

Food price volatility and socio-inequalities in household food insecurity during coronavirus disease-2019 lockdown in Nansana municipality, Wakiso district Uganda

Edward Buzigi (✉ edwardbuzigi@gmail.com)

University of KwaZulu-Natal <https://orcid.org/0000-0002-3605-8111>

Stephen Onakuse

University College Cork College of Business and Law

Research

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Abstract

Background

This study assessed staple food price volatility, food consumption scores (FCS) and prevalence of household food insecurity (HHFI) and its socio-inequalities during enforcing and lifting corona virus disease -2019 (COVID-19) lockdown in Nansana municipality, Uganda.

Methods

A repeated households (HHs) based cross-sectional study was conducted in urban Nansana Municipality, Uganda. A total of 405 HHs (205 slum and 200 non-slum) were selected using stratified random sampling. Data on social demographics and FCS in the previous 7 days were collected using questionnaire-based telephone interviews with HH heads. Prices for staple foods was collected by asking food sellers from local markets. Mean staple food price differences between before COVID-19 lockdown and during enforcing or lifting the lockdown was tested by paired t test. A binary outcome of HHFI (FCS of 0-35) and food secure (FCS>35) HHs was created. The association between exposure variables and HHFI was tested using multivariate logistic regression analysis at a probability value of 5%.

Results

Mean price of staple food significantly increased between before and during enforcing the COVID-19 lockdown ($p < 0.0001$). Mean FCS during COVID-19 lockdown were at borderline for either slum (22.8) or non-slum (22.9) HHs, and were not significantly different from each other ($p=0.06$). During partial lifting of the lockdown, FCS among slum HHs were significantly lower at 20.1 (poor) compared to non-slum HHs at 22.7 (borderline) ($p=0.01$). The mean FCS was significantly higher at borderline (24.5) among HHs that received food aid compared to poor FCS (18.2) among slum HHs that did not receive food aid ($p < 0.0001$). The prevalence of HHFI was high and not significantly different ($p > 0.05$) between slum (94.6%) and non-slum (93.5%) HHs during COVID-19 lockdown. HHFI was higher in slum (98.5%) than non-slum (94%) HHs ($p < 0.05$) on partial lifting of the lockdown. Adjusted odds ratio (AOR) showed that being a wage earner and employed HH head was positively (AOR: 8.3, 95% CI: 1.9-36.2) and negatively (AOR: 0.07, CI: 0.02-0.2) associated with HHFI, respectively. During partial lifting of COVID-19 lockdown, slum HHs (AOR: 11.8, 95% CI: 1.5-91.3), female headed HHs (AOR: 11.9, 95%CI: 1.5-92.7), wage earners (AOR: 10.7, 95% CI: 1.4-82.9) and tenants (AOR: 4.0, 95% CI: 1.1- 14.7) were positively associated with HHFI.

Conclusion

Staple food prices increased during enforcing COVID-19 lockdown compared before lockdown. Food aid distribution during COVID-19 lockdown improved FCS among slum HHs, however, it did not prevent against slum HHFI.

Background

Corona virus disease-2019 (COVID-19) is a novel respiratory tract infection caused by severe acute respiratory syndrome coronavirus 2 [1]. The COVID-19 was first reported in December 2019, in Wuhan, China. However, the disease has spread globally [2, 3]. The disease can spread from person to person through small droplets from the nose or mouth which are spread when a person with COVID-19 coughs or breathes out [1]. The COVID-19 droplets are either inhaled by uninfected persons or land on objects and surfaces around the person [4, 5]. People contract the disease when they inhale the droplets, whilst others contract COVID-19 by touching these objects or surfaces, then touching their eyes, nose or mouth [1, 6]. Social distancing defined as avoiding large crowds, crowded public places, and maintaining at least 2 metres of distance between one person and others, has been recognised as a feasible strategy to halt the spread of COVID-19 [1, 7, 8].

