

Chronic Poverty Advisory Network

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Poverty and wellbeing before and during Covid-19 in
Cambodia: an assessment of trends and correlates

Working paper

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The analysis and views expressed in this study are those of the authors and do not necessarily represent the views of CDRI or CPAN. The authors take full responsibility for any errors.

Executive summary

This study investigates factors affecting welfare prior to and during Covid-19. It employs analysis of the Cambodia Living Standards Measurement—Plus Survey 2019/20 data, alongside five rounds of the Covid-19 High Frequency Phone Surveys between May 2020 and March 2021 to assess socioeconomic impacts of the pandemic.

The results point to a range of factors which could contribute to explaining poverty incidence prior to the pandemic. **Household resource endowment was an important correlate of welfare, particularly in terms of possession of a mobile phone, ownership of livestock and land and access to electricity. Other factors include access to financial services, education, involvement in non-agriculture businesses, migration and remittances.** The role of remittances was particularly pronounced in rural areas and for female heads of households. On the latter, de facto female headship in households with an adult male and in households with a migrant was associated with a lower probability of poverty.

However, a range of these variables are being constrained during Covid-19. For example, analysis of Covid-19 phone surveys points to the severity of income loss both in terms of breadth (share of households affected) and depth, the latter more pronounced in proportional terms among households in the bottom two quintiles with an already low consumption base, and also severe among IDPoor households. In other words, not only has income loss been deep, but it continues to get deeper over time, starting from a low base. This suggests that **there are considerable processes of impoverishment (breadth), but also destitution (depth) in Cambodia as a result of Covid-19.**

Income loss has also been severe. **Non-farm enterprises (NFEs) were most affected by income loss at the outset of the pandemic. Moreover, by March 2021 when compared to December 2020, a large share particularly of IDPoor households, continued to report income loss where their main income derived from NFEs.** Receipt of remittances has also plummeted during the pandemic. These results are particularly concerning given that NFEs and remittances were both important correlates of reducing the probability of poverty pre-Covid-19, suggesting that important pathways out of poverty are being constrained.

Education was another correlate of welfare in Cambodia pre-pandemic, offering protection against poverty especially at the secondary levels and above. During Covid-19, however, education disruption was widespread amid repeated school closures. **Even where education activities have resumed, engagement among poorer households remains low.**

As a result of these shocks, households were forced to rely on a range of coping strategies, especially reducing consumption, taking loans and, for poorer households in later survey waves, accessing social protection. Reliance on support from friends has been reducing over time, perhaps a result of community networks thinning out. Even though the roll-out of cash transfers has eventually reached many ID Poor households, levels may not be adequate resulting in reductions in food consumption among poorer households and continued food insecurity. Moreover, there remain regional variations in access to social protection, disadvantaging Tonle Sap, which was already the poorest region in the country pre-pandemic. In this context, household expectations for future months remain bleak.

The results point to areas for policy and programming focus, including helping to narrow development gaps by area of residence alongside a regional levelling up focused on the Tonle Sap region. Alternatives to borrowing as a coping strategy are also worth considering, alongside improvements in inclusive access and quality of financial services to help mitigate the adverse consequences of indebtedness. Alongside this is a need to focus attention on children who have missed out on school and learning, particularly from poorer households.

1. Introduction

Target 1 of Goal 1, ‘End poverty in all its forms everywhere’ aims, by 2030, to reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions. In Cambodia, attempts to eradicate poverty have been espoused in the country’s key planning documents, including most recently the Rectangular Strategy (IV) and the National Strategic Development Plan (2019–2023). Reflecting this commitment, poverty has declined since the turn of the century, when it stood at 33.8% of the population in 2009, to 17.8% of the population in 2019 (Asian Development Bank, 2014; World Bank, 2009; 2014).^{1 2} However, this still represents a significant share of Cambodians living in poverty, equivalent to 2.7 million people.

This paper aims to understand what was responsible for poverty in Cambodia prior to the pandemic, and how people’s socioeconomic wellbeing has been affected during Covid-19. In this process, correlates of poverty and wellbeing across the welfare distribution in 2019, just before Covid-19, are presented. We then examine changes in wellbeing during Covid-19, focusing on income loss, coping strategies, education and other indicators of wellbeing. The results are disaggregated where possible by pre-pandemic welfare status, area of residence and gender to offer an analysis of wellbeing before and during Covid-19.

The remainder of the paper is organised as follows. Section 2 provides a brief background on poverty reduction efforts and policies in Cambodia, with links to the Covid-19 context. Section 3 highlights the main methods, survey data and variables used in the analysis of pre-Covid-19 welfare. Section 4 presents probit and simultaneous quantile regression results used to examine correlates of poverty and consumption distribution, respectively, pre-pandemic. Section 4 then presents the results of high frequency phone surveys during Covid-19 with a distributional lens. Section 5 concludes and briefly discusses policy implications stemming from the research.

2. Correlates of poverty in Cambodia: a review

This section presents poverty trends and the main correlates at macro and micro levels.

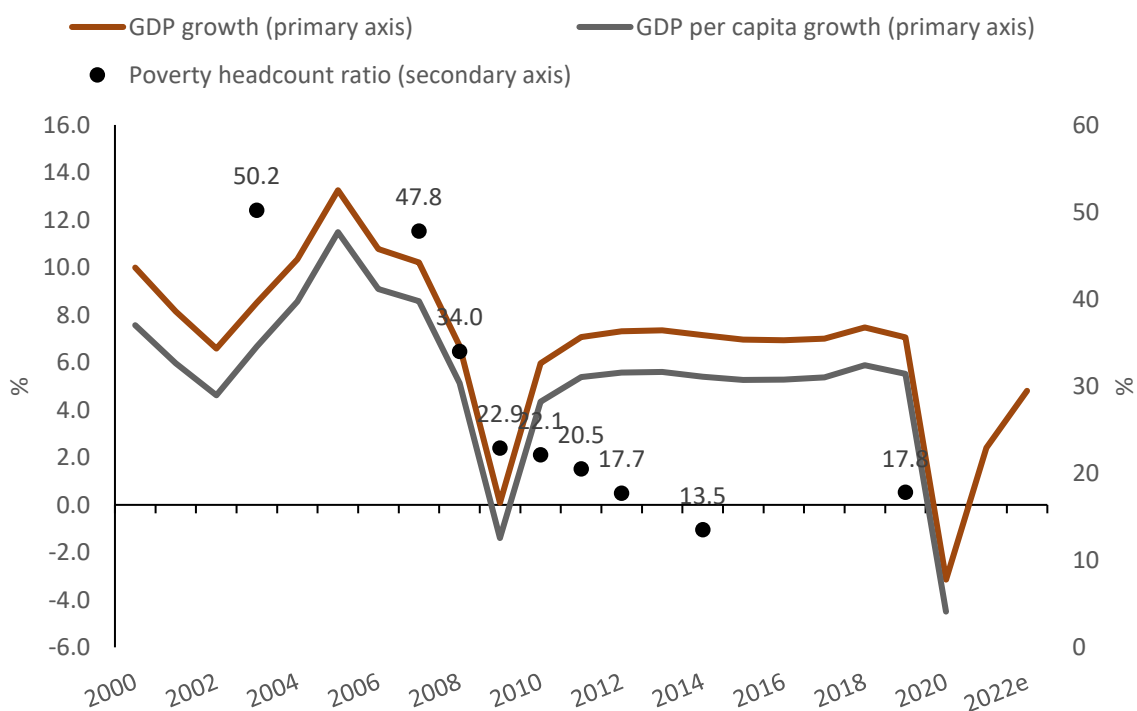
Macro-level growth and poverty

One of the drivers of poverty reduction is economic growth and changing economic structure, which affects sectoral resource allocation and productivity (labour and capital). Cambodia’s pre-Covid-19 growth episode was moderately pro-poor, characterised by faster consumption growth of the poor compared to that of the non-poor (Roth and Lun, 2014). Prior to the Covid-19 outbreak, Cambodia had sustained notable economic growth over two decades. For instance, between 2001 and 2019 GDP growth averaged 7.6%, achieving 7.1% year-on-year in 2019 (Figure 1). The government had set an ambitious goal in the Rectangular Strategy (Phase IV) to reduce poverty to below 10% by the planning period, while at the same time reducing vulnerability and inequality and ensuring income security (RGC, 2018b). GDP growth, nonetheless, contracted by 3.1% year-on-year in 2020, due mainly to the global and national public policy responses to the Covid-19 outbreak and associated disruptions of economic activities. GDP per capita growth contracted by 4.5% in the same period (World Bank, 2020c).

¹ The government has improved the poverty measurement method and redefined the poverty line in 2019/2020. Poverty rates in 2009 and 2014 are estimates of the survey-to-survey imputation using the defined poverty line. Using the old method, poverty rates in 2009 and 2014 are 22.9% and 13.5%, respectively (Ministry of Planning, 2021).

² Using the Cambodia Socio-Economic Survey 2019/20 and revised consumption basket and poverty line, 17.8% of the total population was considered poor in 2019 (4.2% in Phnom Penh, 12.6% in other urban areas and 22.8% in rural areas). It should be noted that there is no poverty calculation using an internationally defined poverty line, for instance as suggested by the World Bank (\$1.90, \$2.30 and \$5.50 per day at Purchasing Power Parity prices).

Figure 1 Growth of GDP and GDP per capita and poverty headcount ratio, 2000–2022



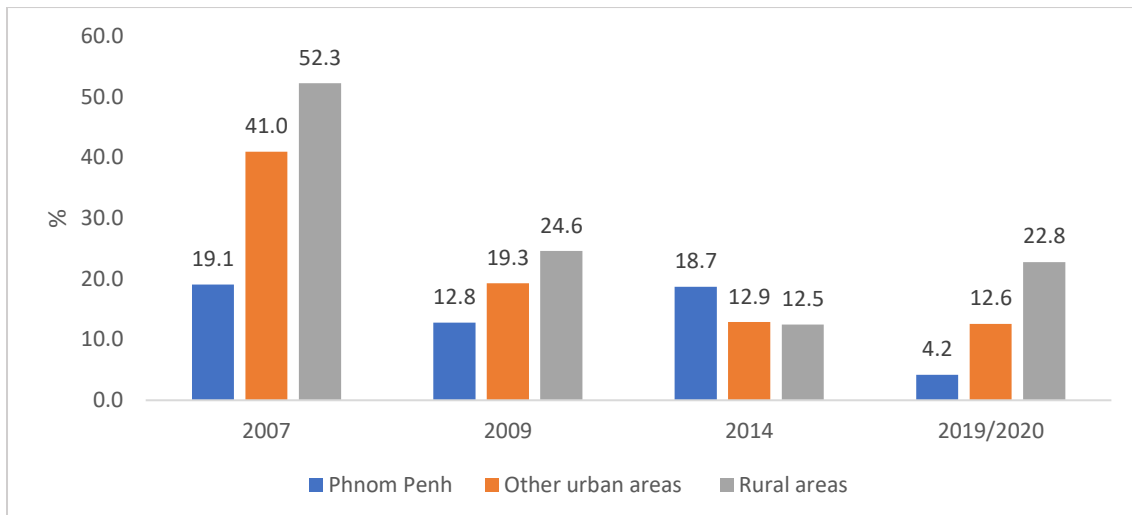
Note: The poverty rate in 2019/2020 is not comparable to previous estimates as the government improved the poverty measurement method and redefined the poverty line to calculate the 2019/2020 poverty rate.

Source: Authors' preparation using WDI data, World Bank (2020) from 2006 to 2020, estimates for 2021 and 2022 are from MEF (2021).

The economic structure has been gradually changing, with the role of agriculture and employment steadily diminishing. The value added of the agriculture sector has remained stagnant in the last five years, growing only at an average rate of 1% annually, compared to 10.8% for industry and 7.3% for services. In addition, agricultural employment (as a percentage of total employment) declined from 73.7% in 2000 to 30.4% in 2018 (World Bank, 2020c). Nonetheless, agriculture remains an important income source for rural Cambodians. Linked to this has been land use change, marked by deforestation and over-fishing, affecting access to common property resources (Bird et al., 2018).

