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# Panel Data Evidence on the Effects of the COVID-19 Pandemic on Livelihoods in Urban Côte d'Ivoire \*

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March 16, 2022

## Abstract

In early March 2020, a few cases of COVID-19 were diagnosed in Abidjan, the capital city of Côte d'Ivoire. To combat the spread of the disease, large restrictions to mobility and gatherings were introduced between mid-March and late May 2020. We collected panel survey data on over 2,500 individuals from the Greater Abidjan area over the period immediately before and after the start of the pandemic. We document striking drops in employment, hours worked, income, and food consumption in the first months after the onset of COVID-19, when lockdown was in place. We also find that, in response, survey respondents received more private transfers from other parts of the country, at a time when remittances from abroad fell – and that some respondents moved either temporarily or permanently. In terms of recovery, we find that subjective well-being was lower on average in December 2020 than it was at baseline. Yet, despite schools being closed between mid-March and July 2020, school enrollment suffered little: by December 2020, enrollment rates had bounced back to their baseline level. Our results finally indicate that government policies aimed at alleviating the worst effects of lockdown only reached a few people, and not necessarily those most in need.

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# 1 Introduction

As the COVID-19 pandemic surged, governments around the world rushed to make decisions on how to face the health emergency. The short- and long-run impacts of the pandemic were, to a great extent, a function of the policy response to it – response taken, more often than not, with little visibility. Approaches to a pandemic that are too permissive can lead to a worsening of the health situation. Some countries were thus keen to impose mobility restrictions, expecting this would halt the spread of the virus. The potential negative effects of such measures, however, soon flooded the policy discussion. Social distancing was predicted to shrink economic activity, with poorer populations shouldering a large share of the economic consequences (Ferreira, 2020; Loayza, 2020; Barnett-Howell, 2020; The Economist, 2020). Shutting down travel and market activity were expected to hurt people economically and socially (Egger et al., 2021; Wieser et al., 2021; Barnett-Howell et al., 2021) and to result in a deterioration of non-COVID health outcomes (Jain and Dupas, 2020; Jain et al., 2021), including an increase in domestic violence (Ravindran and Shah, 2020). Shutting down schools were anticipated to lead to school drop-outs and a serious loss of learning among schoolchildren (Ardington et al., 2021), even in well resourced environments (Engzell et al., 2021). As a result, there is an active concern over the policy responses to the pandemic and their longer-term effect, especially in low-and-middle-income countries (LMICs) where households are poorer and thus more vulnerable to large shocks. Documenting the channels through which the crisis affected health and economic conditions is thus key to identifying policies that remedy – rather than inflame – the situation for future pandemics.

In this paper, we examine the impact of COVID-19 in a large urban and peri-urban setting, in what is one of the most important urban centers in West Africa: Abidjan, the largest city in Côte d’Ivoire. By the time the COVID-19 crisis hit, we had just completed a comprehensive survey of approximately 3,000 individuals from the Greater Abidjan area, conducted between December 2019 and early March 2020. To assess the impact of the pandemic, we subsequently conducted follow-up phone surveys of the same individuals in July 2020 and again in January 2021. In these surveys we asked respondents to recall key outcomes for every month over the 6 months preceding the survey. By combining this follow-up data with information from the baseline survey, we document the month-by-month evolution of employment and income, and

the half-yearly changes in consumption, and overall well-being over the 12 months surrounding the onset of the crisis.

At the beginning of the pandemic, we find a decrease in income and the number of days worked, to which corresponds a decrease of food expenditure in the urban sample. Rural households, however, report a persistent increase in weekly food expenditure all year round. By December 2020, the affected households in our sample had, on average, recovered in terms of employment, income, and expenditures.

Our results mirror other analysis of the pandemic in LMICs, which report a large decrease in income and employment during the first semester of 2020 ([Hirvonen et al., 2021](#); [Janssens et al., 2021](#); [Meyer et al., 2021](#); [Miguel and Mobarak, 2021](#)) and a recovery in the second half of the year ([Furbush et al., 2021](#); [Hoehn-Velasco et al., 2020](#); [Khamis et al., 2021](#)). Regarding consumption similar results were found in rural settings in Kenya, Liberia, and Malawi ([Aggarwal et al., 2020](#); [Janssens et al., 2021](#)).

The literature has documented the different mechanisms households have used to cope with the negative economic impacts caused by the pandemic and the policy response to it. Individuals have resorted, for instance, to the use of savings and loans ([Mahmud and Riley, 2021](#); [Kansiime et al., 2021](#)), the reduction in consumption of durables such as clothing and appliances ([Gupta et al., 2021](#)), the reduction of gifts, remittances and money lent to others, and the postponement of loan repayments ([Janssens et al., 2021](#)). Respondents in our sample reduced transfers and loans to others – which remained low by the end of our sample period – but temporarily increased the loans and transfers received from other households in the country.

The prevalence of containment policies in LMICs has been associated with reduced mental health ([Boateng et al., 2021](#); [Bau et al., 2021](#); [Hamadani et al., 2020](#); [Jain et al., 2021](#); [Kumar and Kumar, 2020](#)) and hindered educational outcomes ([Kim et al., 2021](#); [Favara et al., 2021](#); [Makino et al., 2021](#)). In line with these findings, respondents in our sample report feeling worried and having trouble sleeping more often than before the pandemic. They also report a reduced frequency of positive feelings. Children’s schooling, on the other hand, only experienced a 1% decrease in enrollment, with no significant difference between boys and girls.

The remainder of the paper proceeds as follows. Section 2 provides background information on

the course of the pandemic in Côte d’Ivoire and the government response. Section 3 describes the data used in the analysis and section 4 describes the results. Section 5 concludes.

## 2 Context: Abidjan before and during COVID-19

Following a long period of turmoil, stability returned to Côte d’Ivoire after the crisis surrounding the 2010-11 election. The economy grew at an average growth rate of 5.5% per year after 2011.<sup>1</sup> This steady growth was accompanied by rapid urbanization but little reduction in the poverty rate. The largest city, Abidjan, now accounts for one fifth of the country’s population. 84.4% of its residents are employed primarily in the informal sector. This is one of the highest rates in the world, according to the UN Human Development report of 2019. As a result, the tax-to-GDP ratio, at 13% in 2018, is below the African continental average.

### 2.1 Health impact of COVID-19

Like much of the African continent, Côte d’Ivoire mostly eschewed the 2020 pandemic: as of early May 2021, the total number of COVID-19 deaths officially recorded in the country stood at 291.<sup>2</sup> Figure 1 shows the weekly average number of deaths recorded over that period for Côte d’Ivoire, compared to the United States and France, two major trade partners of Côte d’Ivoire, as well as the rest of Africa. South Africa is shown separately, given that it was much more affected than the rest of the continent. Even if deaths due to COVID-19 were somewhat underestimated, 2020 COVID-19 mortality in Côte d’Ivoire was clearly several orders of magnitude lower than what was experienced in the United States and Europe.

### 2.2 Governmental response to COVID-19

#### 2.2.1 Restrictions

On March 16<sup>th</sup> 2020, when 3 people in the country tested positive for COVID-19, President Ouattara announced restrictions including school closures, the suspension of religious services,

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<sup>1</sup>Source: World Development Indicators, World Bank (2021). Available at: <https://databank.worldbank.org/reports.aspx?source=2&series=NY.GDP.PCAP.KD.ZG>

<sup>2</sup>The Delta Variant surge in the summer of 2021, combined with low vaccination rates, means that the country was relatively more affected in 2021 than in 2020, with the total deaths toll increasing by over 50% between May and September 2021. The total death toll as of September 4, 2021, was 455.

and a ban on gatherings of more than 50 people. A week later, after another 22 people tested positive, the Ivorian government declared a state of health emergency in the capital city Abidjan. The new policy included a curfew between 9pm and 5am, a travel ban around Abidjan to prevent the spread of the virus to the rest of the country, the reduction of public transport within the city, and the closure of non-essential shops. Additional government measures included financial support for hospitals.

The restrictions had an immediate impact on mobility, as can be seen in Figure 2, though the drop in mobility was muted compared to what was observed on the rest of the African continent on average. This suggests that the large effects we estimate for individuals in Abidjan may be, if anything, *underestimate* of impacts in urban areas across Africa. By the end of May 2020, most of the restrictions had been lifted, except for school closures, which remained in place until the summer vacation of 2020. As seen on Figure 2, by June 2020, mobility had resumed, but not fully, and it remained about 5% below its pre-COVID level up to at least mid-2021.

### 2.2.2 Social programs

In April 2020, the government announced a stimulus package that included the suspension of tax payment for formal businesses, and cash transfers to the agricultural sector. To support households, the government promised to pay the electricity bills of April and May for those who were eligible for the prepaid “tarif social”.<sup>3</sup> To the best of our knowledge, no other policy (such as cash transfers or unemployment insurance) was put in place to help households cope with the economic consequences of the restrictions.

## 3 Data and sample characteristics

As part of a long-term panel data collection initiative, we implemented an LSMS-style survey with around 3,000 individuals between December 2019 and March 2020. This baseline survey, conducted in Abidjan and surrounding areas, is part of a Stanford-funded longitudinal study involving three survey waves over six years. It is intended to provide important insights on key economic outcomes and their evolution over time in a period characterized by rapid population

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<sup>3</sup>Eligible households are those with a 5 Amp service, a load barely sufficient to power a regular-size fridge.

and economic growth. The survey was completed just before the onset of the COVID-19 crisis in Africa.

### 3.1 Sampling

The sampling frame is based on a listing we did in August 2019 in 634 enumeration areas (EAs) randomly selected in and around Abidjan (see Appendix B1 and Dupas et al. (2021a) for details). It is representative of the poorer segments of the urban and peri-urban population, with slum areas over-sampled. In each of the 634 EAs, a random list of 13.5 households on average were identified through a listing exercise performed in August 2019 and described in Appendix B1. The survey sample was constructed by first randomly selecting 70% of these listed households in each EA, and then randomly selecting one adult per selected household.<sup>4</sup>

The pre-Covid baseline survey was a 4-hour, face-to-face interview. The questionnaire includes a wide range of topics about the individual’s labor activities, commuting pattern, health condition, and public service access. Data collection took place between early December 2019 and early March 2020, and a total of 2,939 individuals were successfully interviewed in this baseline which, for this paper, we refer to as ‘wave 0’.

During the month of July 2020, we conducted our first phone follow-up survey among the 2,691 respondents from wave 0 (91.5%) who provided at least one phone number in wave 0. Of these 2,691 individuals, we successfully reached 2,343 individuals (87%) in wave 1.<sup>5</sup> The wave 1 questionnaire includes retrospective questions about employment and income over the period from March to June 2020. It also includes short modules on consumption, prices, child schooling, and health.

A second follow-up phone survey was conducted in January 2021. In this survey, 2,406 of the 2,691 wave 0 respondents could be reached. This includes 212 individuals who were not reached in wave 1. Conversely, 150 individuals surveyed in wave 1 could not be surveyed again—leaving 85% of overlap between the two phone surveys. Overall, of the 2,691 individuals who provided

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<sup>4</sup>To avoid oversampling individuals from singleton households, we pooled all singleton households (N=11) together and sampled 70% of them.

<sup>5</sup>34% of the respondents interviewed in wave 0 listed one phone number, 46% listed two, and 16% listed 3 or more phone numbers. 53% of those who could not be reached for the wave 1 phone survey are individuals who listed only 1 phone number in wave 0.



a phone number in wave 0, we have *two* follow-up surveys for 2,194 individuals and at least *one* follow-up survey for 2,555 individuals (75% and 87% of the baseline sample, respectively).

The wave 2 questionnaire includes a module on employment and income similar to that used during wave 1, except that the employment module spans a longer recall period with 11 specific months between August 2019 and December 2020. The 11 months are: August 2019 when the listing exercise was undertaken; December 2019 when wave 0 began; and March, April, May, June, August, September, October, November and December 2020. We also added questions on transfers that match the wording and recall periods of the questions asked in the baseline (wave 0) survey.

### 3.2 Characteristics of the study sample

Table 1 provides summary baseline statistics on the final sample of 2555 participants who responded to at least one follow-up survey.<sup>6</sup> 48% are female. The average age is 37. Around 23% have never moved from their birth location and about 14% are from villages ruled by a traditional chief but located in the vicinity of Abidjan. Over a third of the respondents were self-employed at baseline, 22% were either salaried or doing an apprenticeship, and 13% were casual workers.<sup>7</sup> The remainder (over 36%) were not collecting any income from wages or self-employment at the time of the survey.

Across all the the 2,555 respondents interviewed, the average monthly income was around 59,000 FCFA (around \$100) in wave 0 – roughly equal to the legal minimum wage in Côte d’Ivoire. Average monthly income among those with non-zero income was 76,000 FCFA (around 130\$). Home ownership was limited to a minority: 60% of respondents were renters who on average paid 28,000 FCFA (around \$48) per month in rent.<sup>8</sup> Financial access was limited: only 19.5% of respondents had a bank account. Mobile money usage was widespread (78%), however. At baseline, individuals were spending 3560 and 695 FCFA (\$0.95 and \$1.20) for transportation

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<sup>6</sup>In Table A1 we compare the characteristics of the full baseline sample of 2,969 respondents to the sub-sample of 2,555 who responded to at least one phone survey. We see that phone survey respondents tend to be, on average, slightly richer and younger. This was to be expected given that we could only interview respondents with a phone, and phone ownership is somewhat correlated with income and age.