There is convincing evidence from several countries that a national lockdown strategy characterised by restricting people movements by forcing them to stay at their homes has been found to be one of the most effective social distancing strategies to halt the spread of COVID-19 fast spreading pandemic [7, 9, 10]. COVID-19 lockdowns may be partial or total varying from country to country [10]. For example, in response to the COVID-19 outbreak that began in the city of Wuhan in December 2019, China implemented a total lockdown characterised by nationwide travel blockade and quarantine policy that required all public spaces, businesses, and schools to close until further notice and placed restrictions on individuals leaving their homes or travelling [9]. The Chinese lockdown strategy was applauded in combating the spread of COVID-19 in Wuhan [9]. Therefore, Uganda adopted almost a similar total lockdown strategy that was implemented in China [9].

The Ugandan government through the president announced enforcing the COVID-19 total lockdown on 30th March 2020 [11]. However, in late May 2020, the COVID-19 lockdown was partially lifted. The COVID-19 total lockdown in Uganda was characterised by closing all daily income generating public business including restaurants, barber shops, schools, bars, tourism, hotels and public transport such as air transport, buses, taxis and boda-boda (motor bike) taxis [12]. Partial lifting of COVID-19 was characterised by limited opening of road transport such as buses and taxis. However, all other businesses remained closed except essential business such as food markets and health facilities that remained open during enforcing and partial lifting of the COVID-19 lockdown in Uganda [11].

Food security, defined as a situation when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life[13]. It is worth noting that the global recession, caused by COVID-19 lockdowns and other restrictions on business activity to control COVID-19 is expected to affect food security by disrupting the food supply chain and subsequently increase food prices or lower people's income and therefore, making them unable to purchase adequate food to achieve sustainable household food security [14]. However, the highest burden is expected to be on the urban poor HHs in low income countries of many African countries that survive on purchased food that reaches them through informal food supply chains [15, 16].

The impact of COVID-19 lockdown on food prices, food consumption and HH food security has been reported in some countries such as China and India [17–19] probably because of the interrupted food

supply chains resulting from COVID-19 lockdown or restricted movements of farmers, food dealers, food processors and food sellers [20]. Furthermore, staple food price volatilities and several other socio-inequalities are key determinants of HH food insecurity during enforcing restrictions that aim to prevent the spread of disease epidemics in African low income countries [21, 22]. However, there is scarce evidence on the impact of COVID-19 lockdown on food prices, food consumption and household food insecurity (HHFI) in Uganda. Therefore, this study investigated the staple food price volatility, food consumption scores (FCS), prevalence of HHFI and its socio-inequalities during enforcing and partial lifting of COVID-19 lockdown in urban Nansana municipality, Wakiso district, Uganda.

Methods

Study setting

This study was conducted in Nansana Municipality located in urban Wakiso district, central Uganda, East Africa. Between 1 and 2.99 million Ugandans were food insecure before enforcing COVID-19 lockdown [23]. Nansana is among the fast-growing urban municipalities in Wakiso district harbouring both people of low and middle income status [24]. The total population of Nansana municipality is 365124, of which 53% and 47% are females and males, respectively [24]. Furthermore, 17.3% and 2% of the population are children (below 5 years old) and elderly (65 years old) respectively. The total number of HHs are 90742, of which 27% are female headed HHs [24]. The majority of urban dwellers in Uganda including urban Wakiso district are daily wage earners [24], while the gross domestic product per capita for Wakiso district is 2496 United States dollars [25].

Study design

A repeated community cross-sectional study that was conducted twice in the same HH heads and local food sellers. For food insecurity assessment, HHs were examined during the period when the COVID-19 lockdown was enforced and partially lifted in Uganda. For staple food price volatility assessment, food sellers from the local market were asked to provide staple food prices just before the enforcement, during enforcement and lifting COVID-19 lockdown.

Sample selection of households and food markets

The sample size of 401 households was estimated using the formula for single population proportion with the following assumptions: since there were no previous studies on the prevalence of HH food insecurity in the study area, household food insecurity at 50% was considered, 95% confidence level, 5% margin of error, and 5% allowance for possible non-response.

By using the formula $n = N \times X / (X + N - 1)$ where,

n is the minimum sample size of HHs needed for this study.