Poverty incidence is more prevalent in rural areas despite efforts to reduce regional disparities. The poverty headcount among rural households remains high compared to households in Phnom Penh and other urban areas. For instance, in 2009 rural poverty was 24.6%, compared to 12.8% in Phnom Penh and 19.3% in other urban areas. The incidence of poverty is highest among households in Tonle Sap and Plateau and Mountainous regions compared to households in the Mekong Plain and Coastal regions. Some of this may be related to variations in climate, which have received increasing attention from the government and development partners (Bird et al., 2018; Jiao et al., 2017; Nguyen et al., 2020).

Figure 2 Poverty headcount by area of residence (2019/2020 involves updated basket and poverty line)



Note: The poverty rate in 2019/2020 is not comparable to previous estimates as the government improved the poverty measurement method and redefined the poverty line to calculate the 2019/2020 poverty rate.

Source: Authors' preparation using WDI data, World Bank (2020) for 2007, 2009 and 2014; MOP (2021) for 2019

Micro-level drivers of poverty

Various correlates of poverty have been identified at the individual and household level in Cambodia, summarised below. In terms of attributes, education of the household head and that of household members is associated with poverty escapes, particularly where the household head has completed secondary education or higher (Bird et al., 2018; CDRI, 2012; World Bank, 2014). The risk of being poor is higher among large households with high dependency ratios than in smaller households with lower dependency ratios. Disability, particularly among working-age household members, is another driver of poverty (Bird et al., 2018; Palmer et al., 2019).

Women generally have fewer years of schooling compared to men (NIS, 2015; 2018), are less empowered in major family decisions, under-represented in ownership of family businesses or assets (land and non-land), and subject to norms and cultural practices which often put them at a disadvantage (Royal Government of Cambodia, 2018; Cheng et al., 2019; United Nations Development Programme, 2021). Even so, the association between female headship and poverty more generally remains inconclusive. While some argue that female-headed households are found to be poorer and more vulnerable due to the fact that women lack economic opportunities and have limited access to productive resources (United Nations Development Programme, 2017; World Bank, 2006; 2020b), others find that female-headed households are no more (or less) poor and vulnerable than male-headed households (Bird et al., 2018). Vulnerability might be conditional on other factors. For example, widowed, divorced or separated heads may be more vulnerable compared to households designated as being female-headed on account of having a migrating male member.

Certain types of economic activities and supporting services also affect poverty. Findings on access to microloans or financial services of banks or microfinance institutions have been mixed.³ While some argue that financial access particularly to microcredit could help reduce poverty and increase household production (Chhay, 2011; Phim, 2014; Roth et al., 2017; World Bank, 2019), others find that borrowing households are worse off than those without such access (Bylander, 2015; Bylander and Hamilton, 2015; CATU, 2020; Seng, 2018), as accessing credit can lead to indebtedness (Bird et al.,

³ Empirical results on the effects of microcredit access as a poverty-reducing factor have also been inconclusive in other contexts. See Abebaw et al. (2008); A. Banerjee et al., 2015; Breza & Kinnan, 2021) for a review.

2018; Res, 2021). Indebtedness in turn can prompt distress migration, with individuals or whole households migrating in search of alternative income sources to service loans (Bird et al., 2018).

Credit can sometimes help fund migration, though migration has a mixed impact on poverty. Most empirical studies point to a positive association between migration, remittances and poverty reduction (Diepart and Ngin, 2020; Roth and Tiberti, 2017). Migration can improve welfare by improving access to job opportunities or high-paying jobs at the destination area, with remittances also enabling origin households to improve welfare. The inflow of remittances into Cambodia grew at an average annual rate of 27% between 2009 and 2020, reaching \$1.4 billion in 2020, equivalent to 5.9% of GDP (World Bank, 2020a). There are, nonetheless, downsides with migration and remittances, including reduced labour participation of the sending household because household members may depend instead on remittances as their key income source (Roth and Tiberti, 2017), lower educational expenditure on children (Chea and Wongboonsin, 2020) or reduced years of schooling due to parental migration (Marchetta and Sim, 2021). Cross-border movement was interrupted during the Covid-19 outbreak when governments closed borders to curb infection.

Inclusive infrastructure development (schools, health centres, roads, bridges, electricity, etc.) has also been considered a long-term anti-poverty strategy, and is strongly emphasised in the Rectangular Strategy (Phase IV) and the National Strategic Development Plan (2019–2023). The government and development partners have stressed, for example, the need to increase access to publicly provided electricity and to clean piped water. Improvements to rural roads have also been emphasised to increase connectivity and the market exchange of goods and services. Empirical studies point to positive and significant effects of access to infrastructure like roads, electricity and water on poverty reduction (Bird et al., 2018; World Bank, 2014). Examining the impact of rural electrification in Cambodia, Saing (2018) finds that access to electricity in rural areas increases household consumption by 16.6%.⁴

As shown in this section, there is a plethora of drivers of household poverty. Some correlates are obvious and have been confirmed, whereas others are inconclusive and demand further investigation. This study partly aims to contribute to existing knowledge of the latter, particularly in the pre-Covid-19 context, and to understand changes in wellbeing during Covid-19.

3. Data and methods

3.1. Data

This study examines poverty in Cambodia pre-Covid and welfare changes during Covid-19. The analysis of pre-pandemic welfare in this study is based on the Cambodia Living Standards Measurement—Plus Survey 2019/20 data (LSMS+), a nationally representative survey of socio-economic characteristics of households in rural and urban areas. The data was collected by officials at the National Institute of Statistics (NIS), Ministry of Planning, and funded by the World Bank. The Cambodia LSMS Plus Survey was conducted in 25% of the enumeration areas (EAs) visited by the 2019/20 round of the Cambodia Socioeconomic Survey (CSES), which was also implemented by NIS officials.⁵ The survey was completed prior to the pandemic.

High Frequency Phone Surveys (HFPS)⁶ were conducted in Cambodia between May 2020 and March 2021 during the pandemic, to assess socio-economic impacts of Covid-19. In Cambodia, the HFPS

⁴ International evidence on the impact of rural electrification seems mixed and might vary by context and region. See Lee et al. (2020b; 2020a) for some review and assessment.

⁵ For more information on the data and implementation of data collection, see

<https://microdata.worldbank.org/index.php/catalog/4045/download/50889>

⁶ [World Bank High Frequency Telephone Surveys](#) have been conducted in a number of countries.

consists of two samples: 1) the LSMS+, and 2) IDPoor households.⁷ The latter was implemented to monitor the Cash Transfer Program for Poor and Vulnerable Households during Covid-19, launched in late June 2020. Hence, HFPS Round 1 was conducted before the implementation of the cash transfer programme. Table 1 outlines the sample size per survey and wave. In both cases, sampling weights are employed to ensure representativeness of the LSMS+ at the national and urban/rural levels, and additionally at the regional level among IDPoor households.

Table 1 Sample size per survey and wave

Wave	LSMS+ sample (month)	IDPoor sample (month)
1	700 (May 2020)	984 (June 2021)
2	612 (Aug/Sep 2020)	1055 (Aug/Sep 2020)
3	481 (Oct/Nov 2020)	1185 (Oct/Nov 2020)
4	410 (Dec 2020/Jan 2021)	1277 (Dec 2020/ Jan 2021)
5	378 (Mar 2021)	1309 (Mar 2021)

It is worth emphasising the high attrition rate in both samples. For example, just 51% of the 1,512 LSMS+ households were successfully re-interviewed in round 1, and only around half of those were re-interviewed by the latest survey wave. Although survey weights have been adjusted to try to ensure representativeness at national, rural and urban levels, these small sizes mean that these descriptive results particularly from the HFPS-LSMS dataset should be viewed with caution.

3.2 Methods

To derive poverty status, we develop household-level consumption aggregates from the LSMS+ 2019/20, comprising food and non-food expenditure by households in different reference periods. Consumption items, particularly non-food expenditure, are then converted to a uniform reference (recall) period. We finally treat the poorest 20% of the consumption distribution as poor. Not only does this equate closely to the poverty rate identified in the 2019 Cambodia SES, but it also allows for a relatively fluid assessment of welfare across quintiles, which is then carried over to the Covid-19 analysis. More details on the derivation of consumption aggregates and poverty status are presented in Appendix 1. A detailed description of pre-pandemic results is provided in Roth (2022) and summarised in this paper.

The study presents descriptive analyses of monetary poverty and welfare before the outbreak of Covid-19. We investigate a range of factors that the literature review suggests affects household welfare in the country, and draw attention to gendered differences derived through women’s control of assets, enterprise and migration. Our regression analysis next employs logistic regression and simultaneous quantile regressions to examine correlates of poverty and welfare across consumption distribution, respectively. The probit regression is specified as:

$$Pr(\rho_i = 1 | \beta, v_i) = F(\beta_0 + \beta_1 HH_i + \beta_2 Region_i + \beta_3 H_i) \quad (1)$$

where ρ_i takes the value of 1 if the household per capita daily consumption is below the pre-defined poverty line; β is a set of parameters to be estimated and v_i is a set of characteristics of household head and household and regional differences.

We further investigate how the correlates used to understand household poverty incidence can impact welfare outcomes of households at various levels of consumption distribution (percentile),

⁷ The ‘Identification of Poor Households’ (IDPoor) is a mechanism developed by Cambodia’s Ministry of Planning to identify poor and vulnerable households, after which they receive cards that enable them to access social transfers, healthcare and other services.

using simultaneous quantile regressions (SQR). The simultaneous quantile regression could be specified as:

$$qY_{\tau} = \alpha_0 + \alpha_1 HH_i + \alpha_2 Region_i + \alpha_3 H_i + \epsilon_{\tau i} \quad (2)$$

where τ is per capita daily consumption of household i in quintile τ^{th} ; α_0 is a constant; α_1 , α_2 , and α_3 are a set of parameters to be estimated. $\epsilon_{\tau i}$ is assumed to have zero conditional mean. The per capita daily consumption is in logarithmic transformation to account for the right-skewed distribution. It should also be noted that we employ the same covariates of household head, household and regional differences in equations.

Finally, we descriptively examine changes in households' socioeconomic wellbeing over time during the Covid-19 pandemic, relying on the HFPS. For our analysis, we link households' pre-Covid-19 welfare status from the LSMS+ to the subset of households reinterviewed during the five rounds of the HFPS panel, to offer a joint analysis of pre- and during-pandemic realities. We make use predominantly of the first and last survey waves to examine changes over time, though in some cases we also rely on the second and fourth survey waves for additional variables given that survey modules vary per wave. We focus on changes over time (from pre-Covid-19 through the HFPS rounds) in income from different sources, coping strategies, food security, receipt of social assistance and education activities to understand how these changes differ by (pre-C19) welfare status of households across the distribution. Where possible we disaggregate the LSMS analysis by quintile groups (bottom two quintiles compared to top three quintiles) to carry on the distributional analysis presented in the pre-Covid-19 results. We also analyse the IDPoor survey results as a whole and disaggregate where possible by gender and other demographics, recognising that these constitute households at the bottom of the welfare distribution.

4. Pre-pandemic welfare

4.1 Poverty in Cambodia

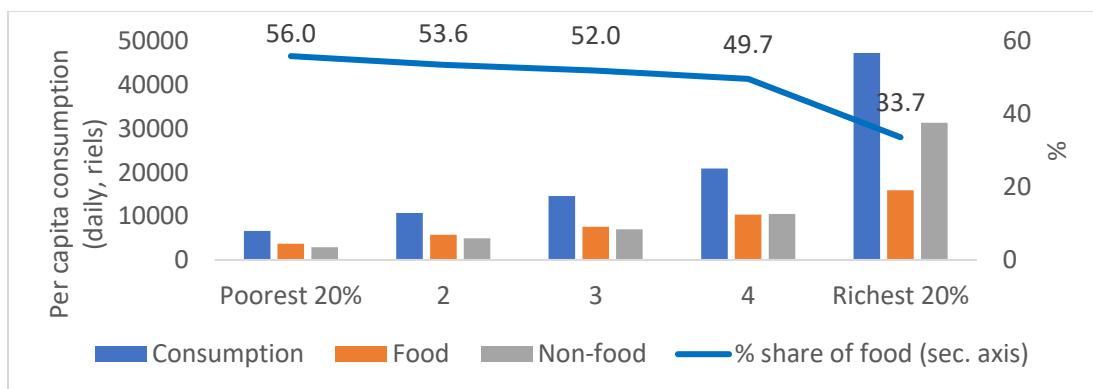
Summary statistics by poverty and quintile

This section presents summary statistics of households by poverty status and quintile. Appendix 2 explains welfare outcomes and main variables used in the descriptive and regression analyses, while Appendix 3 presents descriptive statistics on welfare indicators and household characteristics by poverty status, sector and gender of household head. We further examine differences in poverty and household consumption by household characteristics. Figure 6 highlights associations of the probability of being poor and characteristics of the household and its head.