<sup>7</sup>Traditional apprenticeship in Côte d’Ivoire can last for more than 5 years and people tend to continue to call themselves *apprentice* even after working for many years and taking on new responsibilities in the firm.

<sup>8</sup>Income is computed at the personal level while rent is usually shared among members of the same household.

on Mondays and Wednesday, respectively.

To gauge the representativeness of the sub-samples that could be successfully surveyed in the phone follow-up surveys, columns 2-4 of Table 1 show key baseline characteristics for the sample that completed the COVID survey wave 1, the sample that completed the COVID survey wave 2, and the sample that completed both. We see only very minimal differences, suggesting that variation in response rates across waves is uncorrelated with baseline characteristics.

## 4 Empirical findings

We now use the information collected across the three survey waves to present an evolution of employment, income, and consumption over the period most affected by the restrictions introduced in March 2020. We also present information on transfers and child schooling.

### 4.1 Employment and income sources

We start by documenting the employment *trajectories* of surveyed respondents during the pandemic. This information comes from answers to questions about the main source of income for the individual respondent, not the whole household they live in. This means that the trajectories we report here concern individuals, not households. For the purpose of analysis, we categorize respondents into four mutually exclusive employment types:

- Salaried worker: an individual working regularly with the same employer at the same position and earning a regular salary paid at regular intervals. This includes workers who have a written employment contract and some who do not.
- Casual worker: an individual working episodically for different employers and either paid by day or by completed task.
- Self-employed worker: someone who derives their main income from a small business, either as a single entrepreneur or as an employer of other workers. This category includes very small businesses like selling food or water on the street, as well as a few owners of large businesses (<3% of the sample).
- Not employed: anyone not in the three previous categories. This includes individuals who

report a non-labor income (individual transfers, remittances, scholarships and pensions) as their main individual income, and respondents who do not report any individual income (16%).

In Figure 3, we report the employment trajectory of respondents, broken down by gender and by their employment category reported for December 2019. For each gender and baseline employment category, we plot the share of people in each of the four employment categories in the months following the beginning of the pandemic. We also show where they were in August 2019, so as to benchmark what the regular turnover rate is.

While the pandemic may not have created a health crisis in Abidjan in 2020, the lockdown introduced in mid-March 2020 greatly increased the share of people who report not being employed (see Figure 3). During the full month of lockdown (April 2020), about 40% of female respondents report not being employed, compared to 28% at baseline; close to a quarter of men do the same, compared to 15% at baseline. The non-employment rate for men remained higher than pre-COVID throughout 2020, only reverting to its pre-level by December 2020. For women, non-employment remained 5 percentage points higher than pre-COVID by the end of 2020.

The top panel of Figure 3 shows that approximately 20% of men employed as salaried worker at baseline lost their salaried employment and became non-employed. This is true for both men and women. The same happened for men in casual work, and for men and women in self-employment. Women in casual work suffered a much larger drop in employment: about half of them did not continue as casual workers. Most of these women became non-employed, and 15% turned to self-employment as an alternative source of income.

These changes in employment status proved remarkably persistent: over the 12 months interval covered by our wave 1 and 2 surveys, we only see a very gradual recovery for those who lost their pre-COVID employment situation. Also, during and after lockdown, we only see limited turnover between employment categories, except for exit from non-employment. By the end of our panel survey in December 2020, 25% of women and 20% of men who were not employed at baseline had found a source of labor income, mainly in casual work for women and self-employment for men.

Figure 4 depicts the number of days worked by individuals per month, broken down by income source at Baseline. Mirroring the employment trajectories mentioned above, there is a large drop in the number of days worked per month during the first semester of 2020 for those individuals who were salaried workers, casual workers, and self-employed in December 2019.

Geographically, the maps in Figure A1 show that all sampled areas were affected. The proportion of individuals reporting labor income dropped everywhere up until July 2020. Recovery seems uneven, however: by December 2020, some areas (e.g., Yopougon, Bingerville) had recovered their pre-covid levels of employment, but this is not the case in others (e.g., the south of Abobo).

## 4.2 Income

Figure 5 shows the evolution of income in the first year of the pandemic. Here again, we group individuals based on their baseline employment situation. In line with the employment trajectories described above, we observe large drops in earned income for the four months of March, April, May and June 2020, followed by a recovery in August 2020.<sup>9</sup> Although income levels at the end of 2020 are similar to pre-COVID figures, at the exception of respondents who reported no income at baseline. But the recovery was slow, especially for males who were initially employed as casual workers. Figure 6 decomposes the income trajectory during the pandemic by education level. All groups, irrespective of education, were severely impacted. Even for respondents who completed tertiary education, we observe during the March-June period a 40% and 50% decline in income for men and women, respectively. This drop is similar in magnitude to that incurred by respondents with secondary and lower level of education (44% and 50% for men and women, respectively). High education therefore does not seem to have protected workers against the income shortfall – a finding that is especially true for women. Even though we observe that highly educated men recovered somewhat faster, highly educated women only recovered around 70% of their pre-COVID average income by the end of 2020.

The second dimension of heterogeneity we examine is baseline commute time. This serves to test

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<sup>9</sup>Note that for men, we observe a kink in October 2020, which correspond to the Presidential election, a period full of uncertainty during which many shops closed.

the hypothesis that respondents who had a longer commute at baseline were more affected by travel restrictions. Figure 7 divide the sample between respondents who have a commute time above the median (20 minutes); respondents with a below-the-median but non-zero commute time; and respondents with no commute at all. Results show that all groups experienced a large drop in income between March 2020 and June 2020. The lack of difference may be driven by the fact that commute time is also highly correlated with having a salaried job located in a central part of the city, away from the low socioeconomic-status neighborhoods of our sample, and that salaried workers suffered a large income drop during the early stages of the pandemic.

### 4.3 Consumption expenditures

Since it was not possible to administer a detailed consumption module over the phone, we rely on expenditures as a proxy for consumption.

We asked respondents, regardless of their relationship with the head of household, how much money the household spent on food in the seven days preceding the survey. Figure 8 shows the implied average consumption expenditure per capita in each survey round (baseline, COVID wave 1 and wave 2).<sup>10</sup> We see a clear drop in consumption in July 2020. By December 2020, however, expenditure levels had returned to their pre-COVID level. To see whether the drop in expenditure is larger for high or low expenditure households, Figure 9 plots the kernel density of expenditure per capita for each survey wave. We compute Kolmogorov-Smirnov tests of the equality of the distributions across time periods. The probability density functions for December 2019 and December 2020 are nearly identical. But for July 2020 (the dashed line), we observe a clear shift to the left – i.e., a fall in expenditures per capita – for all employment categories.

Respondents to wave 1 and 2 surveys also answered qualitative question about food consumption. In the wave 1 survey a non-negligible proportion of respondents reported difficulties: 35.2% stated being unable to afford their habitual food consumption because of high prices; 43.3% report reducing food expenditures due to lack of cash; and 36.2% report reducing the number or size of their meals. By wave 2, these numbers had fallen significantly

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<sup>10</sup>We use the total number adults and children in the household as the denominator when calculating per capita expenditure.

to 25.2%, 33.9% and 22.2%, respectively. These responses confirm the effect that lockdown had on food consumption.

Next we look at the evolution of consumption expenditures across space – see Figures A2 and A3. We find that urban dwellers residing outside of slums manage to smooth the negative consumption shock better than those residing in slum areas: on average, they spent as much as they were spending pre-COVID. In contrast, rural households, who started with a lower consumption level than urban households, were able to weather the COVID crisis better. This is perhaps not surprising since rural areas were not directly affected by travel restrictions.

The increase in expenditure in peri-urban rural areas could potentially be due to an increase in prices. To investigate this, we report in Figure A4 information about changes in prices as reported by respondents, broken down between the urban and (peri-urban) rural areas.<sup>11</sup> The Figure indicates that the first year of the pandemic was associated with only a limited increase in prices, and that reported price changes were virtually identical in our urban and rural study areas. Across the entire sample, the average reported price increase between December 2019 and December 2020 is 1.8%, a figure comparable to the 2.4% national inflation rate estimate reported by the World Bank for 2020.<sup>12</sup>

We also examined whether the change in expenditures in peri-urban villages could be driven by changes in household composition, e.g., if these households accommodated additional residents during the pandemic. We find no evidence of this: some households gained a member but a similar proportion lost one. We do, however, find some evidence suggesting a selection effect: some rural households moved during the pandemic, and relocating households have lower consumption on average, a issue we examine in detail in the next Section.

## 4.4 Mobility and relocation

In wave 1, we asked respondents whether they increased or reduced their movements during lockdown. Only 1.2% report increasing their movements; 22.4% report no changes and 76.4% reduced their movements. 41.5% of wave 1 respondents also report an increase in the cost of

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<sup>11</sup> Respondents were asked to report the price of five commonly purchased items in December 2019, July 2020, and December 2020. The five items are: 1Kg of rice, 1Kg of sugar, 1Kg of beef meat, 1Liter of oil; and 100g of soap.

<sup>12</sup> See here: <https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=CI>

transport during lockdown. These answers demonstrate the effect that the pandemic had on the mobility of the study population. Of those who reported reduced mobility, 90.8% list fear of the virus as a reason while 38.1% mention lack of work and 3.3% the cost of transport.

We asked all wave 1 and 2 respondents whether they moved since the previous survey. By July 2020, a sizeable proportion of respondents (8.3%) report having relocated from their baseline location. Of those, 2% reported the move as permanent; the rest (6.3%) reported it as temporarily. We also find that 6.9% of respondents listed moving between COVID survey waves 1 and 2 – 5.1% report the move as permanent and 1.8% as temporary. In total across the two COVID waves, 10.6% of respondents report relocating once – temporarily or otherwise – and 2.0% relocated twice. Across the two waves 5.7% of respondents report moving permanently once and 0.6% twice. While we do not have strictly comparable information on short-term movements before the pandemic, these numbers look high relative to relocation frequency before COVID ([Dupas et al., 2021a](#)).

We also collected information on the reason for the move. Most wave 1 and 2 respondents give answers similar to those given for moving across locations before COVID, namely following one’s family (28% compared to 48% at baseline), starting a new occupation (25% compared to 13% at baseline), or looking for work (8.6% compared to 10.2% at baseline). Some answers do stand out, however. Fewer respondents to the two COVID surveys report moving in order to study or get married (2.5% each compared to 10.8% and 9.1% at baseline, respectively). But more COVID respondents (9.2% compared to 1.0% at baseline) report moving to provide family help (14.1% in wave 1), suggesting they are assisting another household during the crisis; and 4.1% moved because they could not pay rent. Some responses are specific to the wave 1 survey: 5.9% say they moved to flee the coronavirus and 7.7% because they cannot reenter Abidjan.

Taken together, these findings suggest that the restrictions imposed in the early months of the pandemic caused significant disruptions to respondents’ choice of residence. We also note that respondents who relocate temporarily report 25% lower consumption than non-movers, while those moving permanently report 12.5% lower consumption than non-movers on average. While these correlations are not causal, they nonetheless indicate that temporary relocation in the wake of the pandemic is associated with facing hard times.

## 4.5 Monetary transfers and government support

Next we examine how respondents coped with the changes in employment and income that occurred during the first year of the pandemic. We provide evidence on two of the most relevant coping mechanisms: private transfers and government transfers.

Regarding private transfers, we find in Figure 10 that the proportion of respondents who report receiving a transfer in the last 12 months is higher in December 2020 than December 2019). This increase occurred in spite of the fact that the likelihood of transfers from *abroad* (i.e., remittances) dropped in 2020, as shown in Figure A5. Given that most transfers recorded at baseline take place between respondents and other individuals in the country, it is possible that Abidjan residents relied on assistance from friends and family outside of the metropolis.<sup>13</sup> We also note that non-employed and casual workers are those most likely to report receiving private transfers, suggesting that these transfers were, on average, reaching those most in need. In parallel, Figure 11 indicates that the proportion of respondents who report sending or lending money to others dropped during 2020 and had not fully recovered by December 2020.

Turning to government transfers, we start by noting that they were virtually non-existent at baseline: less than 1% of baseline respondents declare receiving a transfer from the government. In the first COVID survey, we asked respondents about specific in-kind government transfers that were advertised in the media, such as face masks, antiseptic gel, money, and food. Survey responses indicate that only 5% of respondents recall receiving such goods. Table 2 breaks this down by income quartiles – keeping in mind that, by design, our sampling frame does not include the richer segments of the population. We see that 8% of respondents in Q4, the highest income quartile in our sample, report receiving face masks and antiseptic gel, compared to 2.5% of the lower quartiles Q1. Salaried and self-employed respondents – who tend to have a higher income on average – similarly report having received these products more often than others.

Regarding government transfers of cash or food, respondents in the third quartile are more likely to report receiving government transfers (7%), compared to 5% and 3% of those in quartiles 1 and 2, respectively. Casual workers and not-employed benefited the most from this type of

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<sup>13</sup>Unfortunately we do not have information on the origin of the domestic transfers received by our respondents.



aid, but the proportion of respondents who received transfers remains low across all categories. From this we conclude that government transfers only benefited a small fraction of our relatively poor sample population, and that these transfers were not particularly targeted towards either the most vulnerable households or those most negatively affected by lockdown.