N = Number of households in the study area = 90742 [24].

$$X = Z^2 P Q$$

$$D^2$$

Where N = minimum sample size, Z = Standard deviation score at 95% = 1.96

P = Prevalence of HH food insecurity from previous studies = 50% = 0.5

Q = Complimentary probability (1-P) = 1 - 0.5 = 0.5

D = Error margin = 5% = 0.05, substituting: $X = \frac{1.96^2 \times 0.5 \times 0.5}{0.05^2} = 384$

$$0.05^2$$

Therefore, $n = 90742 * 384 / (384 + 90742 - 1) = 382$. However, if a 5% allowance for possible non-response is considered, then a total sample of 402 households was needed. Then, at least 201 HHs from either slum or non-slum place of residence were needed for recruitment in this study.

A stratified random sampling procedure was used to recruit HHs for the study. First, 4 administrative divisions in Nansana municipality were stratified into two groups (2 slum and 2 non-slum divisions). One division was selected from each stratum using simple random sampling. The selected divisions were Nansana division (non-slum) and Nabweru divisions (slum). From each of the slum and non-slum division, one administrative local council was selected using random sampling. The slum and non-slum local council selected were Kattoke and Nansana West 1 local council, respectively. Household heads from slum and non-slum HHs respectively were recruited purposively until the required sample size was achieved. Uganda lacks phone directories for HHs. To this end, it was difficult to select HHs by random sampling. Therefore, only telephone contacts for 10 HH heads from the extreme and middle boundaries of the two selected local councils were physically got by research assistants before data collection. Two research assistants experienced in telephone surveys were assigned to each of the two local councils. After interviewing each HH head, the mobile phone contacts of the next participant in the neighbourhood HH was got by snowballing. Snowball sampling is where research participants provide contacts for other eligible participants for the study[26]. Furthermore, 127 food sellers from local food markets such as supermarkets, groceries, food stores, and retail shops closest to the HHs enrolled for the study were purposively visited to enquire staple food prices as explained in World Food Program market analysis tool on how to conduct a food trader survey and collecting prices for food security programming [27, 28]. 65 and 60 food sellers were recruited from each of the local food markets closest to slum and non-slum HHs, respectively.

Data collection and measurement of study variables

Outcome variables

The outcome variables of this study were staple food prices, food consumption scores and prevalence of HHFI.

Staple food prices

Food markets were entitled to remain open during the period of enforcing and partial lifting of the COVID-19 lockdown in Uganda. Therefore, by observing the Uganda's Ministry of Health guidelines of social distancing and wearing of face masks to halt the spread of COVID-19, trained research assistants visited food sellers in their food markets during the periods of enforcing and partial lifting of COVID-19 lockdown to enquire about the price of common bean (dry beans) and maize flour. Food price data was collected on common bean and maize flour because they are major food staples in Uganda[29]. Moreover, the Ugandan government decided to distribute staple common beans and maize flour as food aid to the vulnerable poor in urban districts of Kampala and Wakiso during the COVID-19 lockdown [30].

Staple food prices were enquired for the periods of before COVID-19 lockdown, during enforcing COVID-19 lockdown restrictions, and during partial lifting of lockdown. The first visit of the food markets was done during the COVID-19 lockdown (between 8th April and 5th May 2020). The food prices during COVID-19 lockdown and just before COVID-19 lockdown were enquired during the first visit. The questions asked during the study were "how much do you sell a kilogram of common bean; and maize flour now?" "What was the price of a kilogram of common bean and maize flour just before the COVID-19 lockdown was enforced by government?" Furthermore, the staple food prices during the partial lifting of the lockdown was enquired during the second visit. The question asked was "how much do you sell a kilogram of common bean; and maize flour now?" It is worth noting that both visits were done in the same food markets as explained by the World Food Programme (2009) market analysis tool [27].