An average household spends KHR20,028 (\$5) per person per day on food and non-food items, with food consumption accounting for 43.3% of total expenses.⁸ An average person in households considered poor by our poverty threshold covering the bottom quintile of households spends KHR6,612 (\$1.65) a day, about three times lower than the average consumption. By quintile, per capita daily consumption of households at the bottom 20% of the consumption distribution is around seven times lower than that of the richest 20%, at KHR6,612.5 (\$1.65) (Figure 3). This also applies to food and non-food consumption.

Figure 3 Per capita consumption by quintile

⁸ We simplify the exchange rate by using the rate of KHR4,000 per US\$.



Source: Authors' calculation

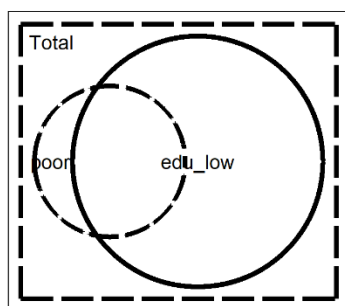
As noted earlier, the incidence of poverty is geographically varied. Poverty remains a rural phenomenon, as 90% of poor households live in rural areas. Households in Tonle Sap region reported the highest poverty incidence. This reflects an economy marked largely by subsistence farming and dependent on agriculture and natural resources, thus also particularly vulnerable to climate-related shocks and stressors (Varis, 2008; World Bank, 2014; Gareth et al., 2013). A large proportion of people in the region in poverty depend on fisheries, lacking access to technology, inputs or services to enable them to benefit from improved value chains (Gareth et al., 2013).

Regarding household attributes, households with younger heads are less likely to be poor than households with older heads. Household size might also explain poverty incidence, with households having five members and above having the highest rate of poverty. Moreover, households with higher dependency ratios were also reported to have higher poverty incidence compared to households with lower rates. A majority of all household heads are married (80%); however, only 21% of female-headed households are married. This might imply that women become heads of households upon divorce, separation or widowhood, and it is customary in Cambodia that men are identified as the household head when they are married. The incidence of poverty among women-headed households is a little higher than that of male-headed households.

In terms of education, 83% of the survey household heads had attended school at some point over their lives, 71% for poor households. A majority of household heads have either no education or have completed only primary education.⁹ These households have the highest rate of poverty, 32% (with no education) and 24% who completed only primary respectively. Households with heads who have completed upper secondary and higher education had the lowest poverty rates, though almost none of the heads of poor households completed these levels. The level of education is particularly low for heads in poor households as 75.6% report having completed five years of schooling or less. A little more than half of the non-poor households also had heads who had completed five years or less.

Figure 4 Overlaps of household poverty and education deprivation measure

⁹ The percent completion of tertiary education is higher than that of upper secondary due to the inclusion of pre- and post-secondary vocational and technical education in the higher education level. See Section 4.2.



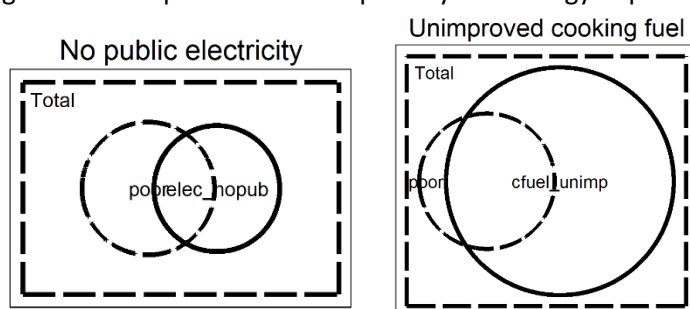
Note: This Venn diagram shows the results of an overlapping deprivation analysis between monetary poverty and non-monetary dimensions. It indicates whether a household that is monetarily poor is also deprived in non-monetary terms, the latter of which is measured here as household heads completing five years of schooling or less.

Source: Authors' calculation

Regarding endowments and related activities, the area of cultivatable agricultural land is small at an average of 1.32 hectares, and 1.51 hectares for rural households. Households' livelihood activities also vary by poverty rates. Fifty-two percent of the households report having a head working in agriculture. The majority (60%) of households in poverty had household heads working in agriculture. Households whose head owns/operates a non-agricultural business or works in a non-agricultural sector tend to be less poor than those with heads who do not own/operate a non-agricultural business or who work in the agricultural sector.

Access to electricity is a key supportive factor in these livelihoods. Access to electricity is relatively high, at 85% of all households, 72% among poor households. There is less of an overlap in terms of monetary poverty and electricity deprivation among households (Figure 5), though this overlap is much higher in terms of other energy requirements. The results for example show that the majority of poor (83% of all poor households) and non-poor households (52% of non-poor households) use firewood and charcoal for cooking. This indicates that improved access is needed to alternative and environmentally friendly energy sources, particularly for poor households.

Figure 5 Overlaps of household poverty and energy deprivation measures

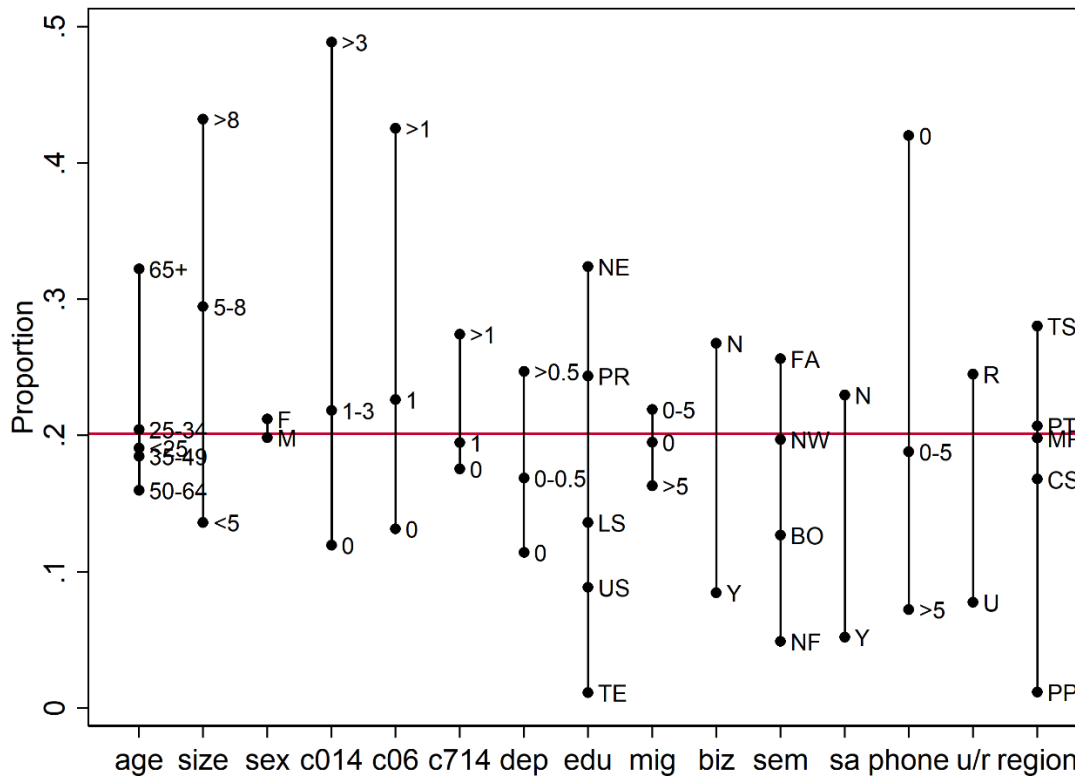


Source: Authors' calculation

The LSMS+ data provides additional information on domestic and international migration and the receipt of remittances. Table A3 shows that almost half of the survey households report having at least an adult member migrate during the previous 12 months (i.e. mostly during 2019, pre-pandemic), domestically or abroad, with the former more frequent. The proportion of households reporting adult migrants is particularly high among female-headed households relative to all or poor households. This might indicate that migration affects family headship, with women assuming the role of head of household when their spouse or other adult members are absent. In addition, the results show that 41% of households report receiving remittances, with this being more frequent among female-headed households with adult migrants (56%) in comparison to male-headed households (37%).

Figure 6 graphs the association between poverty incidence and household characteristics, indicating the deviation of each characteristic from the mean poverty incidence. Overall, the results show that households with older heads, large household size, more dependents (children and elderly), heads with no or primary education, no savings, in a rural area and in Tonle Sap tend to have high poverty incidence.

Figure 6 Mean difference of poverty status by household characteristics



Notes: Age: age of head; size: household members; sex: gender of head; c014: no. of children aged 0–14; c06: no. of children aged 0–6; c714: no. of children aged 7–14; dep: dependency ratio; edu: education of head; mig: no. of migrants; biz: ownership of non-agriculture business; sem: employment of head; sa: savings account; phone: no. of cellphones; u/r: sector; region: region.

Source: Authors' preparation.

4.2 Correlates of poverty and welfare across the distribution prior to Covid-19

Table A5 presents probit regression results examining the relationship between poverty and its correlates for all households and by sector and gender of household head, while Table A6 presents the results of the simultaneous quantile regression (SQR) examining welfare across the distribution. As outlined in Section 3, factors affecting welfare are classified into resource base, income generation activities, household attributes and capacities and sector and region in which the households reside. The estimated associations are presented based on the classification.

Household resources

Household resources were important as anti-poverty factors, but not all types of resources could help households escape poverty. In this analysis, we focus on a range of household assets, land, livestock and electricity. First, ownership of household assets was associated with a lower probability of poverty and higher per capita household consumption across the distribution. However, the effect varied

according to the types of assets owned. Among the examined asset types, possession of a mobile phone by household members was associated with a lower probability of poverty for all categories of households including those in urban or rural areas and male-headed. It was also associated with increased consumption across the distribution. However, descriptively, female-headed households were less likely to own mobile phones than male-headed households.

Livestock and land also offered protection against poverty. Livestock had a negative association with poverty, overall, and for rural households as well as male-headed households. Descriptively, female-headed households were less likely to own livestock compared to male-headed households. In terms of land, households owning more than four hectares of agricultural land experience a lower probability of poverty overall and for the subset of male-headed households.

Access to electricity can have transformative potential, for example by enabling non-farm enterprises, investment in irrigation, and other support to strengthen livelihoods. Indeed, it has a strong relationship with economic growth and human development in Cambodia (Phoumin and Kimura, 2020). As shown by the descriptive results based on the LSMS+ dataset, access to publicly provided electricity or city power could help the household reduce the likelihood of being poor. The significant effects applied to households residing in both urban and rural areas and for male-headed households. SQR results moreover indicated that access to publicly provided electricity or city power is positively associated with household consumption for almost all households across the consumption percentile. In fact, access had a significantly larger positive impact for households at the lowest 20% of the consumption percentile.

Economic activities

Households that owned or operated non-farm enterprises (NFEs) (e.g. carwash owner, metalworker, carpenter, tailor, bar or restaurant owner/operator, street vendor, taxi/tuk-tuk) had lower poverty incidence than those without such businesses. The poverty reduction effect was even stronger among rural and male-headed households. Owning or operating an NFE was also associated with an increase in consumption for all households across the consumption distribution. It should be noted that the effect of engagement in NFEs was largest among the richest 10% of households, among whom ownership or operation of such enterprises was more common than among less well-off households. Descriptively, engagement in NFEs was also much more common among richer households, where for example 67% of the richest deciles engage in NFEs, compared to 15–16% among the bottom two deciles.

Descriptively, the majority of NFEs were vending (street or in a market), followed by transportation or moving services (taxi, tuk tuk or pick-up truck). Only a very small proportion of these business were in professional services (doctor, accountant, lawyer, midwife, etc.). Households in urban areas reported having more NFEs than those in rural areas. In particular, 57% of urban households owned a non-agricultural business, compared to 29% in rural areas. Street vending and operating a market stall was more common among female-headed households, while transportation and moving services were popular among male-headed households.