Other COVID policies were introduced by the authorities. In particular, the government announced that it would subsidize electricity, a measure similar to that taken in Ghana ([Berkouwer et al., 2021](#)). The subsidy was targeted towards poorer households: it was limited to those with an electricity supply limited to 5 Amp (e.g., insufficient to power a large fridge) and with a prepaid plan from the electricity supplier, since these consumers are typically poorer than those with a post-paid plan. Based on these criteria, 23.3% of the households in our study sample can be considered as eligible. Survey responses, however, indicate that only a third of these eligible respondents received a reduction in their electricity bill from the government. Respondents in the upper echelons of income in our sample seem to have benefited as much than poorer respondents – if not more. The incidence of the policy also correlates with employment categories: 13% of salaried workers and 11% of the self-employed report a cost reduction compared to only 4% of the not-employed. Why this is the case is unclear, but a large fraction of households in our sample do not have a supply contract directly with the electricity provider – they receive their power either through a sub-meter (e.g., in rented accommodation) or by connecting to a neighbor or third-party. It is possible that the subsidies were not passed on to them. Whatever the reason, what our results show is that, in spite of being designed to favor the poor, this intervention often failed to reach its intended target.

## 4.6 Child schooling

Schools in Côte d’Ivoire were closed from April to August 2020, but they reopened in September 2020. One of the preoccupations of policy makers regarding the potential long-term impact of the pandemic is the risk that prolonged school closure would lead to school drop-out, especially among adolescent girls. To shed light on this, this Section documents schooling outcomes for the children of our respondents.

In the baseline survey, we asked questions about schooling for all children between 6 and 16

years of age. Information was collected from 1,147 households on 2,094 children with an average (and median) age of 10. Table 3 shows the net enrollment rate for these children just before the pandemic (start of academic year 2019-2020). It is very high (93%), a figure consistent with the World Bank estimate of around 90% at the national level in Côte d'Ivoire.<sup>14</sup>

In wave 2, we collected information on the enrollment rate of these same children in the 2020-21 academic year. In spite of the temporary school closure, enrollment rates upon reopening were very high (92%), with no differential dropout among girls. It is only for the oldest cohort, aged from 14 to 16 years, that enrollment rates seem to have suffered somewhat from the school closure, with a 5 percentage point drop from 91% pre-pandemic to 86% in January 2021. This decrease is mainly driven by children aged 16, old enough to be stopping school. For the few children out of school, we asked parents the reason why the child was no longer attending school. The main reasons given are either that the child no longer wants to go school or that the child needs to help or work at home.

Given the small decrease in enrolment rate and the fact that the lack of money to pay for school fees is only mentioned for 1% of the children, it appears that the loss of employment and fall in income have not negatively impacted the schooling enrollment of children in our sampled households. On the whole, these results suggests that enrollment did not suffer too much from the crisis, which is reassuring. But, given the lack of access to remote learning opportunities, it likely that children's learning suffered substantially from the extended closure of schools, something we cannot document with the data at hand.

## 4.7 Health and well-being

In wave 1, we investigated the direct effect of COVID on the health of the respondents and their family. 28.6% of respondents report being ill in the three months preceding the survey and another 14.4% report a household member falling ill. These proportions are broadly comparable to those reported at baseline, when 72.3% of respondent reported at least one bout of illness over the preceding 12 months. Of those who were ill in the preceding three months, 12.8% respondents (86 individuals) and 10.2% household members (49 individuals) took a COVID test. Among those, only 3 individuals (2.2%) tested positive – confirming that COVID-19 was

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<sup>14</sup>See here: <https://data.worldbank.org/indicator/SE.PRM.NENR?locations=CI>

probably not highly prevalent in Abidjan at the time.

The impact of COVID-19 and the government response to it could nonetheless have affected the psychological well-being of the population. The fear of infection, the large negative income shocks incurred by many, or social distancing measures could all lead to an increase in stress, anxiety, and loneliness. To investigate this possibility, we collected information on well-being during our baseline and wave 2 surveys.

Figure 12 presents the frequency of various emotions as experienced and reported by respondents. We find that respondents are more likely to report feeling sad or worried after than before the pandemic. They also report having more trouble sleeping and report positive feelings less frequently. These findings echo those of other studies in other settings that have documented the fall in mental health following population containment policies in LMICs – e.g.: [Boateng et al. \(2021\)](#), [Bau et al. \(2021\)](#), [Hamadani et al. \(2020\)](#), [Jain et al. \(2021\)](#), and [Kumar and Kumar \(2020\)](#) for adults; and [Asanov et al. \(2021\)](#) for children.

## 5 Discussion and conclusions

This paper has documented how the COVID pandemic disrupted the income earning activities of poor household’s living in the city of Abidjan and its surroundings. Our data structure provides panel information from December 2019 to December 2020, covering the immediate pre-COVID period and the first year of the pandemic. The wide range of question asked during the baseline allowed us to explore many dimensions of heterogeneity.

Given the available estimates of the number of COVID infections and COVID-related deaths in the first year of the pandemic, the pandemic appears to have had very limited impact on health in Côte d’Ivoire and other African countries other than South Africa. This did not stop many African government from introducing strict lockdown measures in the early stages of the pandemic, at a time where they number of local cases was extremely small. As a result of these temporary measures and subsequent fear of the illness, personal mobility was temporarily reduced in Côte d’Ivoire as it was in many parts of Africa – although by not as much as other parts of the world.

In spite of this, our findings document large changes in employment that are consistent with our sample population’s limited access to stable jobs. We observe a large decrease in employment among salaried, casual, and self-employed workers between March and June 2020 and we note a drastic fall in income during the same period. The reduction in income seems to affect our sampled population at large – e.g., irrespective of educational level or commuting time at baseline. By December 2020, however, much recovery had taken place, with most respondents regaining a form of employment similar to what they had at baseline. A similar picture emerges regarding the effect of lockdown and other restrictions on food consumption: we observe a commensurate fall in consumption up to July 2020 but, by December 2020, respondents had, on average, come back to their pre-COVID consumption level.

One channel through which respondents sought to weather the crisis was private transfers coming from other parts of the country, at a time when remittances from abroad also fell. Government policies aimed at alleviating the worst effects of lockdown seem to have only reached a few people, and not necessarily those most in need. Whether interventions could have been better targeted is unclear. [Dupas et al. \(2021b\)](#) indeed show that identifying the poor in Greater Abidjan is far from an easy task without undertaking an in-depth survey which, by definition, would not have been feasible given the available time frame and the travel restrictions themselves.

Child schooling seems to have suffered little from the school closures that were introduced in Côte d’Ivoire at the beginning of the pandemic: enrollment rates in December 2020 had bounced back to the high level they had at baseline, with limited evidence of drop-outs. We cannot rule out the possibility of a large learning loss, but we have no data to speak to that issue.

While we observe that respondents had, on average, recovered by December 2020 in terms of employment, income, expenditure, and school enrollment, it remains that the lockdown and other restrictions introduced at the beginning of the pandemic had a very large negative effect on several dimensions of economic welfare. It is not for us to tell whether this welfare cost was justified in terms of health policy – we cannot be sure of how the pandemic would have evolved in Côte d’Ivoire without the restrictions imposed by the government. What is clear, however, is that the cost was large and significant and that it affected a large fraction of society, including many of the poor. It also appears that, while many of our respondents received financial

assistance through private transfers from individuals in other parts of the country, the targeted policies that the government introduced to limit the economic incidence of the crisis did not have much of an impact and were, by and large, not targeted towards those most in need.

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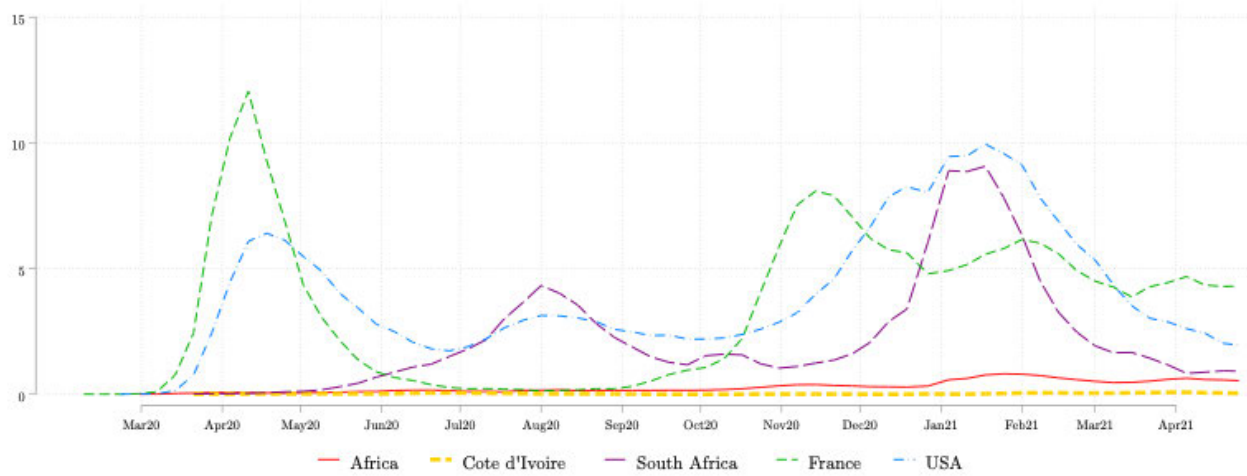
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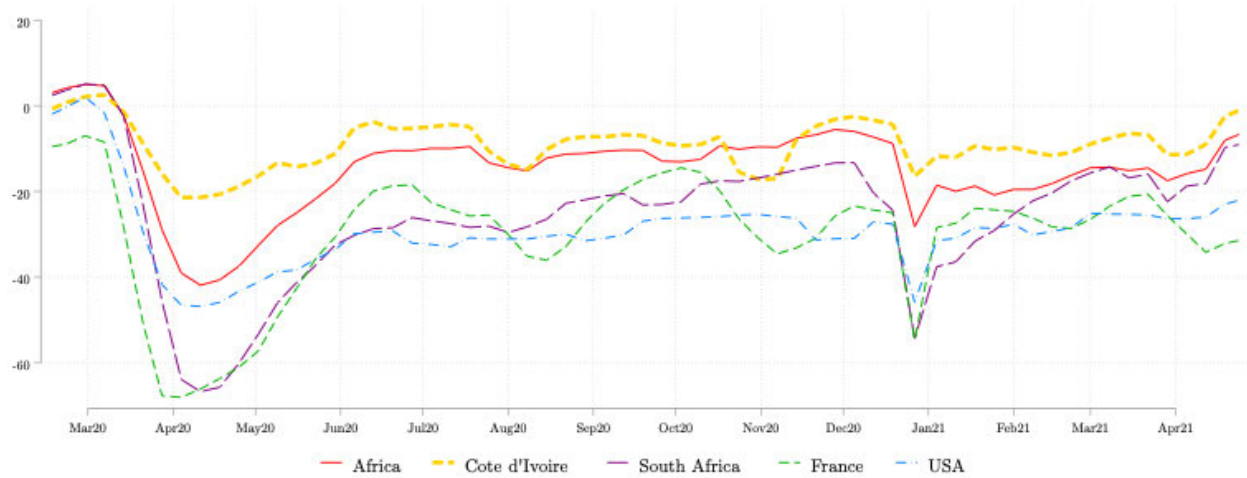
# Figures and Tables

Figure 1: Average weekly COVID-19 deaths per million people



Notes: The Africa average does not include South Africa, which is shown separately. Source: Our World in Data.

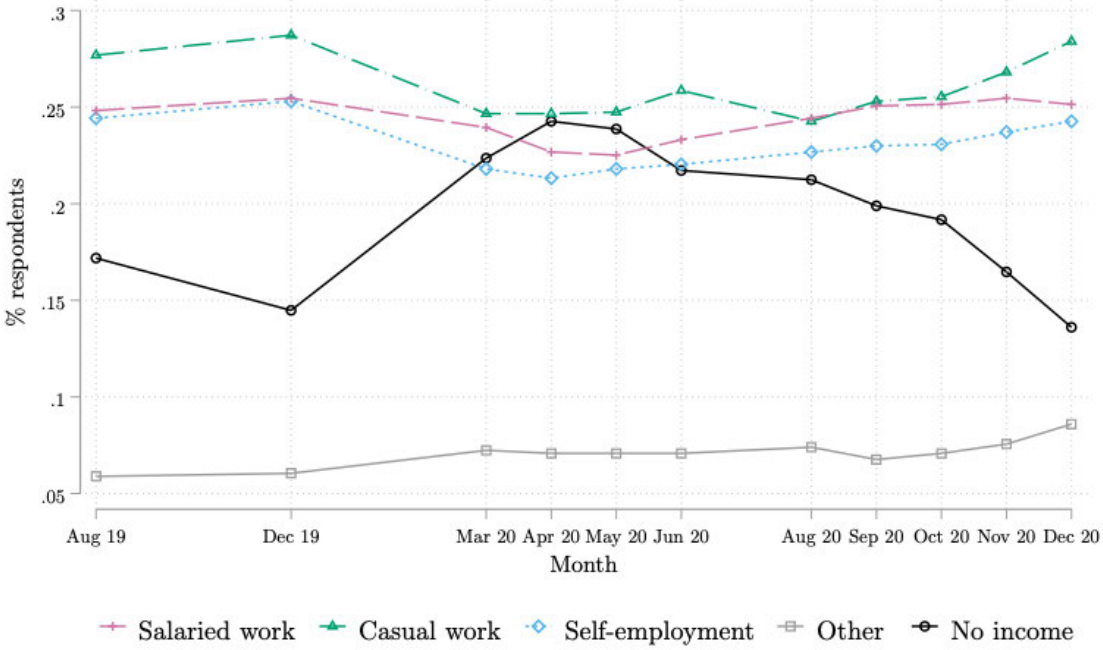
Figure 2: Average weekly mobility in workplaces



