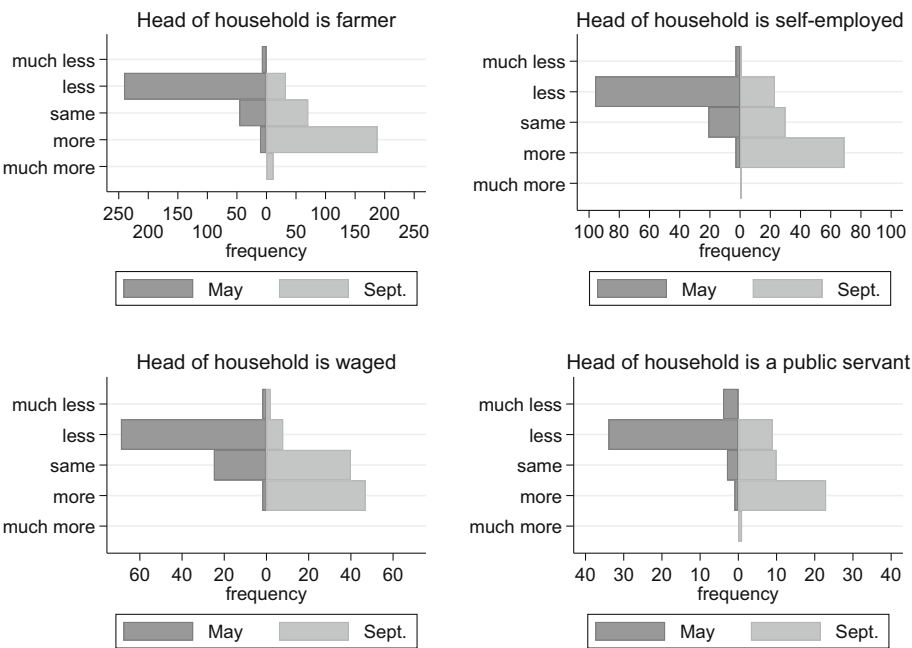


FIGURE A5 Work hours in May and September 2020 compared to a normal year, by occupation of household head.

TABLE A3 Probit regressions for (1) likelihood of having a phone and (2) participating in our study in case respondents do have one.

	(1) Phone available	(2) Reached
Wealth score	0.249*** (0.0205)	0.028 (0.0398)
Share of self-produced food among total household consumption	−0.285 (0.2100)	0.115 (0.5041)
Monthly nonfarm income in USD	0.002*** (0.0004)	0.001 (0.0007)
Household size	0.068*** (0.0163)	0.001 (0.0356)
Respondent is female ^a	−0.183*** (0.0675)	0.061 (0.1540)
Age of respondent	−0.002 (0.0016)	0.009** (0.0041)
Years of education of respondent	0.053*** (0.0071)	0.000 (0.0150)
Respondent is Muslim ^a	−0.0428 (0.0912)	−0.281 (0.2150)
Respondent is married ^a	0.026 (0.0721)	−0.118 (0.1737)

(Continues)

TABLE A3 (Continued)

	(1) Phone available	(2) Reached
Health center closer than 60 min.' walk ^a	0.106* (0.0643)	−0.0931 (0.1406)
Bomi ^a	0.313*** (0.0787)	0.923*** (0.1958)
Grand Cape Mount ^a	0.313*** (0.1153)	0.667*** (0.2579)
Constant	−1.291*** (0.1215)	0.452 (0.2787)
Observations	2069	659

Note: Standard errors in parentheses. Standard errors clustered at village level.

* $p < 0.10$;

** $p < 0.05$;

*** $p < 0.01$.

^a1 = yes, 0 = no.

TABLE A4 Pre- and post-COVID-19 levels of total consumption per adult equivalent, including attrition weights.

	(1) Logged total consumption per adult equivalent	(2) Logged food consumption per adult equivalent	(3) Logged nonfood consumption per adult equivalent
May 2020 ^a	−0.0197 (0.0350)	0.117** (0.0361)	−0.449*** (0.0608)
September 2020 ^a	0.0332 (0.0353)	−0.0289 (0.0377)	0.264*** (0.0526)
Constant	3.182*** (0.0230)	2.839*** (0.0375)	1.688*** (0.0357)
Observations	1731	1731	1731
r2	0.00441	0.0310	0.219

Note: Standard errors in parentheses. Standard errors clustered at village level.

* $p < 0.10$;

** $p < 0.05$;

*** $p < 0.01$.

^a1 = yes; 0 = no.

TABLE A5 OLS regressions for “life has become worse,” continuous-SHOCK variable.