Engagement in agriculture as well as households engaging in paid employment were not significant correlates of poverty. On the latter, the lack of significance may reflect the different types of paid work, including stable salaried employment but also less stable casual labour. The lack of statistical significance in the relationship between agriculture and poverty might reflect rewards as well as risks, including continued deforestation and over-fishing affecting the availability of common property resources, as noted above (Bird et al., 2018). In this context of advantages but also risks, engagement in agriculture alone may be insufficient to make or break poverty escapes. Descriptively, 73% of rural household heads worked in agriculture, compared to 28% of urban household heads.

The results further show that migration and remittances could help households reduce the incidence of poverty, particularly for rural households and for female-headed households. Descriptively, 29% of female-headed households received remittances. Remittances also had a positive and statistically significant impact on household consumption, averaging 7% of per capita consumption across the consumption distribution. The results seem to indicate that the effect is larger among households at the higher end of the consumption distribution.

Access to financial services underpinned these activities and could also offer some protection against poverty. Results indicate that households with a savings account were associated with a lower probability of poverty, and higher per capita household consumption across the distribution. These results may signal reverse causality, where richer households were more easily able to access financial services. Nevertheless, the statistical significance of the association does point to the importance of financial services more generally as households escape poverty. Even so, it is worth noting that microfinance in particular can be helpful but also harmful (Bird et al., 2018; Res, 2021). For example, an analysis during Covid-19 found many families struggling with loan repayments, and high levels of indebtedness prompting distress asset sales (Res, 2021).

Household attributes, and a focus on gender

There are also attributes of households and their heads that correlate with poverty. In terms of residence, as before, the incidence of poverty tended to be concentrated in rural areas and around Tonle Sap and Plateau regions. Rural households, for instance, are 25% more likely to experience poverty than those living in urban areas. Households in Phnom Penh had the lowest propensity of poverty.

The older the head, the higher the likelihood of being poor, particularly among rural and women heads. The level of education achieved by the household head also played an important role in preventing poverty, and the higher the education level, the stronger the effect. For instance, poverty incidence was lower among households with heads who have completed lower secondary education compared to those with heads with no education. The intensity of the poverty-reducing effect increased with higher education, so having tertiary education had the highest impact. The SQR results further showed consistent effects of education of the household head on household welfare. Specifically, education improved welfare for all households across the consumption distribution (i.e. poor, near-poor and non-poor). It should also be noted that the higher the education level, the larger the effects on household consumption. Lower secondary education had particularly large effects among households in lower quintiles compared to richer households.

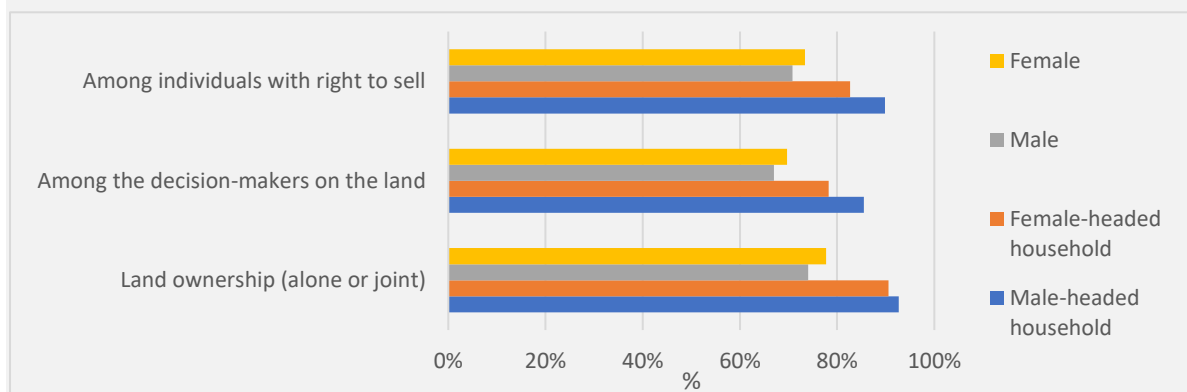
The results also showed that female-headed households, overall and in rural areas, have a lower propensity of being poor compared to male-headed households, after controlling for other correlates of poverty that might otherwise contribute to their reduced welfare. This is despite the slightly higher rate of poverty amongst female-headed households overall, pointing to the importance of correlates such as remittances and other factors in mitigating the vulnerability of female-headed households. Even so, though there may have been a lower probability of poverty amongst female-headed households in the regression analysis, this did not necessarily translate into greater agency of women (Box 1).

Box 1 Gender and decision-making, with a focus on land and NFEs

Descriptively, while a similar share of women and male heads of household owned agricultural land, decision-making on the land regarding the timing of crop activities, crop choice and input use was less common among female heads (78.2% recorded being among the decision-makers on their land) compared to male heads (85.5%), with the difference statistically significant. Female-headed

households were also less likely to be among those with the right to sell their land. Thus, despite women having access to land and its use, female heads of households had less agency and rights compared to male household heads.

Figure 7 Land ownership and engagement by gender



We further descriptively examined the role of men and women in the household in managing and owning household NFEs. The results showed that men were more likely to manage and own household enterprises compared to women, either as a household member or head (Table 2). In other words, women tended to take a secondary role as manager or owner. There are other household members who might have been involved; however, management of the enterprise remained with the household head or her/his spouse. This could be a result of men claiming enterprises started by women, especially when the enterprise grows or becomes successful, as reflected in the international literature (Bird, 2018). As such, though female headship might correlate with a lower probability of poverty when controlling for other factors, women more generally had limited control or decision-making over key assets and activities that could otherwise contribute to further welfare improvements.

Table 2 Management and ownership of household NFEs

	Manager 1		Manager 2		Owner 1		Owner 2	
	Male	Female	Male	Female	Male	Female	Male	Female
Head	289 (85.8)	101 (33.4)	-	-	316 (86.6)	101 (36.9)	-	-
Spouse	5 (1.5)	153 (50.7)	7 (33.3)	132 (84.1)	6 (1.6)	125 (45.6)	7 (25.0)	192 (87.3)
Son/daughter	23 (6.8)	42 (13.9)	3 (14.3)	19 (12.1)	26 (7.1)	44 (16.1)	7 (25.0)	22 (10.0)
Son/daughter-in-law	19 (5.6)	2 (0.7)	9 (42.9)	4 (2.5)	16 (4.4)	0 (0.0)	13 (46.4)	4 (1.8)
Other (parent, sibling brother/ sister-in-law, other relatives, other non-relative incl boarder)	1 (0.3)	4 (1.2)	2 (9.6)	2 (1.3)	1 (0.3)	4 (1.6)	1 (3.6)	2 (0.9)
Total	337 (100.0)	302 (100.0)	21 (100.0)	157 (100.0)	365 (100.0)	274 (100.0)	28 (100.0)	220 (100.0)
	<i>Pearson chi2(8) = 252.4145, Pr = 0.000</i>		<i>Pearson chi2(8) = 62.6074, Pr = 0.000</i>		<i>Pearson chi2(8) = 236.4144, Pr = 0.000</i>		<i>Pearson chi2(4) = 97.0063, Pr = 0.000</i>	

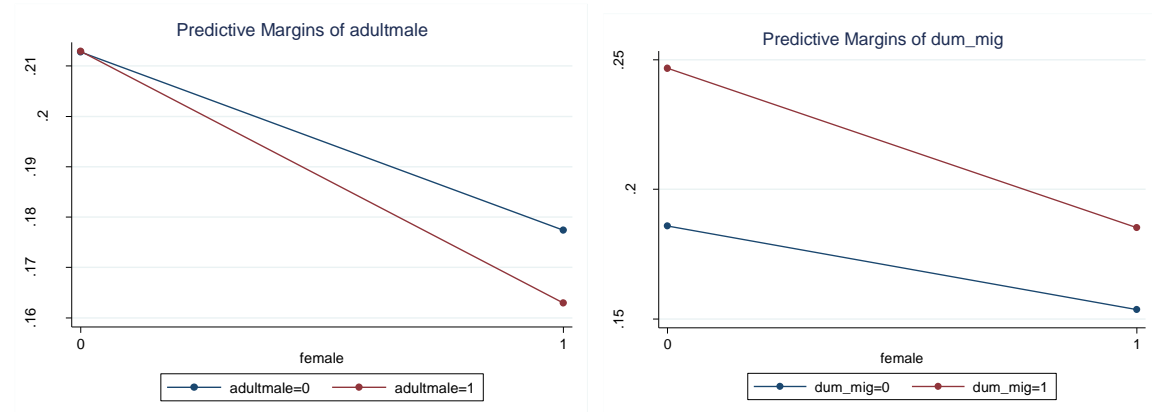
Note: The table records numbers and the % of total households is in parentheses.

Source: Authors' calculation

Moreover, there are likely to be differences within female-headed households that can also affect the probability of poverty. Following Brown and van de Walle (2021), we investigated the effects further, focusing on female-headed households with a range of characteristics and activities. This allowed us to understand whether there are heterogeneous effects which could have implications for poverty reduction policies and targeting mechanisms. Conditional on selected household characteristics, we found a statistically significant marginal effect of female headship on the predicted probability of poverty in cases where there was an adult male in the household (Figure 8, left). The same held where

there was a migrant (Figure 8, right), reinforcing the benefits of migration and remittances to female-headed households, as noted above.

Figure 8 Predicted probability of poverty, by gender and adult male members (left), and by gender and migration (right)



5. Changing welfare during Covid-19

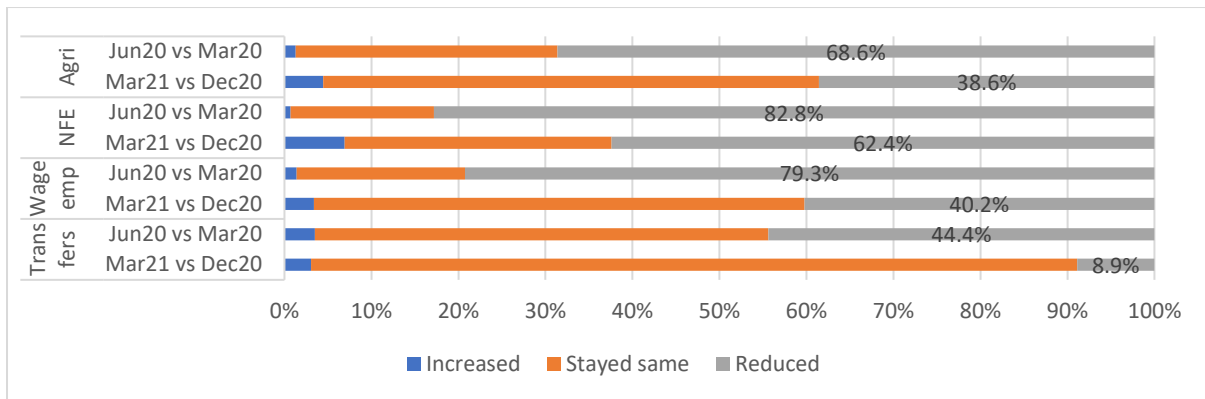
This section examines changing welfare of households during Covid-19, relying on multiple rounds of high-frequency phone surveys between May 2020 and March 2021.

5.1 Income loss

The Cambodian labour market was affected during the Covid-19 pandemic as a direct result of 'lockdown measures resulting in firm closures and work stoppage, and indirectly through aggregate demand drops and supply change disruptions' (ADB, 2020). In May 2020 a majority of households in the country (83%) reported that their income had declined since the start of the pandemic, a figure which reduced to 44% of households in the period between December/January 2021 and March 2021. Income loss from NFEs and wage employment was particularly slow to recover, especially among the poorest households. For example, 62% of IDPoor households recorded declines in non-farm employment income in the period between December 2020/Jan21 and March 2021, compared to 52% among the wider population (based on LSMS-linked data). Given that NFE activities were an important correlate associated with a lower probability of poverty in the pre-Covid analysis (Table A5), this does not bode well for household welfare during the pandemic, suggesting that an important pathway out of poverty is being constrained.