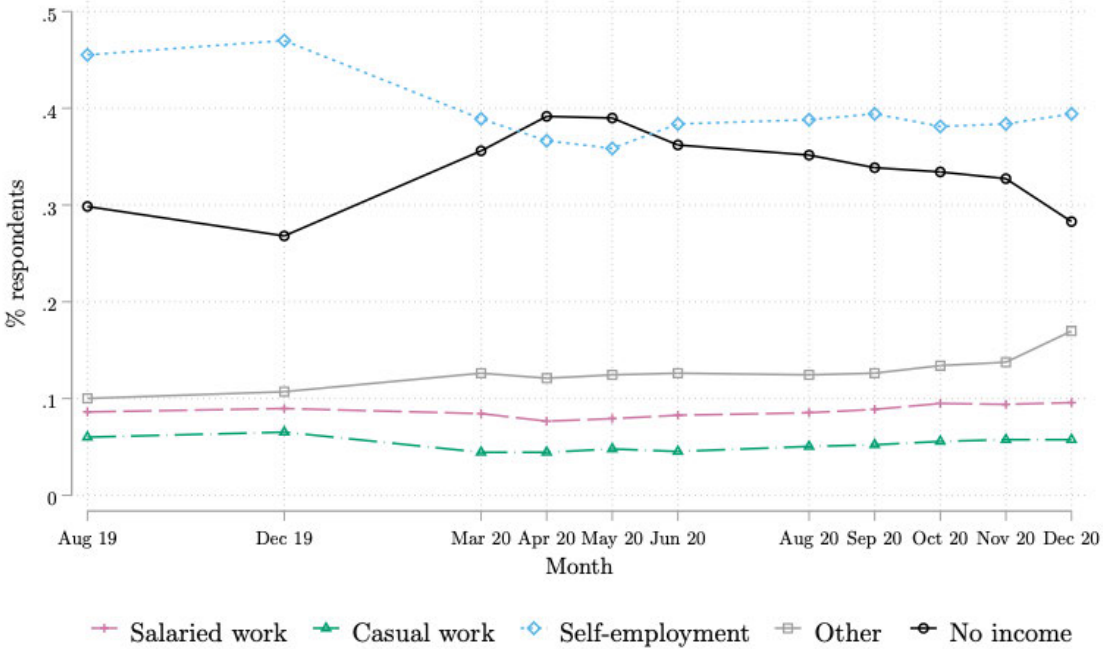
Notes: Baseline mobility is the median mobility for each day of the week between Jan 3–Feb 6, 2020. The Africa average does not include South Africa, which is shown separately. Source: Google COVID-19 Community Mobility Reports.

Figure 3: Main source of individual income, by month

(a) Male



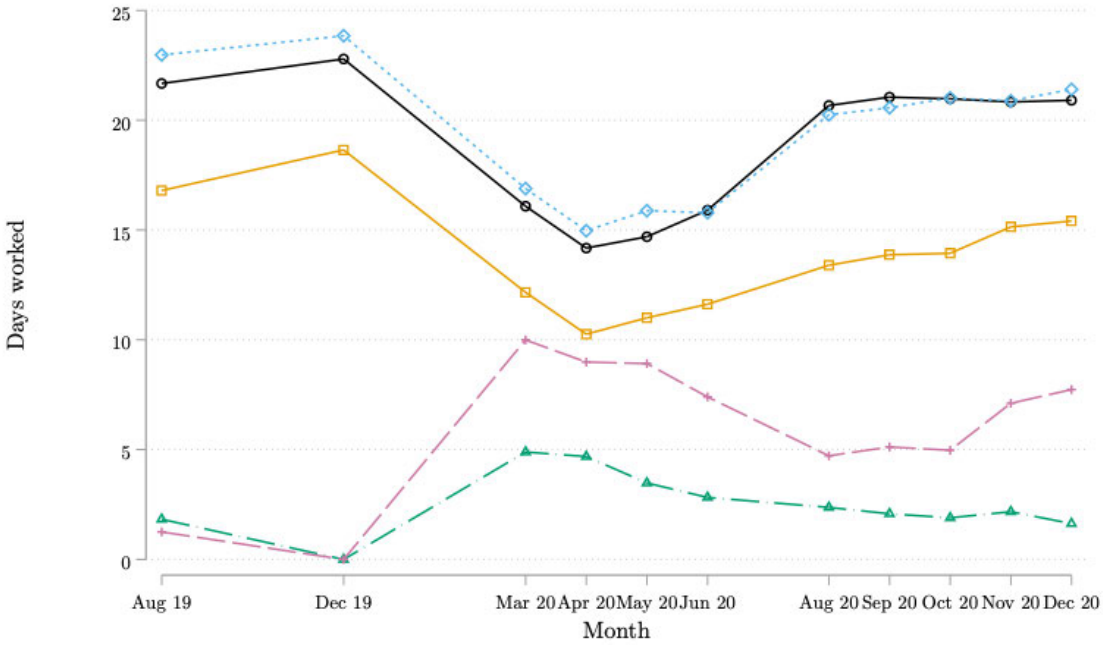
(b) Female



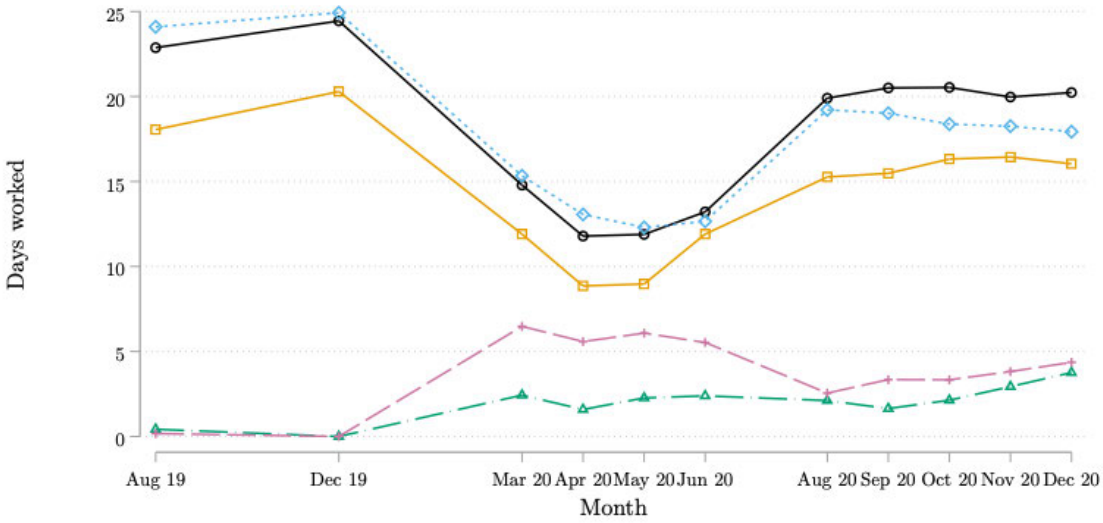
Notes: Main reported source of individual income for each reported month, broken down by the gender of the respondent. Salaried work includes a small number of apprentices; self-employment includes farming; and the 'other' category combines all unearned source incomes (e.g., transfers and income from property). The sample is limited to the respondents interviewed during the COVID survey wave 2. Source: COVID survey wave 2.

Figure 4: Days worked each month, by main income source in December 2019

(a) Male



(b) Female



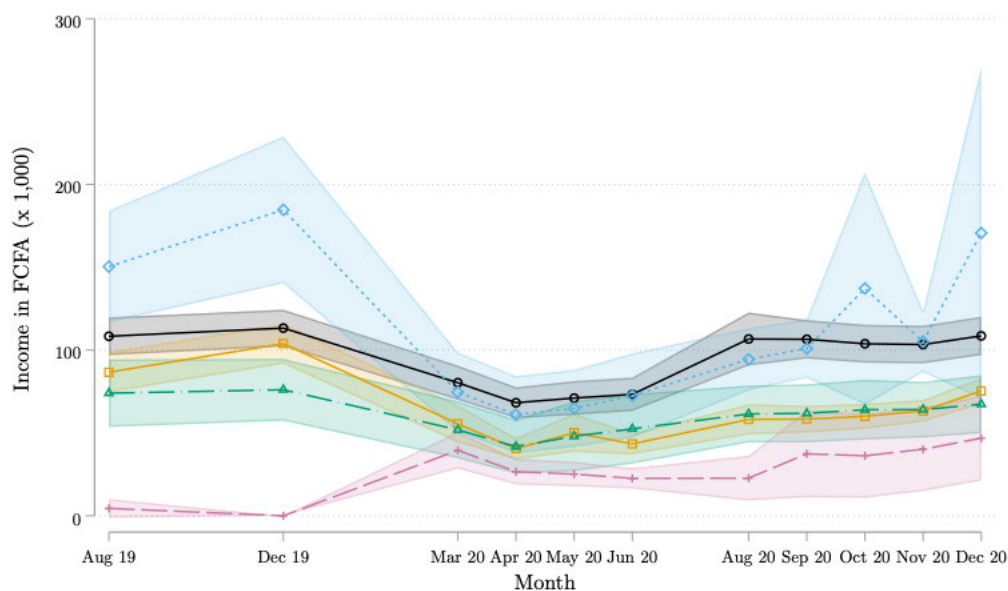
Main source of income in Dec. 2019

○ Salaried work    □ Casual work    ◇ Self-employment    ▲ Other    + No income

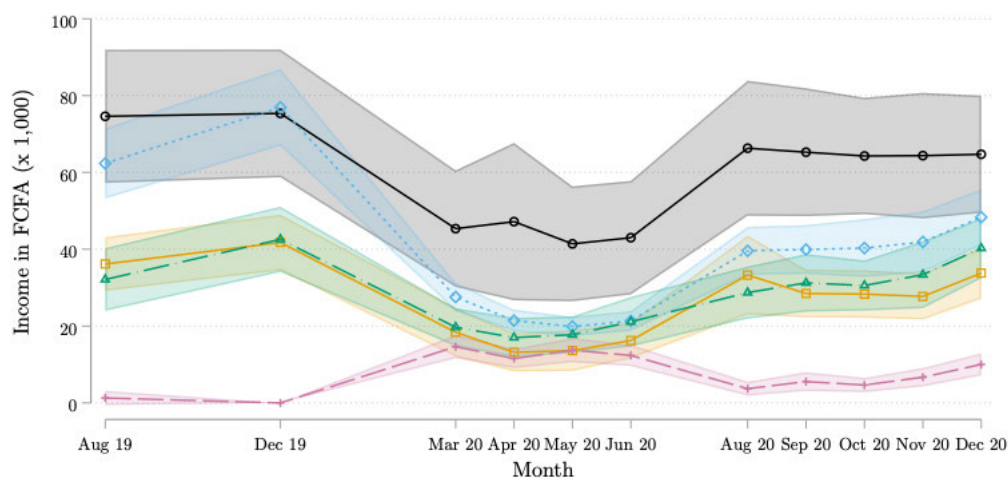
Notes: Each marker represents the average of the reported number of days worked in each reported month, broken down by the main source of individual income reported for December 2019. The top panel combines all the male respondents interviewed in either of the two COVID survey waves 1 and 2; the bottom panel does the same for female respondents. Source: COVID survey waves 1 and 2.