	(1) 1 = life has become worse	(2) 1 = life has become worse
Difference between consumption t2 and t1 in USD ^a	−0.004*** (0.0015)	−0.004*** (0.0015)
Married ^b		0.007 (0.0175)
Member of Poro/Sande society ^b		0.261*** (0.0469)
Part of labor-sharing (<i>kuu</i>) ^b		0.029 (0.0429)
No. of household members ^c		0.015 (0.0101)
Subsistence level in t1 ^d		0.137 (0.1469)
Monthly nonfarm income in t1 ^e		−0.000 (0.0002)
Age of respondent ^f		0.002 (0.0016)
Female respondent ^b		0.011 (0.0543)
Muslim respondent ^b		−0.171*** (0.0594)
Years of education of respondent ^g		−0.000 (0.0054)
Health center closer than 60 min.’ walk ^b		0.021 (0.0449)
Constant	0.680*** (0.0282)	0.445*** (0.1081)
Observations	577	479
r2	0.055	0.152

Note: Standard errors in parentheses. Standard errors clustered at village level. We control for the respective county and closeness to an oil-palm plantation.

* $p < 0.10$;

** $p < 0.05$;

*** $p < 0.01$.

^aThe consumption-difference variable is negative when the household has experienced a decrease in consumption compared to pre-COVID-19 levels and positive when experiencing an increase therein. It lies between −415.25 and 102.46.

^b1 = yes; 0 = no.

^c1–18.

^d0–0.86.

^e0–930.47 USD.

^f18–89 years.

^g0–24 years.

TABLE A6 Logit regressions for “life has become worse,” effects.

	s 1 = life has become worse	(2) 1 = life has become worse
1 = lower consumption in t2 compared to t1 ^b	0.231*** (0.0420)	0.263*** (0.0484)
Grand Cape Mount ^b	−0.028 (0.0603)	0.041 (0.0564)
Grand Bassa ^b	−0.061 (0.0471)	−0.165*** (0.0635)
Close to oil-palm plantation ^b	−0.006 (0.0401)	0.005 (0.0466)
Married ^b		−0.004 (0.0189)
Member of Poro/Sande society ^b		0.316*** (0.0706)
Part of labor-sharing (<i>kuu</i>) ^b		0.034 (0.0511)
No. of household members ^c		0.015 (0.0119)
Subsistence level in t1 ^d		0.123 (0.1632)
Monthly nonfarm income in t1 ^e		−0.000 (0.0002)
Age of respondent ^f		0.003** (0.0017)
Female respondent ^b		0.027 (0.0607)
Muslim respondent ^b		−0.177*** (0.0665)
Years of education of respondent ^g		−0.001 (0.0062)
Health center closer than 60 min.’ walk ^b		0.022 (0.0483)
Observations	577	479
Pseudo r2	0.047	0.137

Note: Standard errors in parentheses. Standard errors clustered at village level. We control for the respective county and closeness to an oil-palm plantation.

* $p < 0.10$;

** $p < 0.05$;

*** $p < 0.01$.

^b1 = yes; 0 = no.

^c1–18.

^d0–0.86.

^e0–930.47 USD.

^f18–89 years.

^g0–24 years.

TABLE A7 Ordered logit regressions for “life has become worse.”

	(1) Life has become worse	(2) Life has become worse
1 = lower consumption in t2 compared to t1 ^b	0.937*** (0.1801)	1.094*** (0.213)
Grand Cape Mount ^b	−0.078 (0.2320)	0.135 (0.260)
Grand Bassa ^b	−0.177 (0.1890)	−0.576*** (0.222)
Close to oil-palm plantation ^b	−0.038 (0.1640)	0.048 (0.170)
Married ^b		−0.306 (0.255)
Member of Poro/Sande society ^b		1.109*** (0.232)
Part of labor-sharing (<i>kuu</i>) ^b		0.174 (0.234)
No. of household members ^c		0.082 (0.052)
Subsistence level in t1 ^d		1.488* (0.797)
Monthly nonfarm income in t1 ^e		−0.000 (0.001)
Age of respondent ^f		0.010 (0.007)
Female respondent ^b		−0.035 (0.253)
Muslim respondent ^b		−0.516** (0.258)
Years of education of respondent ^g		−0.014 (0.027)
Health center closer than 60 min.’ walk ^b		0.136 (0.168)
Observations	577	488
Pseudo r2	0.031	0.096

Note: Standard errors in parentheses. Standard errors clustered at the village level. We control for the respective county and closeness to an oil-palm plantation.

* $p < 0.10$;

** $p < 0.05$;

*** $p < 0.01$.

Note: Life has become worse: 1 “has become completely better”; 2 “has become slightly better”; 3 “did not change”; 4 “has become slightly worse”; 5 “changed completely for the worse.”

^b1 = yes; 0 = no.

^c1–18.

^d0–0.86.

^e0–930.47 USD.

^f18–89 years.

^g0–24 years.