When focused on the subset of ID Poor households, moreover, large reductions in household income were observed across sources, more so than for the full population. In particular, while 63% of LSMS households relying on income from wage employment experienced income losses in May 2020, the figure reached 79% among ID Poor households. This could reflect the insecurity of informal work, in which a large share of the population is employed. For example, it was estimated pre-pandemic that 7 million workers were not covered by National Social Security Fund schemes, corresponding to over 83% of the country's workforce (Both et al., 2018). In addition, 75% of LSMS households and 87% of ID Poor households in May 2020 that relied on income from remittances experienced income loss from these transfers, compared to pre-pandemic levels. Relatedly, over 60% of migrant households reported declines in the income of the migrant during Covid-19. Of migrants who had returned home by August/September 2020, the majority had done so because of factories being closed (36%), followed by a lack of work (24%) (Karamba and Tong, 2020).

Figure 9 Changes in household income over time by source (percent)



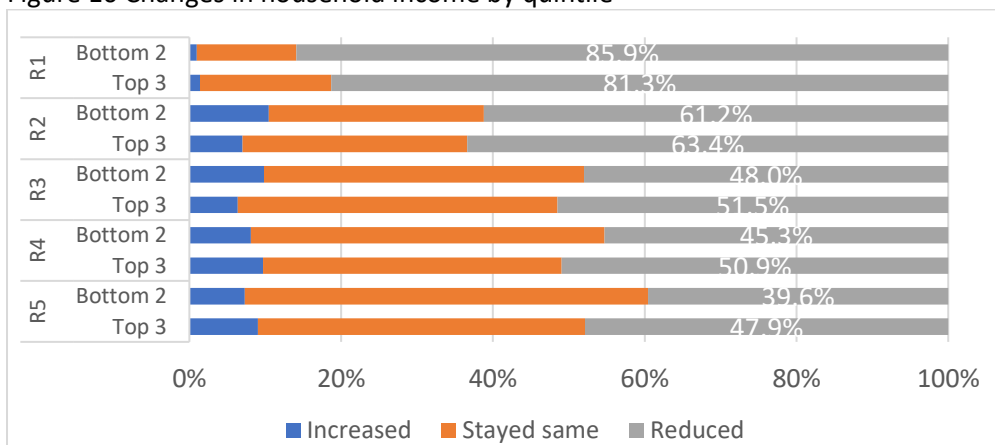
Note: Transfers cover remittances, assistance (from family, non-family or government), income from property or pensions.

Source: Authors' analysis of HFPS-IDPoor dataset

By gender, 83–85% of women- compared to men-headed households reported income losses in May 2020. While the share of women reporting these losses had declined by the latest wave, to 39% compared to 46% among men, the difference was not statistically significant. Among ID Poor households, however, more women-headed households than men-headed households reported income loss where their income had derived from transfers, in particular through remittances, assistance (from family, non-family, or government), income from property or pensions. Specifically, among households that had reported income from transfers, 47% of women-headed IDPoor households and 35% of men-headed IDPoor households reported income loss across all of the transfers they received.

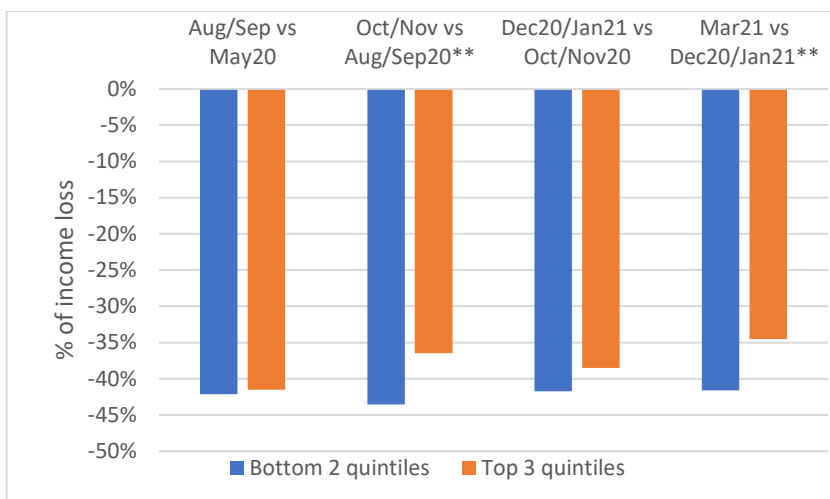
Across the wider population, income losses were relatively constant in proportional terms across the distribution in the early months of the pandemic, but by the later period (March 2021 compared to December/January 2021), more households in the top three quintiles were likely to report income losses compared to households in the bottom two quintiles (Figure 10). Even so, when examining the percentage change in income, households in the bottom two quintiles experienced a more severe reduction in their incomes, among households reporting income loss. Based on the already low per capita consumption and presumably low income of households in the bottom of the distribution (Figure 3), this points to not just new impoverishment, but severe processes of destitution from an already low welfare base.

Figure 10 Changes in household income by quintile



Source: Authors' analysis of HFPS-LSMS dataset

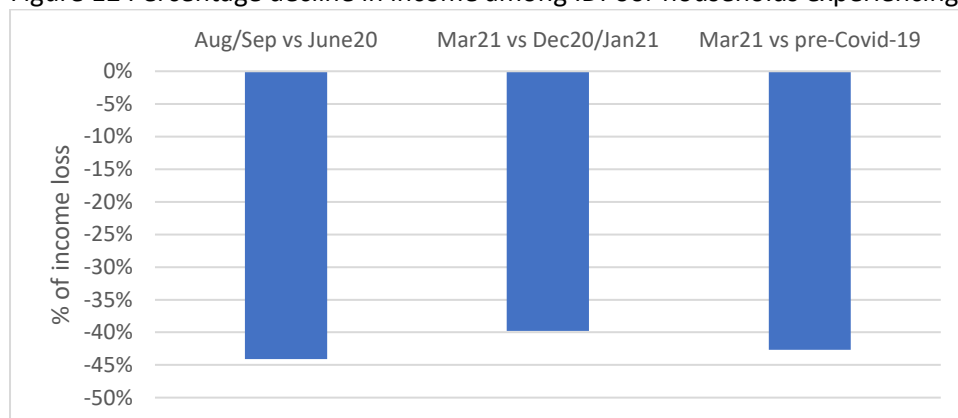
Figure 11 Percentage decline in income among households experiencing reduction in income



Source: Authors’ analysis of HFPS-LSMS dataset

To better understand the extent of destitution, we further examine percentage decline in income among IDPoor households. Here, 56.5% experienced reductions in their income in August/September 2020 compared to June 2020. IDPoor households experiencing reductions in income on average experienced a 44.1% reduction in August/September 2020 compared to before the Covid-19 outbreak (Figure 12). By the latest round in March 2021, IDPoor households experiencing income loss on average experienced a 39.8% reduction compared to December 2020/January 2021. However, when compared to the months prior to the Covid-19 pandemic, the depth of income loss remained high, on average with households experiencing income loss reporting as much as a 42.7% reduction in their incomes over time. Many households reporting this income loss overall also reported income loss in agriculture, NFEs and wage employment, with between a 45.1% and 47.2% reduction in their income from these sources by March 2021 compared to prior to the pandemic.

Figure 12 Percentage decline in income among IDPoor households experiencing reduction in income



Source: Authors’ analysis of HFPS-IDPoor dataset

More recent data since the HFPS points to continued loss in employment and income into July 2021 (ADB et al., 2021a). By December 2021, though fewer households faced income reduction and job loss compared to October 2021, female-headed households remained particularly vulnerable to job loss. Income reductions especially affected IDPoor households (ADB et al., 2021b).

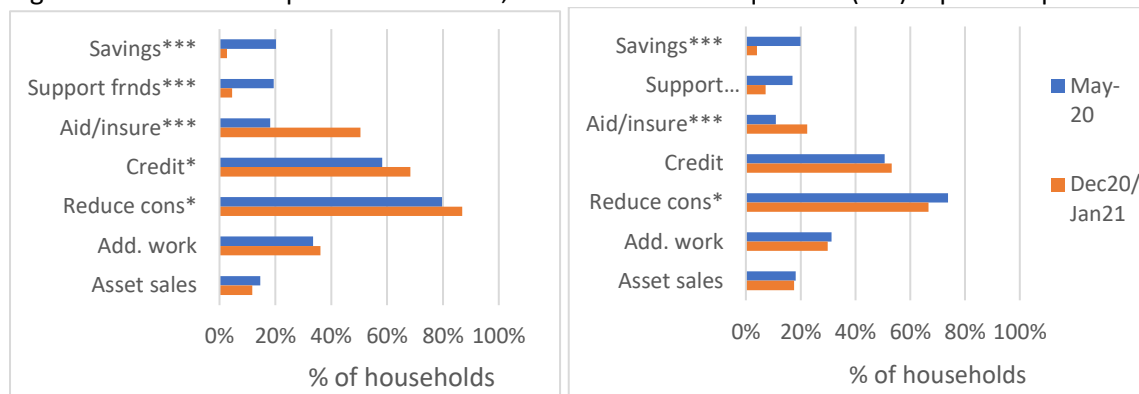
5.2 Coping strategies

In this context, it is important to understand how households are coping in response to Covid-19. The most common coping strategy across the country has been through reducing food consumption,

corresponding to increases in food insecurity over the period. The second most common strategy has been increased borrowing. A similar share of households across the distribution drew on savings (20%) or relied on support from friends (17–19%). Households headed by women were more likely to rely on support from friends (35%) compared to households headed by men (13%) at the onset of the pandemic.

There were some notable differences by quintile. Among the bottom two quintiles, reliance on friends was slightly lower than in other quintiles by the latest wave, likely pointing to the thinning out of social networks especially for the poorest, in a context where entire communities may be hard hit. This could also help explain the decline in income pointing to processes of destitution, as discussed above. Instead, households in the bottom two quintiles, especially by the latest wave, were able to rely on public assistance to help them cope. By December 2020/January 2021, ID Poor households were more likely to reduce consumption, rely on credit, aid or insurance and take on additional work, compared to the full sample of LSMS households. Other research indicates that many households have engaged in a combination of these strategies, particularly poorer households, where the reduction of consumption on its own has been inadequate to cope (Res, 2021). The most vulnerable households in these situations have often become even more debt-distressed (Res, 2021).

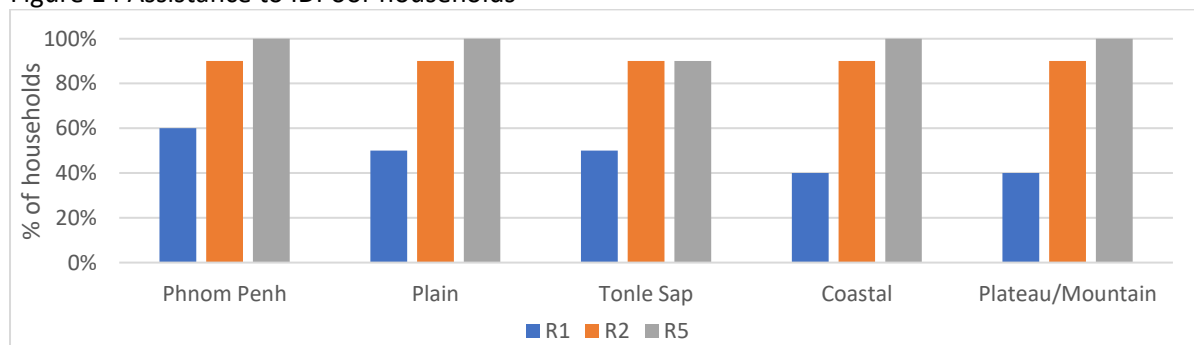
Figure 13 Actions in response to Covid-19, LSMS: bottom two quintiles (left) top three quintiles (right)



Source: Authors' analysis of HFPS-LSMS dataset

Finally, when examining access to social assistance for IDPoor households, there were regional variations disadvantaging Tonle Sap compared to other regions, potentially on account of its remoteness (Figure 14). Despite improvements in access, the level of aid appears to be inadequate. For example, most IDPoor households on average received a total of \$252 in Covid-19 relief cash transfers between late June 2020 and December 2020/January 2021 (Karamba et al., 2021).