Figure 5: Individual income each month, by main source of income in December 2019

(a) Male



(b) Female



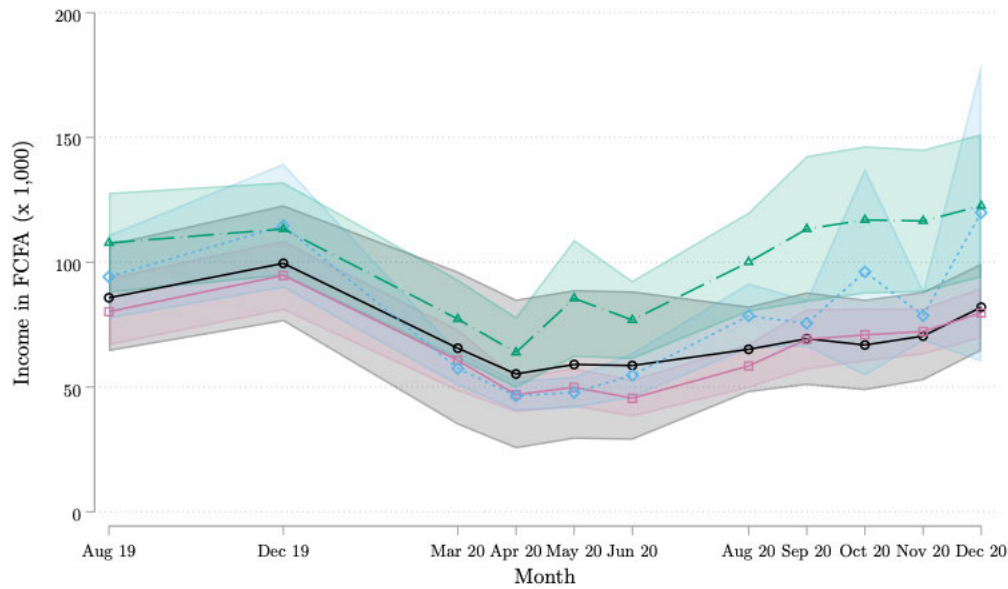
Main source of income in Dec. 2019

Salaried work
  Casual work
  Self-employment
  Other
  No income

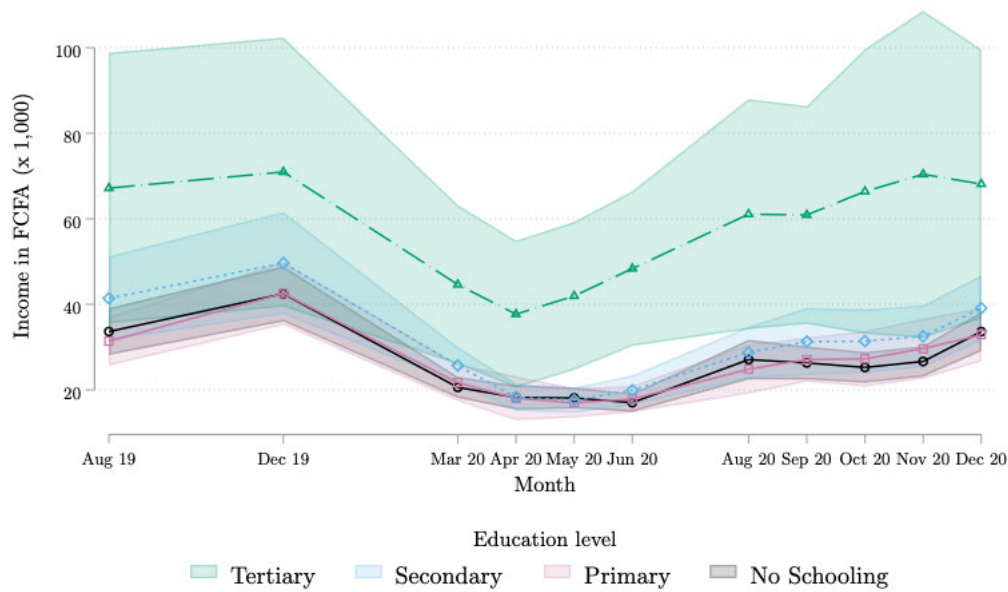
Notes: Each marker represents the average of the reported individual income in each reported month, broken down by the main source of individual income reported for December 2019. Each average is calculated by regressing the reported monthly individual income on monthly dummies. The corresponding 95% confidence intervals are shown in color. The top panel combines all the male respondents interviewed in either of the two COVID survey waves 1 and 2; the bottom panel does the same for female respondents. Source: COVID survey waves 1 and 2.

Figure 6: Individual income each month, by educational attainment at baseline

(a) Male



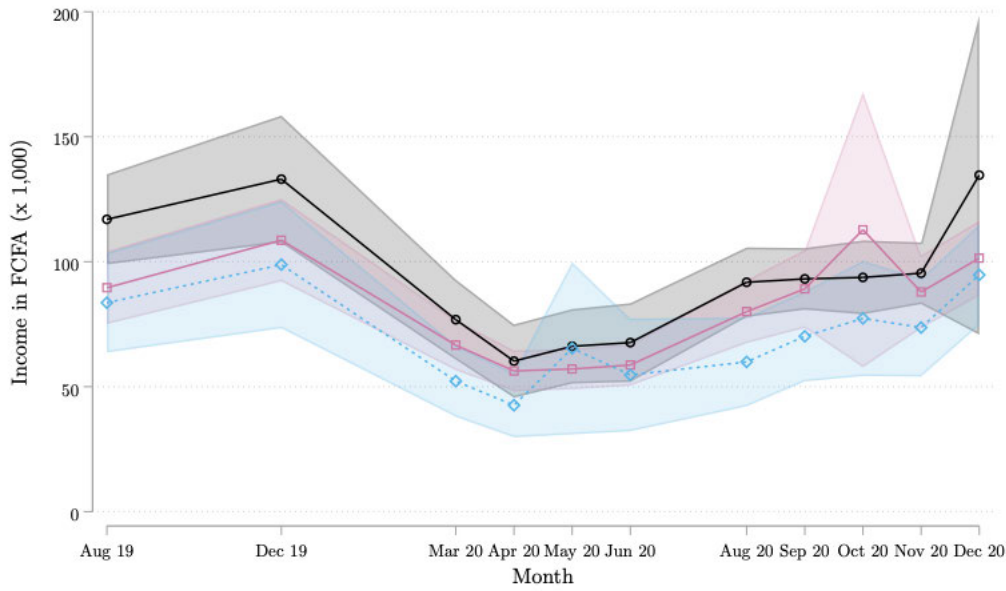
(b) Female



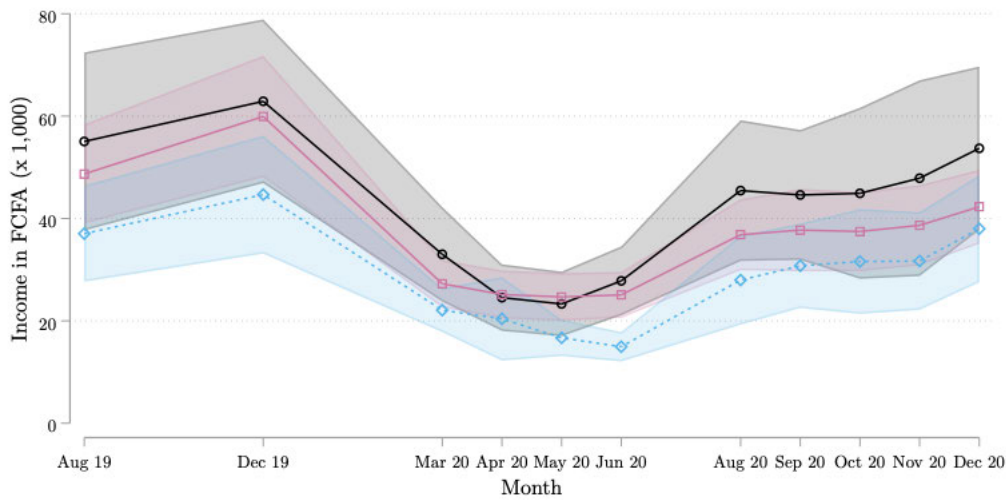
Notes: Each marker represents the average of the reported individual income in each reported month, broken down by the respondent's educational attainment at baseline. Each average is calculated by regressing the reported monthly individual income on monthly dummies. The corresponding 95% confidence intervals are shown in color. The top panel combines all the male respondents interviewed in either of the two COVID survey waves 1 and 2; the bottom panel does the same for female respondents. Source: COVID survey waves 1 and 2.

Figure 7: Individual income each month, by commute time at baseline

(a) Male



(b) Female

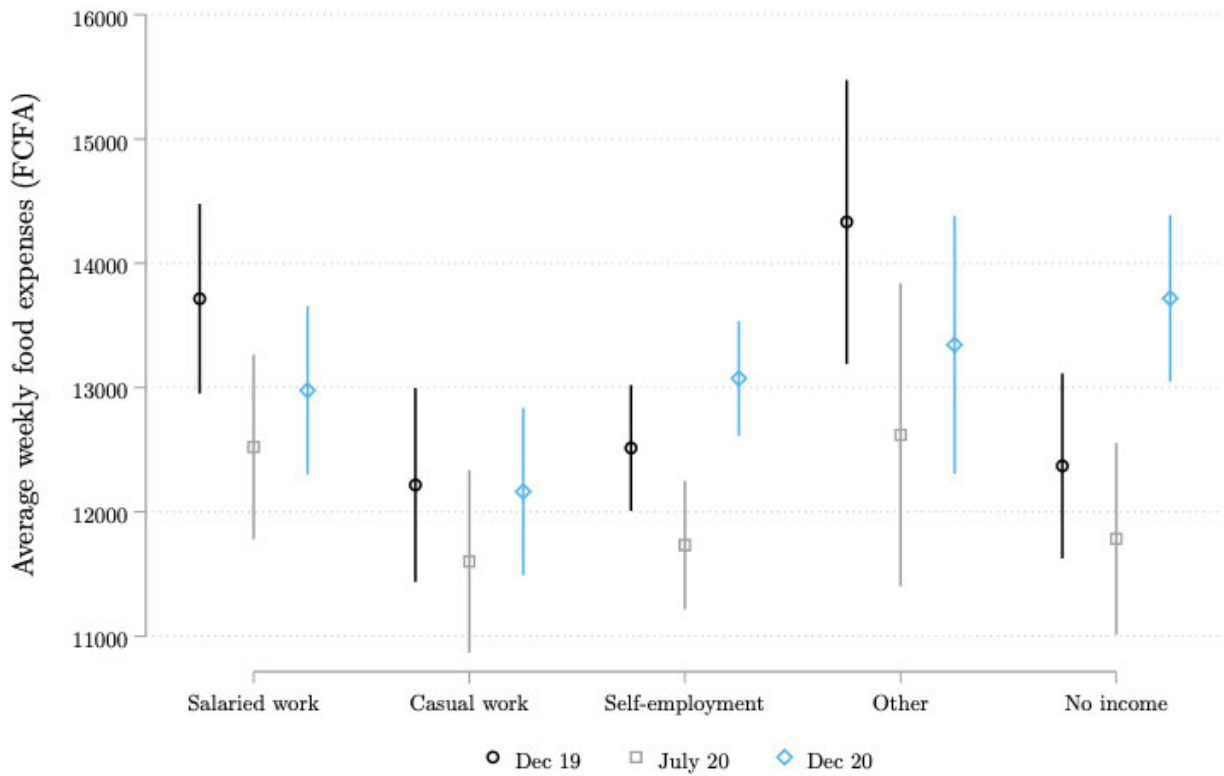


Commute time at Baseline (Dec. 2019)

■ Above median commute time ■ Below median commute time ■ No Commute time

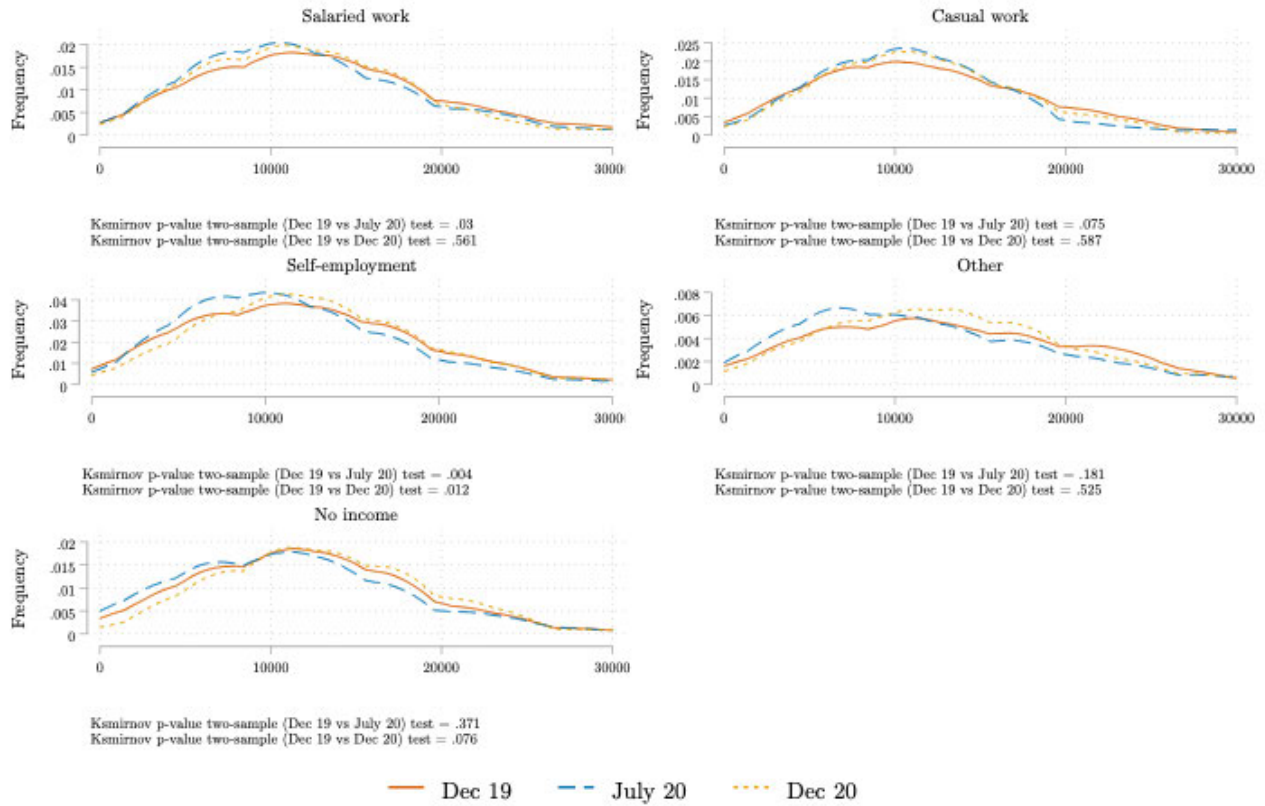
Notes: Each marker represents the average of the reported individual income in each reported month, broken down by the respondent's commute time at baseline. Commute time is divided into three categories: zero commute time (this includes non-working individuals and individuals working from home); below median non-zero commute time; and above median non-zero commute time. Each average is calculated by regressing the reported monthly individual income on monthly dummies. The corresponding 95% confidence intervals are shown in color. The top panel combines all the male respondents interviewed in either of the two COVID survey waves 1 and 2; the bottom panel does the same for female respondents. Source: COVID survey waves 1 and 2.