Measurement of food consumption scores and household food insecurity

To contribute towards halting the spread of COVID-19 from person to person, the Ugandan government restricted human movements including suspending HH visits and face to face interviews. To this end, data on food security (food consumption scores) and socio-inequalities was collected by telephone call interviews using an interviewer guided questionnaire as recommended during infectious disease outbreaks such as COVID-19 [31–33]. The first episode of data collection was conducted during the COVID-19 lockdown (Between 8th April and 5th May 2020) and repeated data collection with in the same HHs was collected between 25th May and 13 July 2020 when the COVID-19 lockdown was partially lifted. Household food insecurity was measured by the World Food Programme's food consumption scores (FCS) method [34]. In brief, the World Food Programme FCS method uses a brief questionnaire to ask respondents "How many days over the last 7 days, did members of your household eat the following food items, prepared and/or consumed at home, and what was their source?"[34]. To calculate the FCS from these results, the consumption frequencies were summed and multiplied by the standardized food group weight recommended by World Food Programme as shown in table 1[34].

Table 1 here

Food items were (i) specified into food groups (condiments not included); (ii) Summed all the consumption frequencies of food items within the same group; (iii) Multiplied the value of each food group by its weight (see table 1); (iv) Summed the weighted food group scores to obtain FCS; (v) Determined the household's food consumption status based on the following thresholds of FCS: 0-21 (Poor); 21.5-35 (Borderline) and;

>35 (Acceptable) [34]. A binary outcome of HH food insecurity (Yes and No) was created. A household was regarded as food insecure if it had a FCS of 0 to 35 (poor to borderline). In contrast, a HH was regarded as food secure if its FCS was greater than 35 (acceptable).

Exposure variables

The exposure variable was residence in either slum or non-slum area of urban Nansana Municipality, Wakiso district. Place of residence was selected as an exposure variable because the Ugandan government decided to distribute food aid to the vulnerable poor HHs located in urban slums of Wakiso district. To this end non slum HHs were used as a control.

Covariates

Since food insecurity was assessed at the HH level, all the covariates used in this study were captured and measured at the HH level as well. Socio-economic covariates such as sex of HH head, source of income for HH head, size of HH, age of HH heads, HH head ownership of house, and HH receiving food aid were considered for this study because they have been found to influence HH food insecurity either during disease disasters or without disease disasters [35–37]. Furthermore, HH receipt of food aid was considered as a covariate because the government of Uganda through the president had promised to give food aid to vulnerable poor HHs in Wakiso district during the COVID-19 lockdown [38].

Statistical data analysis

HH food insecurity was measured by household's FCS. Mean FCS differences between two categorical exposure groups was analysed by unpaired t test, whilst mean FCS differences between three or more categorical exposure groups was analysed by one-way analysis of variance (ANOVA). A binary outcome of HHFI (FCS of 0-35) and food secure (FCS >35) was created. The association between exposure variables and HHFI was tested using multivariate logistic regression analysis. An odds ratio (OR) and 95% confidence interval (CI) was computed by multivariate logistic regression analysis. Mean staple food price difference (in Uganda shillings) between before COVID-19 lockdown and during enforcing or lifting the lockdown was tested by paired t test. The level of significant difference was set at a probability value of 5% ($p = 0.05$) using STATA, version 13.1.

Ethical considerations

Permission to carry out the study was granted by the Office of the Mayor, Nansana Municipality. Prior to any enrolment to the study, informed and verbal consent was sought and obtained from study participants through phone calls. Signed consent was not obtained individually from study participants because of the COVID-19 lockdown restrictions such as social distancing and avoiding physical contact with study participants.

Results

Data was collected twice among the same food markets and HHs during enforcing and partial lifting of COVID-19 lockdown. A total of 65 and 62 staple food sellers in food markets closet to slum and non-slum

HHs, respectively participated in providing information on food prices during the study. A total of 208 and 202 slum and non-slum HHs respectively participated in data collection during COVID-19 lockdown. However, 3 of 208 and 2 of 202 slum and non-slum HHs respectively were lost to follow-up after COVID-19 lockdown was partially lifted. Therefore, data for 205 and 200 slum and non-slum HHs were available for analysis during the period of enforcing and partial lifting of the COVID-19 lockdown.