Figure 14 Assistance to IDPoor households

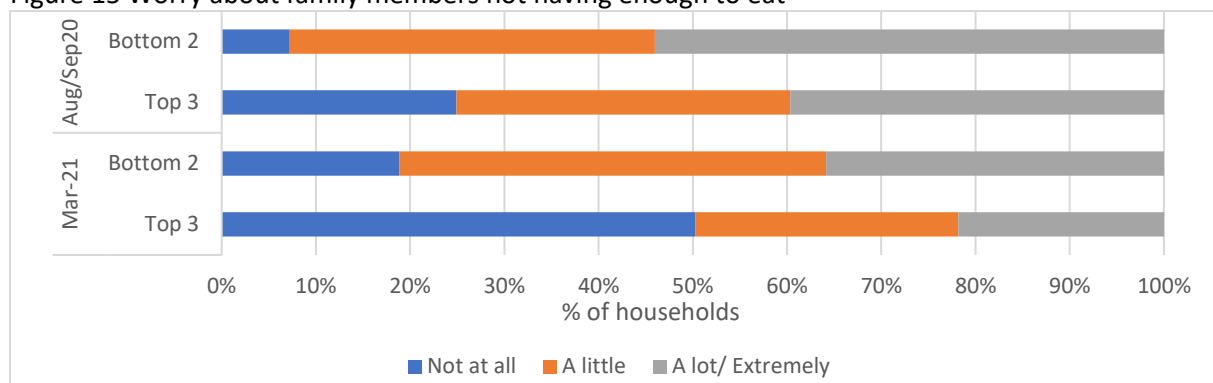


Note: The cash transfer programme was not launched in round 1, which largely explains the difference between rounds 1 and 2 in terms of household receipt of social assistance.

Source: Authors' analysis of HFPS-IDPoor dataset

As a result, households especially in the bottom two quintiles were forced to further reduce their consumption in an effort to make ends meet (Figure 15). Instead, households in the top three quintiles were less likely to reduce consumption over time. By gender, the main difference among ID Poor households was in terms of borrowed food, where women-headed households were more likely than men-headed households to borrow food by the latest wave. Reflecting these coping strategies, households in the bottom two quintiles across the country were also much more likely to record being a lot or extremely worried about family members not having enough to eat, despite people in poverty already spending a larger share of their income on food pre-pandemic (Figure 3). Indeed, by the latest survey wave, though these shares decreased across the distribution, around 35% of households in the bottom two quintiles were still very concerned about this, a percentage comparable to the share of households in the top three quintiles expressing ‘a lot’ or ‘extreme’ worry at the onset of the pandemic.

Figure 15 Worry about family members not having enough to eat



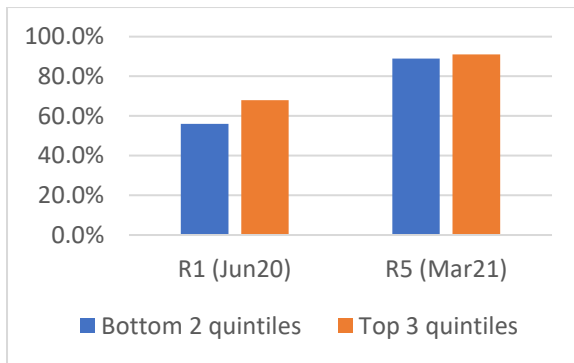
Source: Authors’ analysis of HFPS-LSMS dataset

More recent data since the HFPS points to a continuation of some of these coping strategies. By July 2021 borrowing had reduced, potentially as a result of lower credit-worthiness. There was also evidence of reduced food intake, some asset sales, some withdrawal of children from school and an increase in children working compared to earlier in the year (ADB et al., 2021a). Moreover, by December 2021, dietary diversity remained worse in rural areas and among IDPoor households (ADB et al., 2021b).

5.3 Disruption to learning

Another important consequence of the pandemic was in terms of lost education. This is particularly worrying intrinsically but also instrumentally given the importance of post-primary education in sustaining escapes from poverty (Diwakar et al., 2021). In Cambodia, the closure of schools in March 2020 until the start of November, followed by a second nationwide closure by the end of November, badly affected children’s ability to engage in learning. At the onset of the pandemic, children from richer households were better able to continue to engage with education activities despite these closures, though by the latest wave there was a levelling off as the proportion of children from poorer households engaging in education increased (Figure 16).

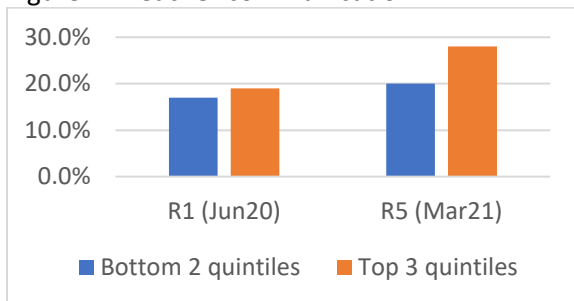
Figure 16 Education activities



Source: Authors' analysis of HFPS-LSMS dataset

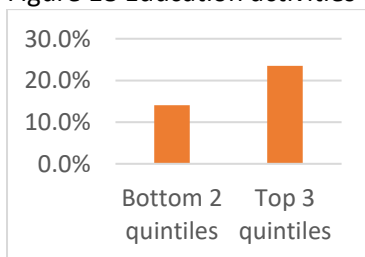
Even so, the effects of the pandemic on learning outcomes were particularly pronounced in other ways for children in IDPoor households, perhaps partly due to their enrolment in public schools, which were closed earlier during the summer. In December 2020, just 33% of IDPoor households with children reported engagement in learning activities in the week preceding the survey, compared to 57% among the full population of households with children (Karamba et al., 2021). Moreover, teacher communication remained higher among children from richer households (Figure 17), which may partly be a function of different types of school (public vs. private), and more time spent on education activities per week compared to the bottom two quintiles (Figure 18).

Figure 17 Teacher communication



Source: Authors' analysis of HFPS-LSMS dataset

Figure 18 Education activities for more than 24 hours/week



Source: Authors' analysis of HFPS-LSMS dataset

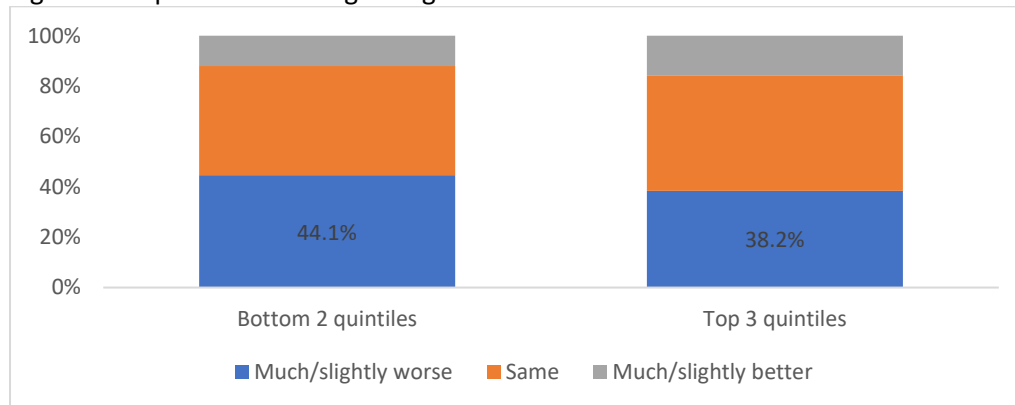
More recent data since the HFPS points additionally to an increase in the number of children working in July 2021 compared to March 2021 (ADB et al., 2021a). Into December 2021, moreover, there remained a common reliance on online materials provided by the government and schools for learning. A third of children still relied on these online materials (ADB et al., 2021b). This was despite children returning to schools.

5.4 Expectations for the future

Ultimately, with all of these impacts in terms of pronounced income loss, severity of the loss, reduced consumption, food insecurity and learning losses, it is no wonder that we also observe a sense of

hopelessness among households in the bottom two quintiles (Figure 19). Among IDPoor households, a similar share (41%) reported that they expected their welfare to be slightly or much worse in the months ahead. By gender, households headed by men were on average more optimistic, with 17% expecting the situation to be better, compared to 8% of women-headed households. This is understandable given that women were more likely to rely on social networks and migrant remittances, support from friends and borrowing food to meet ends meet. With a thinning out of these networks, and a reduction in migration, they are less able to remain optimistic. Finally, if we disaggregate according to households experiencing income loss or food insecurity, food-insecure households and those experiencing income loss were more likely to expect their wellbeing to decline into the summer of 2021.

Figure 19 Expected wellbeing change in next few months



Source: Authors' analysis of HFPS-LSMS dataset

6. Conclusion

This paper examines poverty and its correlates before Covid-19, and changes in wellbeing during the pandemic across the welfare distribution. For the first part of the investigation, we use large-scale and nationally representative survey data to examine correlates of poverty and welfare. The analysis is conducted in the pre-Covid-19 context, focusing on drivers of poverty and poverty dynamics. In addition to descriptive statistics, we employ probit and simultaneous quantile regression as estimation strategies. While the former provides an empirical investigation of drivers of poverty, the latter offers insights and further details on how the examined drivers affect households across the wealth distribution, allowing policy-makers to target at a more disaggregated level. The results of the probit regression indicate a range of poverty-reducing factors. These include access to publicly provided electricity, access to financial services (i.e. savings accounts), ownership of a mobile phone and bicycle, remittances, ownership of non-agriculture businesses and education.

During Covid-19, households reinterviewed from LSMS+ and a new set of ID Poor households surveyed during the pandemic were analysed. From these results, we observe large declines in income across the distribution, though with the severity of the income reduction more pronounced among households in the bottom two quintiles. This pattern of disproportionate loss has continued into more recent waves. Among IDPoor households, moreover, the declines in income remained severe even by March 2021 compared to pre-pandemic levels, pointing to processes of destitution among households that were already poor. This is worrying given that pre-pandemic welfare at these lower consumption quintiles was already low. As a result of these shocks, households were forced to rely on a range of coping strategies, especially reducing consumption, borrowing and, for poorer households in later survey waves, public assistance. Even though the roll-out of cash transfers has reached many ID Poor households, however, adequacy concerns remain given that reductions in food consumption among poorer households occurred, coupled with continued food insecurity, and this continued into 2021.

despite the widespread receipt of transfers. In this context, it is not surprising that household expectations for future months remain bleak, particularly among the poorest.

The study is not without caveats. First, there is limited information in the LSMS+ with which to examine other important potential poverty correlates (e.g. household/individual borrowing and disability within the household). Yet estimates of the cost of having a member with disabilities is about 19% of monthly household consumption expenditure, and doubles household poverty from 18% to 37%, while also increasing the severity of poverty (Palmer et al., 2019). Second, the monetary poverty measure was not calculated using national poverty lines, but instead chosen to identify the bottom 20% of the population in terms of per capita consumption. This nevertheless equates closely to the poverty rate identified in the 2019 Cambodia SES, while also offering a fluid assessment of welfare across quintiles. Third, the Covid-19 surveys have huge attrition rates that we have attempted to partly mitigate through relying on sampling weights designed to ensure representativeness, though this should still be viewed with caution given small sample sizes. We also rely accordingly on the IDPoor dataset to offer a more nuanced analysis of households identified as living in poverty by the government. Finally, the Covid-19 analysis is largely based on trends over time, and thus does not control for other factors that could have affected the changes observed.

Even so, the results prior to and during the Covid-19 pandemic point to certain areas for policy and programming focus. A focus on narrowing development gaps across sector (urban vs. rural) and region (Phnom Penh vs. others; levelling up especially in Tonle Sap) remains relevant. This would contribute to inclusive and sustainable growth and development, an agenda which has been strongly emphasised in the Rectangular Strategy IV, the National Strategic Development Plan (2019–2023) and the Cambodia Sustainable Development Goals. Increasing coverage of financial services and improving quality (e.g. non-credit services) particularly for households at the bottom of the distribution, has the potential to reduce poverty. At the same time, financial services can also sometimes be a source of impoverishment, with evidence pointing to high levels of indebtedness and loan arrears, as people borrow from moneylenders to repay formal sector loans. As such, exploring alternatives to borrowing as a coping strategy is also worth considering. Continued public investment in education for all has a strong and long-term poverty-reducing factor, particularly ensuring that the majority of school-age children finish secondary education or higher. There is also an urgent need to enable children who have missed school and those who have dropped out to recover the learning they have missed and rejoin school. Finally, further expanding coverage of and disbursements under the cash transfer programme and ensuring the targeting of poorer households is an important area for continued effort.