Figure 8: Household weekly expenditures on food, by main income source in December 2019



Notes: Each whisker plot presents the average of the household weekly expenditures reported in each of the three surveys, broken down by the respondent’s main source of individual income for December 2019. Each average is calculated by regressing the reported expenditures on survey dummies. The corresponding 95% confidence intervals are shown in color. To correct for outliers, the top 1% of the weekly expenditure was winsorized. The Figure combines all the respondents interviewed in either of the two COVID survey waves 1 and 2. Source: Baseline survey and COVID survey waves 1 and 2.

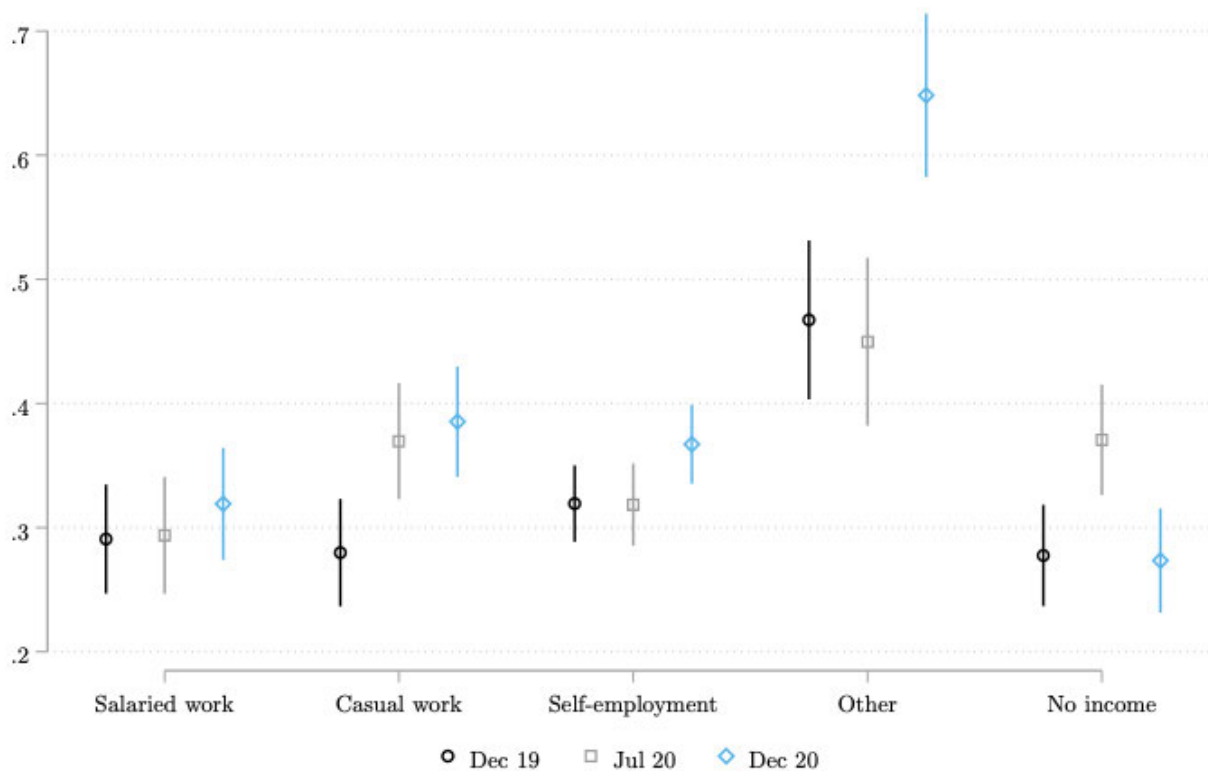
Figure 9: Kernel density of food expenditures, by main income source in December 2019



Notes: The Figure shows the estimated Kernel density of the household weekly food expenditures reported in each of the three surveys. Each panel only includes respondents reporting a particular main source of income for December 2019. To correct for outliers, the top 1% of the weekly expenditure was winsorized. The Figure combines all the respondents interviewed in either of the two COVID survey waves 1 and 2. Source: Baseline survey and COVID survey waves 1 and 2.

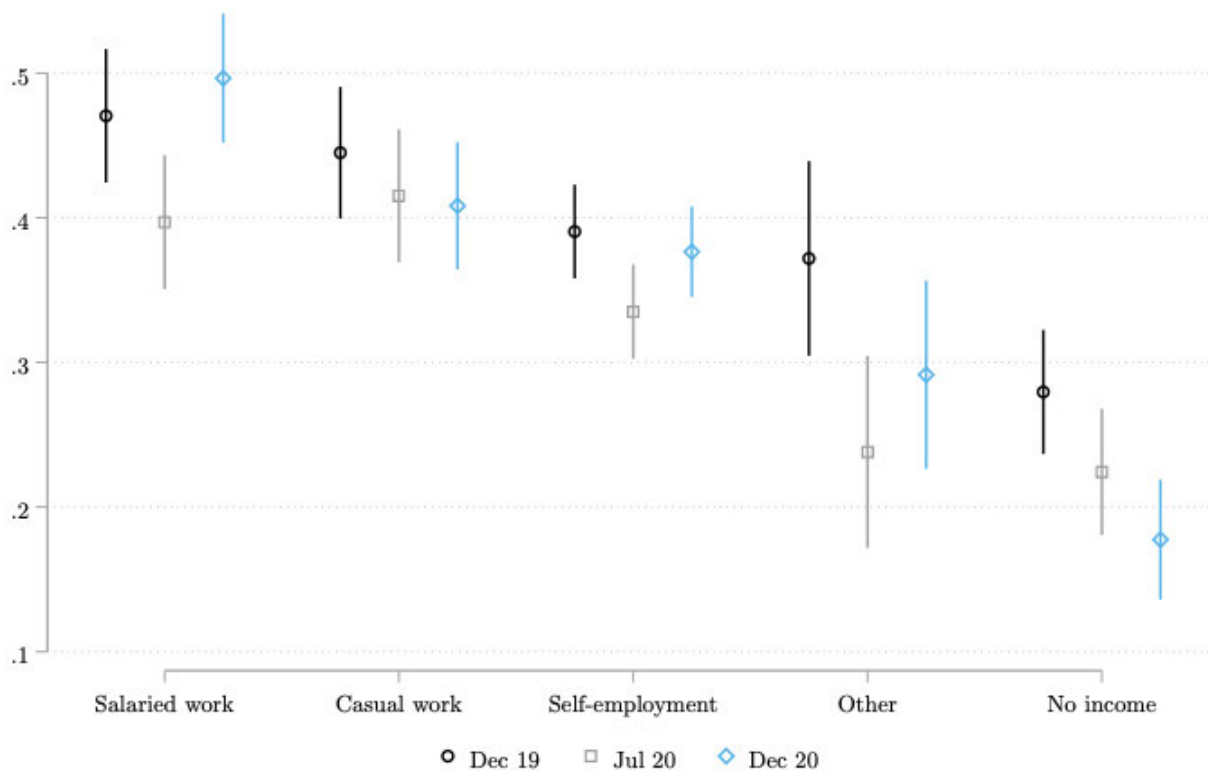


Figure 10: Recipients of private transfers, by main income source in December 2019



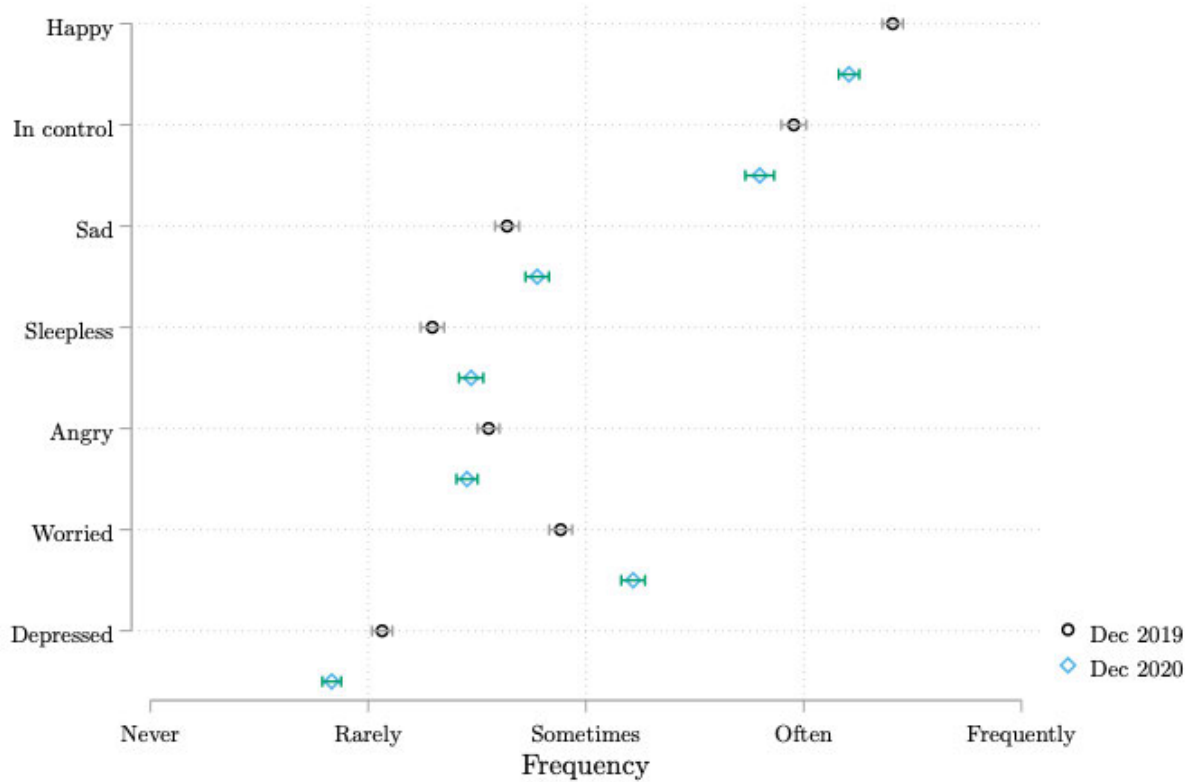
Notes: Each marker represents the proportion of respondents who report receiving at least one transfer from a private source over a specified recall period. Each proportion is calculated by regressing on survey dummies a dummy equal to one if the respondent reported receiving at least one transfer. The corresponding 95% confidence intervals are shown in color. The specified recall period for Dec 19 (the baseline survey) and Dec 20 (the second COVID survey) is the 12 months preceding the survey. For Jul 20 (the first COVID survey) the recall period is since the beginning of the pandemic in March 2020. The Figure combines all the respondents interviewed in either of the two COVID survey waves 1 and 2. Source: Baseline survey and COVID survey waves 1 and 2.

Figure 11: Respondents who sent or lent money, by main income source in December 2019



Notes: Each marker represents the proportion of respondents who report sending or lending money to other individuals over a specified recall period. Each proportion is calculated by regressing on survey dummies a dummy equal to one if the respondent reported making at least one transfer to another individual. The corresponding 95% confidence intervals are shown in color. The specified recall period for Dec 19 (the baseline survey) and Dec 20 (the second COVID survey) is the 12 months preceding the survey. For Jul 20 (the first COVID survey) the recall period is since the beginning of the pandemic in March 2020. The Figure combines all the respondents interviewed in either of the two COVID survey waves 1 and 2. Source: Baseline survey and COVID survey waves 1 and 2.

Figure 12: Subjective well-being indicators, by survey wave



Notes: Each line presents the average value of the response to a separate Likert scale question on one aspect of emotional well-being, summarized by the label on the left. The scale ranges from 1 (Never) to 6 (Always). The questions were asked in the baseline survey and in COVID survey wave 2. The Figure includes all the individuals interviewed in COVID wave 2. Source: Baseline survey and COVID survey wave 2.

Table 1: Characteristics of COVID survey respondents at baseline

Surveyed in:	COVID waves 1 or 2	COVID wave 1	COVID wave 2	COVID waves 1 and 2
<b>Demographics</b>				
% of females	48.5	48.0	47.8	47.2
Age	37.1	37.2	37.1	37.3
% Head of household with any secondary education	45.5	45.5	45.7	45.7
% Head of household with any tertiary education	11.7	11.6	11.7	11.5
% respondents living in their birth place	23.3	23.3	23.3	23.3
% respondent who live in rural areas	14.4	13.8	14.2	13.6
<b>Employment</b>				
% salaried or apprentices	22.3	22.1	22.6	22.5
% casual workers	13.1	13.2	13.3	13.4
% self-employed	35.9	36.3	35.8	36.3
% not employed	28.8	28.4	28.3	27.8
% All: Monthly income (x1000 FCFA)	59.4	59.9	59.6	60.2
% Income earners: Monthly income (x 1000 FCFA)	76.4	76.5	76.5	76.6
<b>Housing</b>				
% renters	59.6	60.1	59.4	59.9
Monthly rent (x1000 FCFA)	27.9	27.8	27.9	27.8
% respondent with gutter near the house	20.0	20.2	19.8	20.0
<b>Transport</b>				
Transport expenditure -Mondays	562.6	570.2	568.2	576.7
Transport expenditure - Wednesdays	695.4	673.0	724.6	703.2
<b>Personal Finance</b>				
% owning a bank account	19.5	19.7	19.5	19.8
% owning a mobile money account	78.4	79.3	78.6	79.6
% respondents who saved in the last 12 months	44.5	44.6	44.9	45.0
<b>Observations</b>	2,555	2,343	2,406	2,194

*Notes:* The Table only includes respondents interviewed in either of the two COVID survey waves. Characteristics are those reported in the baseline survey. Each column corresponds to a slightly different sample, based on participation in the two COVID survey waves. Source: Baseline survey.