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Appendices

Appendix 1 Welfare indicator

Constructing nominal consumption aggregate

The household-level consumption aggregate comprises food and non-food expenditure by households in different reference periods, converted to a uniform reference (recall) period. Table A1 provides a summary of expenditure items included (or excluded) from the consumption aggregate. On non-food, expenses in various reference periods on 46 items in seven categories were surveyed, but not all items are included in the consumption aggregate. Those are taxes on income and on property and loan payments to banks, microfinance institutions and other unofficial sources (i.e., principal, interest rate and other financial services), given inaccuracies in data. The health category excludes bulk expenses on medical operations or other emergencies which might be skewed to overall non-food expenditure. Education expenses include expenses on formal and non-formal education and private lessons during the past school year, and school fees, tuition, textbooks, school supplies, allowances for children studying away from home, transport and gifts for school building/development funds. Educational expenses do not cover assistance from the government or NGOs. On housing, zero value of house rent is imputed using actual value and housing characteristics, using a hedonic regression approach. Finally, we exclude non-land durable assets, as we could not obtain acquisition value (12-month purchase value), and due to non-responses on account of absence or unwillingness to participate by eligible individuals.

Table A1 Household consumption items

	Include	Exclude
Food	8 categories, 64 items: Rice and other rice products Fish, seafood and other fish products Meat and other meat products Fruit and fruit products Vegetables, mushroom tubers and other ingredients Soft drinks, beer, wine, cigarettes and coffee Food and drinks away from home Other food expenses	Information on tobacco consumption was recorded in the food consumption module. However, we exclude this item from food consumption and include it as non-food consumption
Non-food and durables	8 categories, 40 items: Tobacco Clothing, footwear and apparel Transport, accommodation and postal Telephone, internet services, gambling and recreation Education (household expenses on formal and non-formal education and private lessons. These expenses do not include assistance from the government or NGOs) Salary, wage, home equipment and maintenance Health treatment and health services Wedding gifts Other gifts (funeral, <i>bonkathen</i> , <i>bonpka</i>) and other contributions to other households Housing utilities: water, energy and house repairs House rent – only if actually paid for with imputation for households that did not pay house rent. Hedonic house price equation is used to impute zero value of house rent	Taxes on income (tax on salary) Taxes on property (e.g. houses, cars) Banks, MFIs and unofficial loan payments (principle, interest rate and other financial services) Information on 12-month purchase value of durable assets used to calculate acquisition value is not available. Thus, there is no acquisition value in the calculation of consumption aggregate

Source: Authors' preparation

Consumption data is checked and cleaned using standard procedures. Checking distribution of zero and missing and identifying gross outliers was done. On the latter, we used a simple univariate technique that identifies outliers as those observations that deviate from the village mean more than 3.5 standard deviation. With the outlier identification technique, we place potential outliers by value at the upper or lower boundaries of $[\bar{x} \pm 3.5 \times s]$, where x is mean consumption and s is standard deviation.

Finally, we adjust for household consumption when deriving per capita values. Per capita terms and equivalence of scales are the two commonly used cases for adjustment of household composition. In this study, we use per capita terms as this has been used by the National Institute of Statistics when calculating per capita consumption and poverty rate. In addition, we use adult equivalence scale (OECD) to conduct a sensitivity test. We do not however calculate spatial-price adjusted values, as there is no price data we could use. Instead, we rely on a nominal consumption aggregate.

Determining poverty line and adjusting for household consumption

The choice of poverty line might depend on the intended use of the poverty rates. It is common to define the poor as those who lack command over basic consumption needs. Consequently, the poverty line is obtained by specifying a consumption bundle considered adequate for basic consumption needs, then estimating the cost of these basic needs. Absolute poverty lines are common in low- and middle-income countries. In this study, we calculate and use an absolute poverty line to estimate poverty measures and to conduct poverty-related analyses.

For its construction, we consider the following options.

1. Option 1: we could treat the poorest 20% of the consumption distribution as poor. This might make sense as households between 5 and 30 percentiles are normally used to identify consumption baskets when calculating a poverty line. One weakness might be that this does not fully reflect the consumption basket of all the poor.
2. Option 2: we could identify the maximum consumption level of the richest households among the poorest 20% of the consumption distribution and use that as the poverty line to further identify the poor.
3. Option 3: we could also utilise the newly released poverty line used to calculate 2019/20 poverty rates. The new national poverty line is KHR10,951 (\$2.73) per person per day. We are unable to use the line as we cannot construct the same consumption aggregate with the LSMS+ data, as the 2019/20 Cambodia Socio-Economic Survey collects more information necessary to construct the poverty line and consumption.

Because our main purpose in this study is to understand determinants of poverty incidence before the outbreak of Covid-19, not to calculate poverty rates nationally or by region of the country, we use the poverty line in Option 1.

Appendix 2 Description of variables

Variables	Type	Explanation
Welfare outcomes		
Per capita daily consumption (riels)	Continuous	Food and non-food consumption of the household divided by its total members
Poverty status	Categorical	Poverty status of household: 1 if the per capita daily consumption is below the poverty line
Resource base		
Cell phone	Categorical	1 if the household owns cellphone
Bicycle	Categorical	1 if the household owns bicycle
Livestock	Continuous	Number of livestock owned (excludes duck, chickens, geese)
Electricity	Categorical	1 if the household uses publicly provided electricity/city power for lighting
Income generation and activities		
HH head employed in agriculture	Categorical	1 if HH head is employed in agriculture
HH head in paid employment	Categorical	1 if HH head is employed in paid jobs
Area of cultivatable agricultural land	Continuous	Area of cultivatable agriculture land (hectares)
Own/operate non-agriculture business	Categorical	1 if the household owns or operates non-agriculture business
Migration	Categorical	1 if the household has at least an adult member migrating
Remittances	Categorical	1 if the household received remittances
Savings account	Categorical	1 if the household has savings account
Attributes and capacities		
HH size	Continuous	Household size
Age of HH head	Continuous	Age of household head
Gender of HH head	Categorical	1 if the household head is female
Marital status of HH head	Continuous	1 if the household head is married/living together
Dependency ratio	Continuous	Total number of dependents (0–14 & 65+) by working age (15–64) members
Years of schooling of HH head	Continuous	Years of schooling of household head
Education level of HH head	Categorical	1: No education; 2: Primary or lower; 3: Lower secondary; 4: Upper secondary; 5: Tertiary.
Context and region		
Sector	Categorical	1 if the household is in rural area
Region	Categorical	1: Phnom Penh; 2: Mekong Plain; 3: Tonle Sap; 4: Coastal; 5: Plateau and mountainous

Source: Authors' preparation

Appendix 3 Summary statistics

Table A3 Household descriptive statistics by poverty status, sector and gender of head

	(1) All	(2) Poor	(3) Male	(4) Female	(5) Urban	(6) Rural
Consumption (per capita daily, riels)	20028.56 (22106.4)	6612.53 (1542.5)	19933.04 (23166.1)	20378.92 (17711.7)	31076.59 (34994.8)	16134.34 (13106.1)
Access to publicly provided electricity	0.85 (0.361)	0.72 (0.448)	0.83 (0.375)	0.90 (0.300)	0.97 (0.175)	0.80 (0.398)
Cows (1/0)	0.23 (0.419)	0.22 (0.412)	0.25 (0.431)	0.16 (0.364)	0.08 (0.266)	0.28 (0.449)
Head worked in agriculture	0.61 (0.488)	0.72 (0.452)	0.63 (0.482)	0.53 (0.500)	0.28 (0.451)	0.73 (0.447)
Head worked in paid employment	0.42 (0.494)	0.46 (0.499)	0.48 (0.500)	0.21 (0.407)	0.41 (0.493)	0.42 (0.494)
Area of cultivatable agricultural land (ha)	1.32 (10.74)	0.97 (1.625)	1.20 (6.666)	1.75 (19.41)	0.75 (10.91)	1.51 (10.68)
Ownership of non-agriculture business	0.36 (0.481)	0.15 (0.360)	0.36 (0.480)	0.37 (0.484)	0.57 (0.496)	0.29 (0.454)
Household with migrants	0.46 (0.498)	0.47 (0.500)	0.42 (0.494)	0.60 (0.491)	0.41 (0.492)	0.48 (0.500)
Household receives remittances	0.41 (0.491)	0.42 (0.495)	0.37 (0.482)	0.56 (0.498)	0.33 (0.471)	0.43 (0.496)
Savings account	0.16 (0.366)	0.04 (0.199)	0.16 (0.370)	0.14 (0.351)	0.31 (0.464)	0.11 (0.307)
Household size	4.21 (1.770)	4.95 (1.853)	4.39 (1.696)	3.54 (1.876)	4.14 (1.740)	4.24 (1.781)
Dependency ratio	0.70 (0.691)	0.96 (0.794)	0.69 (0.651)	0.71 (0.821)	0.64 (0.637)	0.72 (0.708)
Female-headed household	0.21 (0.410)	0.23 (0.419)	0.00 (0)	1.00 (0)	0.21 (0.407)	0.22 (0.412)
Age of household head	48.39 (14.26)	50.32 (15.85)	46.23 (13.59)	56.32 (13.88)	47.29 (14.17)	48.78 (14.28)
Years of schooling of household head	5.24 (4.061)	3.29 (2.944)	5.90 (3.968)	2.84 (3.455)	7.02 (4.698)	4.62 (3.610)
Urban/rural (1=rural)	0.74 (0.439)	0.90 (0.301)	0.74 (0.440)	0.75 (0.436)	0.00 (0)	1.00 (0)
Phnom Penh	0.12 (0.324)	0.01 (0.0832)	0.11 (0.319)	0.14 (0.345)	0.46 (0.499)	0.00 (0)
Mekong Plain	0.36 (0.481)	0.36 (0.480)	0.36 (0.479)	0.39 (0.489)	0.20 (0.403)	0.42 (0.494)
Tonle Sap	0.32 (0.466)	0.45 (0.498)	0.31 (0.464)	0.34 (0.476)	0.24 (0.427)	0.35 (0.476)
Costal	0.07 (0.251)	0.06 (0.231)	0.07 (0.255)	0.06 (0.237)	0.03 (0.180)	0.08 (0.271)
Plateau	0.13 (0.336)	0.13 (0.340)	0.15 (0.353)	0.07 (0.254)	0.07 (0.247)	0.15 (0.359)
Observations	1,512	312	1,198	314	456	1,056

Standard deviations are in parentheses. Source: Authors' calculation

Table A4 Descriptive statistics by consumption quantile

	(1) Poorest 20%	(2)	(3)	(4)	(5) Richest 20%
Consumption (per capita daily, riels)	6612.53 (1542.5)	10720.68 (977.2)	14595.37 (1343.1)	20895.83 (2457.6)	47384.90 (37295.1)
Food (per capita daily, riels)	3701.41 (1205.5)	5741.15 (1400.1)	7585.05 (2165.0)	10392.41 (3138.1)	15964.94 (8886.0)
Non-food (per capita daily, riels)	2911.12 (1107.5)	4979.53 (1405.8)	7010.32 (2190.8)	10503.42 (3622.1)	31419.97 (36222.6)
Access to publicly provided electricity	0.72 (0.448)	0.82 (0.382)	0.84 (0.363)	0.88 (0.326)	0.96 (0.195)
Cows (1/0)	0.22 (0.412)	0.29 (0.456)	0.29 (0.453)	0.22 (0.412)	0.12 (0.330)
Head worked in agriculture	0.72 (0.452)	0.72 (0.448)	0.67 (0.469)	0.58 (0.494)	0.35 (0.478)
Head worked for a wage, salary or any other paid job	0.46 (0.499)	0.49 (0.501)	0.42 (0.494)	0.36 (0.482)	0.36 (0.482)
Area of cultivatable agricultural land (ha)	0.97 (1.625)	1.27 (12.41)	1.16 (2.494)	1.08 (3.052)	2.11 (20.16)
Ownership of non-agriculture business	0.15 (0.360)	0.27 (0.445)	0.34 (0.474)	0.44 (0.497)	0.61 (0.488)
Household with migrants	0.47 (0.500)	0.42 (0.494)	0.43 (0.495)	0.51 (0.501)	0.46 (0.499)
Household receives remittances	0.42 (0.495)	0.38 (0.486)	0.39 (0.488)	0.45 (0.498)	0.39 (0.489)
Savings account	0.04 (0.199)	0.11 (0.308)	0.10 (0.297)	0.18 (0.385)	0.37 (0.485)
Household size	4.95 (1.853)	4.44 (1.665)	4.14 (1.666)	3.78 (1.768)	3.74 (1.611)
Dependency ratio	0.96 (0.794)	0.76 (0.685)	0.71 (0.721)	0.52 (0.547)	0.54 (0.588)
Female-headed household	0.23 (0.419)	0.18 (0.383)	0.21 (0.409)	0.22 (0.413)	0.24 (0.426)
Age of household head	50.32 (15.85)	46.85 (13.89)	47.64 (13.17)	49.01 (13.98)	48.13 (14.13)
Years of schooling of all members	4.45 (2.082)	5.45 (2.103)	5.64 (2.340)	6.15 (2.925)	7.74 (3.516)
Urban/rural (1=rural)	0.90 (0.301)	0.86 (0.347)	0.80 (0.398)	0.68 (0.466)	0.45 (0.498)
Phnom Penh	0.01 (0.0832)	0.03 (0.162)	0.07 (0.261)	0.13 (0.341)	0.36 (0.480)
Mekong Plain	0.36 (0.480)	0.37 (0.484)	0.41 (0.492)	0.38 (0.485)	0.31 (0.462)
Tonle Sap	0.45 (0.498)	0.36 (0.482)	0.31 (0.463)	0.28 (0.447)	0.20 (0.404)
Costal	0.06 (0.231)	0.10 (0.305)	0.07 (0.254)	0.07 (0.254)	0.04 (0.200)
Plateau	0.13 (0.340)	0.14 (0.344)	0.14 (0.348)	0.14 (0.352)	0.09 (0.289)
Observations	312	304	307	297	292