Table 2: Beneficiaries of government support programs

Sample	Overall average	Income quartiles				Employment June 2020			
		Q1	Q2	Q3	Q4	Salaried	Casual	Self-employed	Not employed
<b>Panel A: monetary or in-kind transfer</b>									
Monetary or in-kind transfers at baseline	0.4	0.4	0.4	0.5	0.0	0.3	0.3	0.2	0.7
Distribution of masks/gel Apr-Jul 2020	5.4	2.5	5.1	6.9	8.0	7.8	3.5	7.0	4.3
Distribution money/food Apr-Jul 2020	3.0	2.7	3.3	3.2	2.4	2.8	3.8	2.7	3.1
<b>Panel B: reduction of electricity bill</b>									
Full sample	11.3	10.1	11.6	12.5	11.4	14.8	13.1	10.7	10.0
Sample with legal access to electricity	14.3	13.4	14.9	16.3	13.5	18.4	16.8	13.5	13.0
Eligible sample	38.3	32.8	40.6	40.2	37.2	41.9	39.1	43.2	33.1
<b>Observations</b>	2,343	670	449	554	551	357	344	657	836

*Notes:* The Table presents the percentage of respondents who report having benefited from government support programs. Each row in Panel A corresponds to a different government support program. Each row in Panel B corresponds to a different sample: the full sample includes all the respondents interviewed in COVID survey wave 1; the sample with legal access to electricity is restricted to respondents who have a contract with the government electricity supplier; the 'eligible sample' includes only those respondents who satisfy the conditions for benefiting from a reduction in their electricity bill. The first column includes all income and employment categories. Columns Q1 to Q4 break down the sample by quartiles of individual income reported in COVID survey wave 1 for June 2020 (N=2,224). Columns 'Salaried' to 'Not employed' breaks down the sample by the type of main source of income reported in COVID survey wave 1 for June 2020 (N=2,194). Source: Baseline survey and COVID survey wave 1.

Table 3: School enrollment

Sample	Overall	Gender		Age category		
		Boys	Girls	[6-9]	[10-13]	[14-16]
Enrolled in 2019-2020	93.0	92.7	93.4	93.3	94.1	90.9
Enrolled in 2020-2021	91.6	91.3	92.0	94.1	92.3	85.9
Not enrolled in Sept 2020 because:						
School was closed	0.7	0.9	0.4	0.6	0.6	0.9
Child not willing to go to school	2.7	2.3	3.3	1.8	3.4	3.5
Child finished school	0.5	0.7	0.3	0.4	0.4	0.9
Child needs to work/help at home	2.2	2.6	1.7	0.8	1.9	5.3
No money to pay for school	1.2	1.3	1.2	1.3	0.7	1.8
<b>Observations</b>	2,094	1,087	1,007	864	761	469

*Notes:* The first two rows of the Table compare average enrollment rates in academic years 2019-2020 and 2020-2021. Enrollment is a binary variable equal to 1 if the child is reported by parents as going to school, irrespective of grade. For 2020-2021, enrollment information is as reported in January 2021. The remaining rows of the Table reports the proportion of non-enrolled children, broken down by the main reason given by the respondent for the child not attending school. The first column includes the full sample of children. Columns 2 and 3 break down the sample by gender. The last three columns break down the sample by age of the child in January 2021. The sample includes 2,094 children aged 6-16 in January 2021, living in 1,113 surveyed households. Source: COVID survey wave 2.

# Appendix Tables and Figures

Table A1: Baseline Characteristics of Respondents

Surveyed in:	Baseline	COVID waves 1 or 2	COVID waves 1 and 2
<b>Demographics</b>			
% of females	50.5	48.5	47.2
Age	37.2	37.1	37.3
% Head of household with any secondary education	44.2	45.5	45.7
% Head of household with any tertiary education	11.3	11.7	11.5
% respondents living in their birth place	24.4	23.3	23.3
% respondent who live in rural areas	15.4	14.4	13.6
<b>Employment</b>			
% salaried or apprentices	20.9	22.3	22.5
% casual workers	12.8	13.1	13.4
% self-employed	35.8	35.9	36.3
% not employed	30.5	28.8	27.8
% All: Monthly income (x1000 FCFA)	55.8	59.4	60.2
% Income earners: Monthly income (x1000 FCFA)	73.4	76.4	76.6
<b>Housing</b>			
% renters	58.5	59.6	59.9
Monthly rent (x1000 FCFA)	27358.7	27871.8	27830.5
% respondent with gutter near the house	20.4	20.0	20.0
<b>Transport</b>			
Transport expenditure -Mondays	547.1	562.6	576.7
Transport expenditure - Wednesdays	673.7	695.4	703.2
<b>Personal finance</b>			
% owning a bank account	17.9	19.5	19.8
% owning a mobile money account	73.0	78.4	79.6
% respondents who saved in the last 12 months	43.2	44.5	45.0
<b>Observations</b>	2,940	2,555	2,194

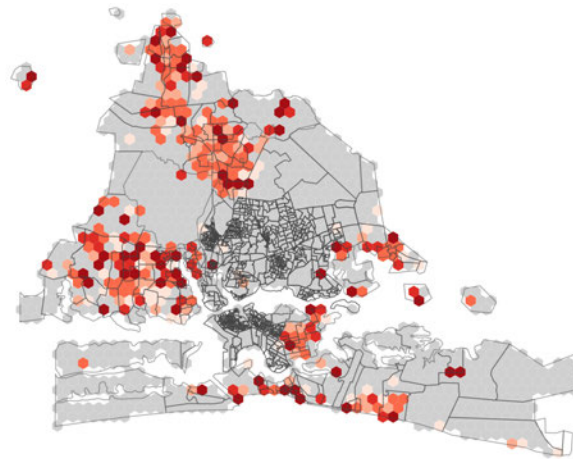
*Notes:* The reported characteristics are those given at the time of baseline survey. The different columns correspond to different samples: column 1 includes all baseline respondents; column 2 includes respondents to either wave 1 or 2 of the COVID surveys; column 3 includes respondents who to either of the COVID survey waves. Source: Baseline survey.

Figure A1: Proportion of respondents reporting earned income

(a) December 2019



(b) April 2020



(c) December 2020

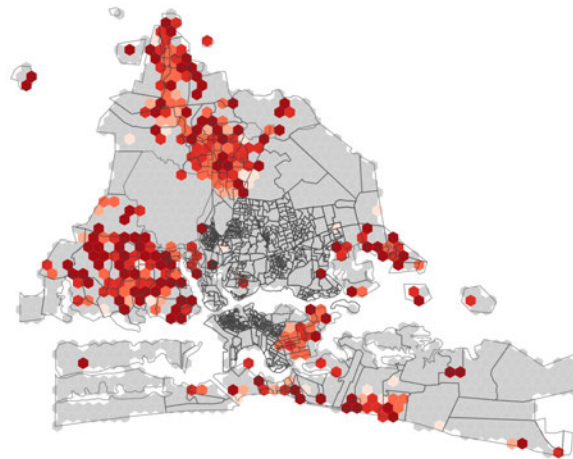
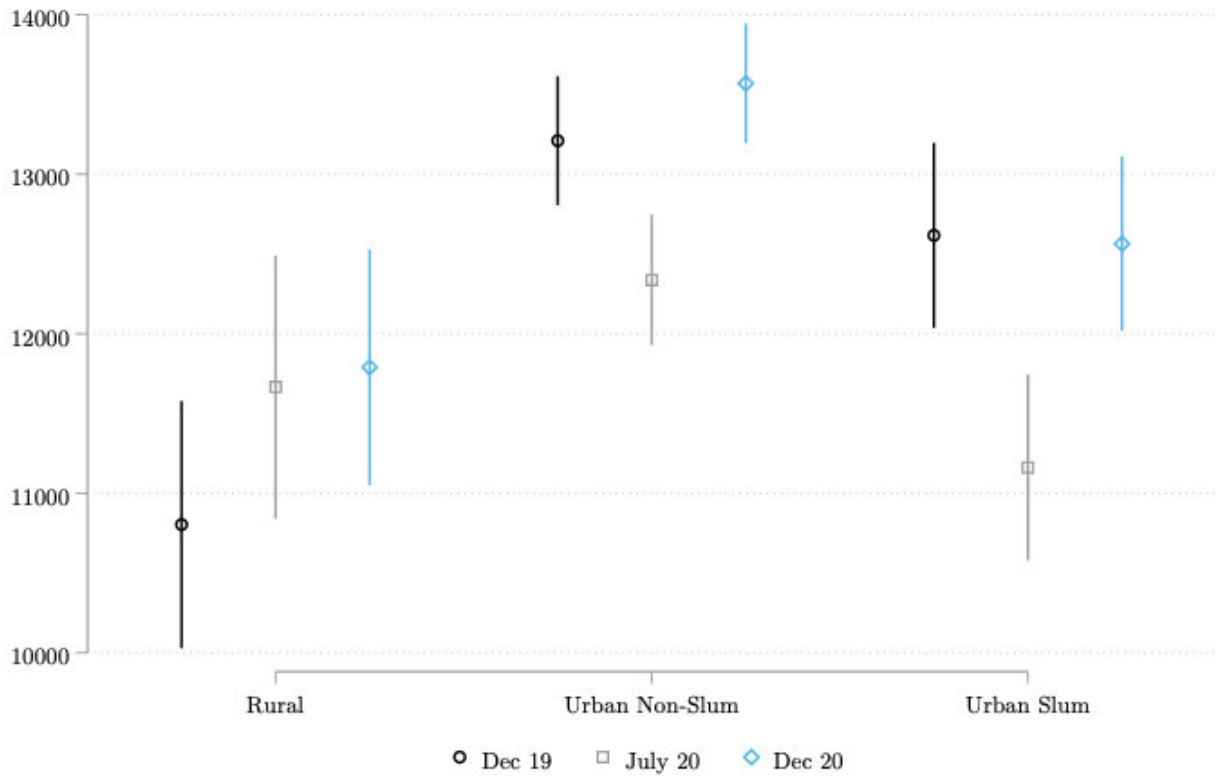


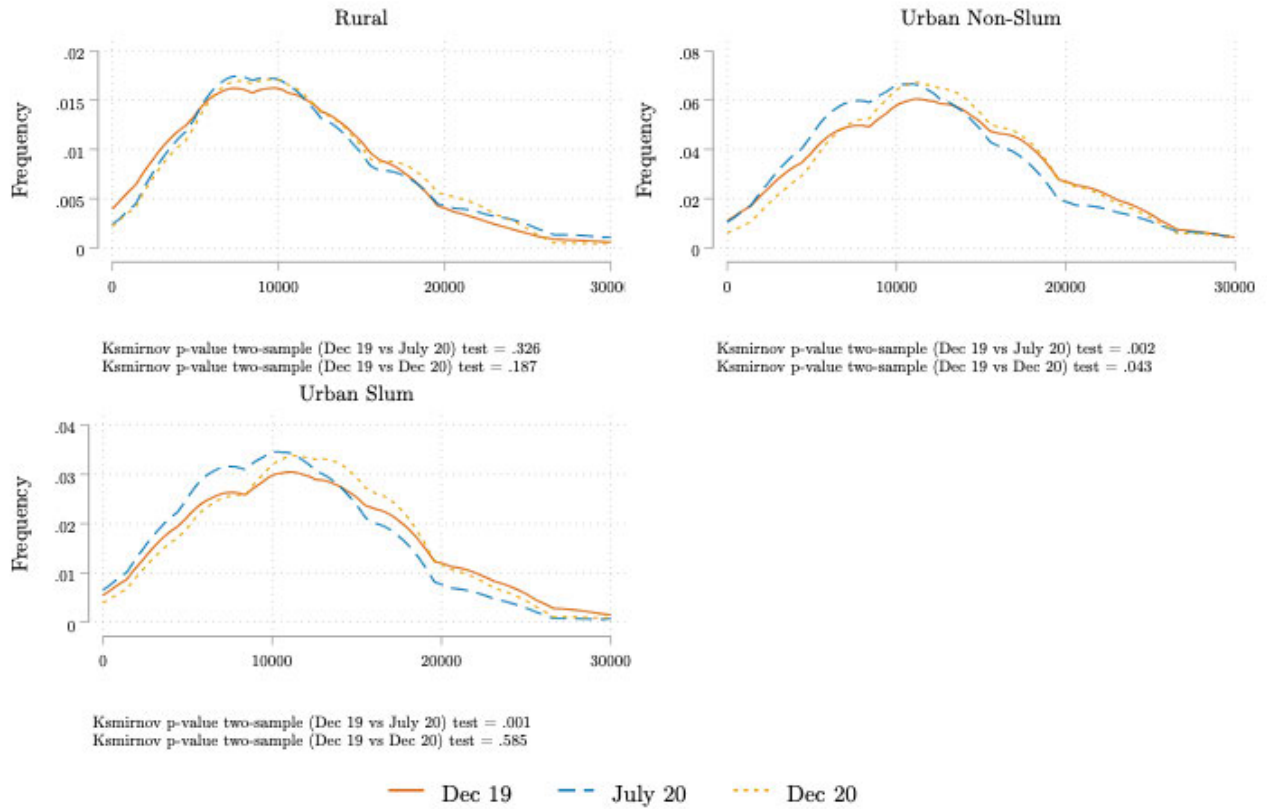
Figure A2: Average weekly food expenditure, by location of residence



Notes: Each whisker plot presents the average of the household weekly expenditures reported in each of the three surveys, broken down by the respondent's location of residence at baseline. Each average is calculated by regressing the reported expenditures on survey dummies. The corresponding 95% confidence intervals are shown in color. The Figure combines all the respondents interviewed in either of the two COVID survey waves 1 and 2. To correct for outliers, the top 1% of the weekly expenditure was winsorized. Source: Baseline survey and COVID survey waves 1 and 2.



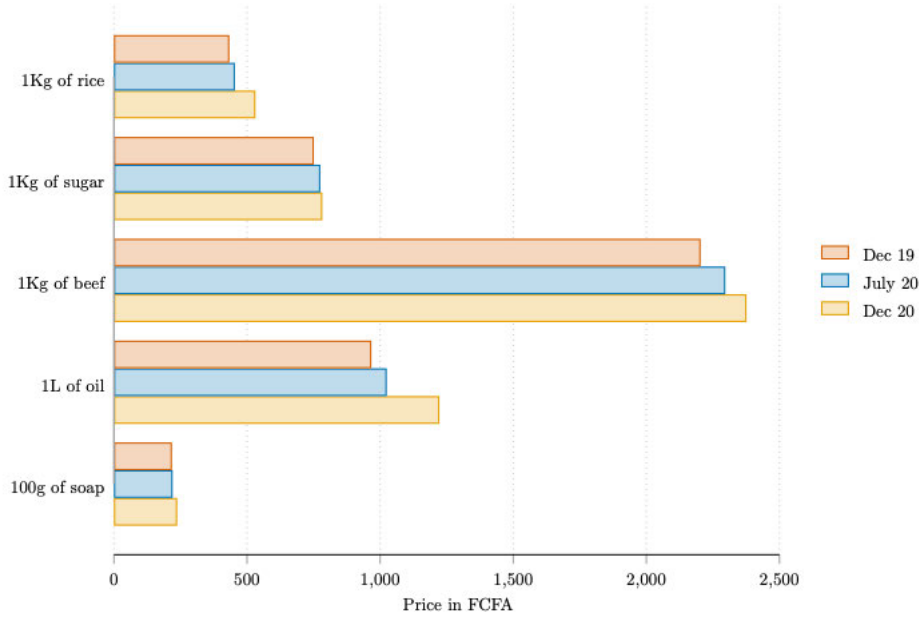
Figure A3: Average weekly food expenditure, by living location



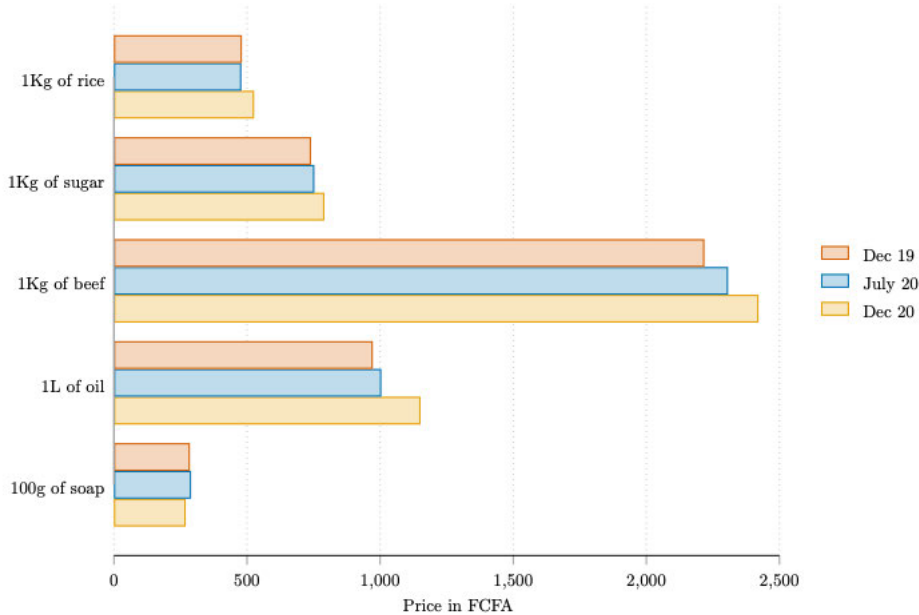
Notes: The Figure shows the estimated Kernel density of the household weekly food expenditures reported in each of the three surveys. Each panel only includes respondents in a particular type of residential location. To correct for outliers, the top 1% of the weekly expenditure was winsorized. The Figure combines all the respondents interviewed in either of the two COVID survey waves 1 and 2. Source: Baseline survey and COVID survey waves 1 and 2.

Figure A4: Food Prices

(a) Rural sample

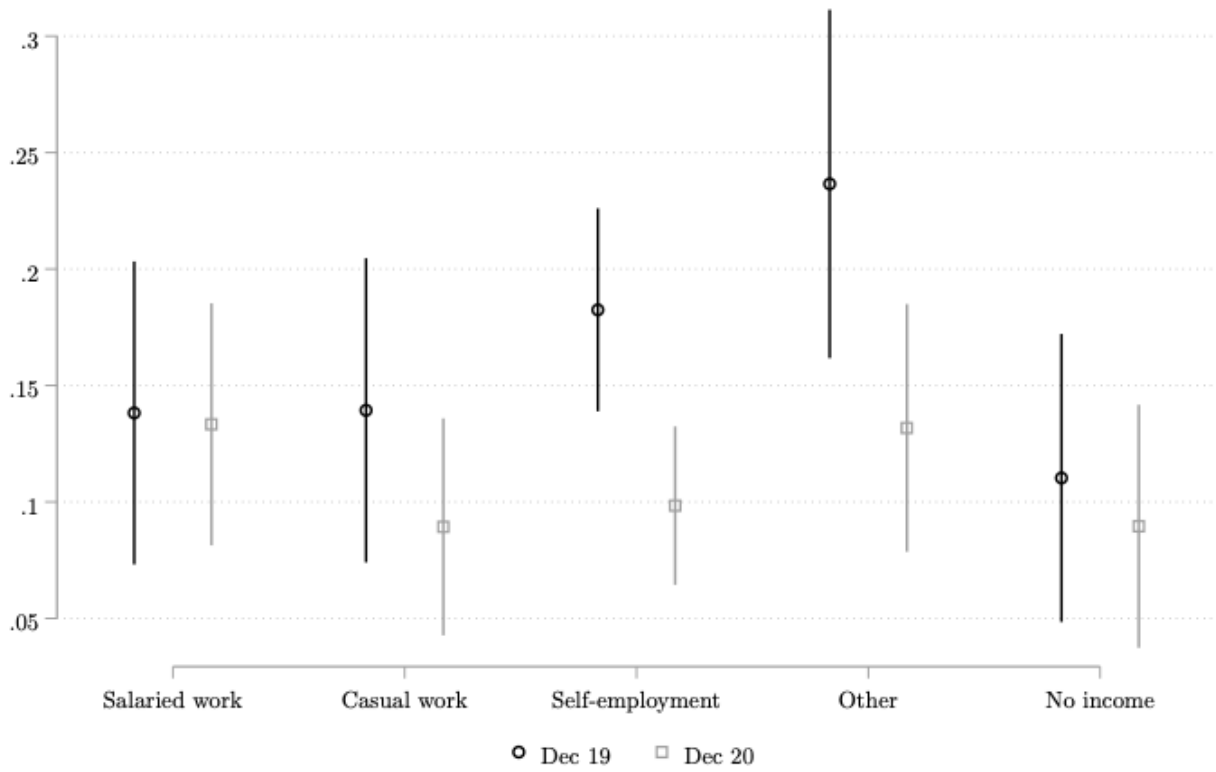


(b) Urban sample



Notes: Each bar represent the average price reported by respondents for each purchase category in each of the three surveys: baseline (for December 2019), COVID wave 1 (for July 2020) and COVID wave 2 (for December 2020). The sample includes 1,235 respondents randomly selected from all sampling areas to answer these questions. Source: Baseline survey and COVID survey waves 1 and 2.

Figure A5: Proportion of respondents who received transfers from abroad, by employment status in Dec 2019



Notes: Each whisker plot represents the proportion of respondents who report receiving transfers from abroad in the 12 months preceding the survey. Each proportion is calculated by regressing on survey dummies a dummy equal to one if the respondent reported receiving at least one transfer from abroad in the last 12 months. The corresponding 95% confidence intervals are shown in color. The specified recall period for Dec 19 (the baseline survey) and Dec 20 (the second COVID survey) is the 12 months preceding the survey. The Figure includes respondents interviewed in the COVID survey wave 2. Source: Baseline survey and COVID survey wave 2.

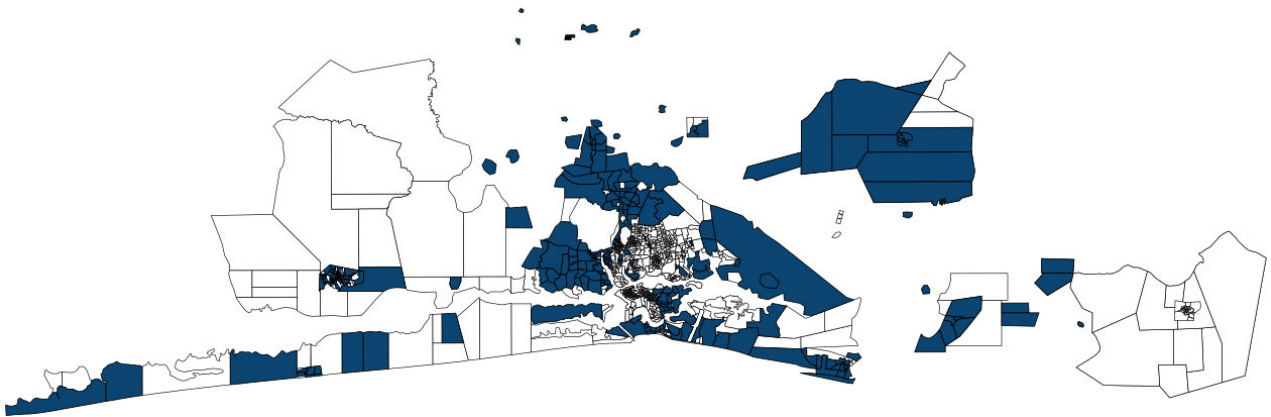
# Appendix B: Sampling Details

## B1 Sampling Frame

The main objective of the AUDRI project is to create a representative sample of urban and peri-urban population in the Greater Abidjan. To help at targeting those zones, the 2015 Japan International Cooperation Agency (JICA) map was used. As a sample frame, we use the Institut National de Statistique (INS)'s enumerations areas (EAs). In 2014, these zones were defined as follows: (i) in urban area, a EA includes exactly 200 households, (ii) in rural areas, an EA includes all households living in a village.

For each zone, we used the definition of EAs as described in the 2014 database to determine the total population. Based on this estimate, 85% of the population is living in Abidjan City<sup>15</sup> and 93% is living in urban areas. As the AUDRI's focus was the potential areas where urbanisation would increase in the coming years, we decide to built our AUDRI sample such that 50% of the listed households were living in Abidjan City which resulted in 78% of the listed households living in urban areas. This methodology resulted in 84 selected villages allocated in 11 sous-prefecture and 622 urban EAs in the same 11 sous-prefecture and in the 5 additional sous-prefecture that were only urban.

Figure B1: Sampling area



Note: sampled areas are in blue

## B2 Listing

The listing exercise was launched in mid-July 2019 and lasted almost 2 months. During the listing, we collected information about each member of the household, assets ownership, health and CMU enrollment. Whoever was above 18 years old and gave their consent was surveyed. To collect these information enumerators started from the centroid<sup>16</sup> and knock on every 20

<sup>15</sup>Abidjan City refers to municipality that are exclusively urban, namely Abobo, Attécoube, Koumassi, Pourt-Bouet and Yopougon

<sup>16</sup>The centroid was computed using GIS and the shapefiles provided by INS.

doors counting from the closest door to the centroid in urban areas and from a random number of door in rural areas.

The initial objective was to list 8000 households in and around Abidjan within 84 villages and 622 enumeration areas (EA). In this initial size, 954 households had been excluded because they were part of 39 villages and 9 EAs which were “too rural” and/or were undergoing an “administrative constraint”. Moreover, the respondent’s quota did not fill within numerous EAs and villages because their number of inhabitants was smaller than planned. This field reality, unexpected in the initial prevision, created a reduction of 752 households in the final sample size of the listing. To sum up, the listing’s theoretical sample size was reduced by 21% (or by 1706 households) because of the above explanations. Overall, 6294 households have been listed. The refusal rate was 7% and the “absence” rate was 11% (1 over 10 absent households is theoretical, as it was registered by the “cours fermé protocol”). The listing’s response rate was 82%.