Standard deviations are in parentheses. Source: Authors' calculation

Appendix 4 Correlates of poverty and welfare

Table A5 Correlates of poverty: marginal effects

	(1) All	(2) Urban	(3) Rural	(4) Male	(5) Female
Access to publicly provided electricity (1/0)	-0.057** (0.027)	-0.058** (0.028)	-0.055 (0.034)	-0.063** (0.028)	-0.019 (0.057)
Cellphone (1/0)	-0.075*** (0.028)	0.066 (0.046)	-0.101*** (0.035)	-0.070* (0.037)	-0.070 (0.049)
Bicycle (1/0)	-0.029 (0.021)	-0.019 (0.024)	-0.030 (0.028)	-0.034 (0.024)	0.001 (0.045)
Livestock	-0.004**	-0.001	-0.005**	-0.004**	-0.003
Area of cultivatable agricultural land (base<1 hectare)	-	-	-	-	-
1–2	0.029 (0.030)	0.046 (0.070)	0.031 (0.035)	0.028 (0.030)	0.042 (0.088)
2–4	0.032 (0.036)	-0.005 (0.034)	0.041 (0.045)	0.021 (0.036)	0.083 (0.088)
>4	-0.065* (0.036)	-0.021 (0.026)	-0.074 (0.047)	-0.073* (0.038)	0.027 (0.131)
Head worked in agriculture (1/0)	-0.010 (0.020)	0.033 (0.020)	-0.021 (0.025)	0.007 (0.023)	-0.075 (0.046)
Head worked in paid employment (1/0)	0.005 (0.024)	0.012 (0.028)	0.005 (0.031)	-0.004 (0.025)	0.061 (0.061)
Ownership of non-agriculture business (1/0)	-0.111*** (0.024)	-0.007 (0.023)	-0.155*** (0.033)	-0.125*** (0.029)	-0.055 (0.048)
Remittances (log)	-0.004** (0.002)	-0.002 (0.002)	-0.004* (0.003)	-0.002 (0.002)	-0.011*** (0.003)
Savings account (1/0)	-0.112*** (0.042)	0.003 (0.023)	-0.168*** (0.065)	-0.109** (0.044)	-0.114 (0.096)
Age of household head	0.002** (0.001)	0.000 (0.001)	0.003** (0.001)	0.001 (0.001)	0.008*** (0.002)
Female-headed household	-0.049* (0.026)	-0.033 (0.024)	-0.059* (0.034)		
Education level of household head (base=No education)	-	-	-	-	-
Primary or lower	-0.038 (0.029)	-0.101* (0.052)	-0.023 (0.035)	-0.028 (0.036)	-0.022 (0.051)
Lower secondary	-0.094*** (0.035)	-0.110** (0.051)	-0.097** (0.044)	-0.076* (0.041)	-0.137** (0.067)
Upper secondary and higher	-0.175*** (0.037)	-0.172*** (0.051)	-0.171*** (0.049)	-0.168*** (0.042)	-0.073 (0.114)
Dependency ratio	0.086*** (0.013)	0.062*** (0.015)	0.095*** (0.017)	0.091*** (0.016)	0.080*** (0.023)
Urban/rural (1=rural)	0.055* (0.030)			0.040 (0.030)	0.136* (0.076)
Region (base=Phnom Penh)					
Mekong Plain	0.143*** (0.037)	0.077*** (0.029)		0.164*** (0.036)	0.058 (0.102)
Tonle Sap	0.193*** (0.038)	0.089*** (0.030)	0.065* (0.034)	0.212*** (0.037)	0.125 (0.103)
Coastal	0.116** (0.048)	0.165** (0.080)	-0.049 (0.038)	0.131*** (0.044)	0.033 (0.130)
Plateau	0.100** (0.045)	0.013 (0.028)	-0.034 (0.046)	0.115*** (0.041)	0.052 (0.121)
Observations	1,511	456	1,055	1,197	314
Pseudo R2	0.185	0.316	0.142	0.197	0.207
Log likelihood	-1.678e+06	-237400	-1.375e+06	-1.307e+06	-369914

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculation.

Table A6 Results of the simultaneous quantile regression

	0.2	0.4	0.6	0.8
Access to publicly provided electricity (1/0)	0.160*** (0.044)	0.125*** (0.045)	0.134*** (0.040)	0.074 (0.059)
Cellphone (1/0)	0.176** (0.077)	0.164*** (0.046)	0.177** (0.082)	0.153* (0.081)
Bicycle (1/0)	0.050 (0.040)	0.059* (0.031)	0.037 (0.035)	0.104* (0.055)
Cows (1/0)	0.008*** (0.003)	0.005** (0.002)	0.001 (0.002)	0.001 (0.004)
Livestock	0.160*** (0.044)	0.125*** (0.045)	0.134*** (0.040)	0.074 (0.059)
0–1	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
1–2	0.012 (0.044)	0.003 (0.058)	-0.036 (0.043)	-0.066 (0.068)
2–4	-0.035 (0.057)	0.019 (0.047)	0.002 (0.060)	-0.039 (0.072)
>4	0.168*** (0.059)	0.155*** (0.052)	0.119 (0.096)	0.105 (0.091)
Head worked in agriculture (1/0)	-0.026 (0.044)	-0.038 (0.041)	-0.043 (0.061)	-0.081 (0.064)
Head worked in paid employment (1/0)	-0.020 (0.043)	-0.051 (0.040)	-0.028 (0.040)	-0.031 (0.045)
Ownership of non-agriculture business (1/0)	0.157*** (0.043)	0.175*** (0.034)	0.243*** (0.048)	0.237*** (0.053)
Remittances (log)	0.004 (0.004)	0.007*** (0.002)	0.010** (0.004)	0.008* (0.004)
Savings account (1/0)	0.269*** (0.040)	0.213*** (0.054)	0.162*** (0.054)	0.186** (0.090)
Age of household head	-0.002 (0.002)	-0.003* (0.002)	-0.000 (0.002)	0.002 (0.002)
Female-headed household	0.130*** (0.048)	0.182*** (0.026)	0.114** (0.054)	0.169*** (0.061)
Household has members (aged 6–14) currently in school	-0.026 (0.044)	-0.038 (0.041)	-0.043 (0.061)	-0.081 (0.064)
No education	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
Primary and lower	0.177*** (0.045)	0.127*** (0.045)	0.033 (0.043)	0.055 (0.075)
Lower secondary	0.294*** (0.051)	0.249*** (0.063)	0.158*** (0.059)	0.228*** (0.084)
Upper secondary and higher	0.492*** (0.081)	0.499*** (0.068)	0.346*** (0.067)	0.416*** (0.096)
Dependency ratio	-0.197*** (0.033)	-0.181*** (0.024)	-0.167*** (0.029)	-0.189*** (0.039)
Urban/rural (1=rural)	-0.145*** (0.044)	-0.171*** (0.055)	-0.134*** (0.042)	-0.185** (0.085)
Phnom Penh	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
Mekong Plain	-0.403*** (0.086)	-0.374*** (0.068)	-0.488*** (0.081)	-0.467*** (0.129)
Tonle Sap	-0.471*** (0.087)	-0.535*** (0.049)	-0.587*** (0.106)	-0.618*** (0.141)
Coastal	-0.394*** (0.092)	-0.417*** (0.085)	-0.515*** (0.088)	-0.448*** (0.155)
Plateau	-0.295*** (0.076)	-0.374*** (0.081)	-0.470*** (0.105)	-0.459*** (0.147)
Constant	9.061*** (0.173)	9.455*** (0.155)	9.754*** (0.153)	9.988*** (0.114)
Observations	1511	1511	1511	1511
Pseudo R ²	0.2051	0.2011	0.2135	0.2298

Notes: Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Source: Authors' calculation

Table A7 Correlates of poverty using various definitions: marginal effects

	(1) Model 1	(2) Model 2	(3) Model 3
Access to publicly provided electricity (1/0)	-0.057** (0.027)	-0.083*** (0.024)	-0.076** (0.031)
Cellphone (1/0)	-0.075*** (0.028)	-0.076*** (0.027)	-0.115*** (0.037)
Bicycle (1/0)	-0.029 (0.021)	-0.022 (0.020)	-0.037 (0.023)
Livestock	-0.004** (0.002)	-0.004** (0.002)	-0.006** (0.002)
Area of cultivatable agricultural land (base<1 hectare)	-	-	-
1-2	0.029 (0.030)	0.008 (0.026)	0.034 (0.029)
2-4	0.032 (0.036)	0.015 (0.031)	0.041 (0.034)
>4	-0.065* (0.036)	-0.078** (0.031)	-0.070 (0.045)
Head worked in agriculture (1/0)	-0.010 (0.020)	-0.017 (0.020)	0.008 (0.024)
Head worked in paid employment (1/0)	0.005 (0.024)	-0.002 (0.023)	-0.003 (0.026)
Ownership of non-agriculture business (1/0)	-0.111*** (0.024)	-0.098*** (0.022)	-0.126*** (0.026)
Remittances (log)	-0.004** (0.002)	-0.004** (0.002)	-0.005*** (0.002)
Savings account (1/0)	-0.112*** (0.042)	-0.117*** (0.038)	-0.124*** (0.037)
Age of household head	0.002** (0.001)	0.002** (0.001)	0.002 (0.001)
Female-headed household	-0.049* (0.026)	-0.040 (0.025)	-0.071** (0.030)
Education level of household head (base = No education)	-	-	-
Primary or lower	-0.038 (0.029)	-0.047 (0.029)	-0.038 (0.033)
Lower secondary	-0.094*** (0.035)	-0.097*** (0.032)	-0.103*** (0.037)
Upper secondary and higher	-0.175*** (0.037)	-0.182*** (0.034)	-0.232*** (0.041)
Dependency ratio	0.086*** (0.013)	0.087*** (0.013)	0.113*** (0.016)
Urban/rural (1=rural)	0.055* (0.030)	0.067** (0.028)	0.068** (0.032)
Region (base = Phnom Penh)	-	-	-
Mekong Plain	0.143*** (0.037)	0.130*** (0.041)	0.191*** (0.049)
Tonle Sap	0.193*** (0.038)	0.174*** (0.041)	0.258*** (0.048)
Coastal	0.116** (0.048)	0.083* (0.050)	0.179*** (0.053)

Plateau	0.100** (0.045)	0.093** (0.045)	0.113** (0.052)
Observations	1,511	1,511	1,511
Pseudo R2	0.185	0.190	0.189
Log likelihood	-1.678e+06	-762.7	-946.8

Notes: Per capita daily consumption is welfare indicator. For Model 1, poverty is defined as all households whose per capita daily consumption is within the bottom 20% of the consumption distribution; for Model 2, maximum per capita daily consumption of all households in the bottom 20% is poverty line; for Model 3, the newly calculated national poverty line of KHR10,951 (\$2.73) per person per day. Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: Authors' calculation.