Socio-demographic characteristic of the study sample

A total of 127 food sellers (65 and 62 from HHs closest to slum and non-slum HHs respectively) participated in the study. Out of the 127 food sellers, 75 (59%) and 52 (41%) were females and males, respectively. Furthermore, a total of 405 HH heads participated in the HHFI assessment, of which 205 (50.6%) and 200 (49.4%) HHs were slum and non-slum residents. Out of the 405 HH heads, 185 (45.7%) were female headed. The mean age \pm standard deviation (SD) of HH heads was 40 years \pm 11 SD. Table 2 shows the social demographic characteristics of HHs that participated in the HHFI assessment.

The average family size was 5, with a range of 1 to 9. Out of 405 HH heads the majority, 176 (43.5%) were daily wage earners, whilst 96 (23.7%) and 133 (32.8%) were unemployed and employed, respectively. Out of the 176 daily wage earners, 55 (31.3), 32 (18.2%), 77(43.8%), 4 (2.3%) and 8 (4.5%) were boda-boda (motorbike) transport riders, public passenger tax drivers, bar/hotel maids, sex workers and food vendors, respectively. Of the 205 slum HHs, 179 HHs had received food aid of staple common beans and maize flour to sustain them for one month during the period of enforcing the COVID-19 lockdown. Figure 1 shows Uganda's military force distributing food and a woman receiving food aid in a slum located in urban Uganda.

Staple food prices before, during enforcing and partial lifting of COVID-19 lockdown

Maize flour and common beans are major staple foods in Uganda. The mean price of maize flour significantly increased from 2030 Uganda shillings (Ug Shs) before COVID 19 lockdown to 2383 Ug Shs during COVID19 lockdown ($p < 0.00001$), an increase equivalent to 17.4%. However, the mean price of maize flour significantly ($p < 0.00001$) reduced from 2383 Ug Shs during lockdown to 1823 Ug Shs during partial lifting of the lockdown, a reduction rate equivalent to 23.5%. Currently 1 United States Dollar is equivalent to 3719 Ug Shs. Figure 2 shows staple food prices before, during enforcing and partial lifting of COVID-19 lockdown lock down in Nansana municipality, Uganda .

The price of common beans significantly ($p < 0.00001$) increased from 2558 Ug Shs before COVID-19 lockdown to 4333Ug Shs during lockdown, an increase of 69.4%. However, on partial lifting of the lockdown, the common bean price significantly ($p < 0.00001$) reduced from 4333 to 2847 Ug Shs, a reduction rate of 34.3%.

Association between socio-demographic characteristics and food consumption scores during COVID-19 lockdown and partial lifting of COVID-19 lockdown in Nansana Municipality, Uganda

The mean food consumption scores (FCS) during the lockdown were at borderline (22.8-22.9) for either slum (22.8) or non-slum (22.9) HHs and were not significantly different from each other ($p=0.06$). However,

during partial lifting of the lockdown, FCS among slum HHs were significantly lower at 20.1 (poor) compared to non-slum HHs at 22.7 (borderline) ($p=0.01$). During lockdown, both female and male headed HHs had borderline FCS. However, mean FCS was significantly lower ($p<0.00001$) in female HHs (21.7) compared to male headed HHs (24.7). In contrast, when the COVID-19 lockdown was partially lifted, mean FCS for female headed HHS were poor (20.3) and significantly lower ($p<0.00001$) compared to borderline mean FCS (23.4) for male headed HHs. Mean FCS were significantly lower among HH heads who were unemployed and daily wage-earners compared to the employed both during the COVID-19 lockdown and partial lifting of the lockdown ($p<0.05$). Table 3 shows the association between socio-demographic characteristics and mean FCS during COVID-19 lockdown and during partial lifting of COVID-19 lockdown in Nansana municipality, Wakiso district, Uganda.

Household heads with advanced level education and above had significantly higher mean FCS ($p<0.05$) compared to HH heads who were uneducated, had primary and secondary education both during lockdown and partial lifting of the lockdown. Household heads who were tenants had significantly lower ($p<0.05$) FCS during lockdown (21.0) and during partial lifting of lockdown (20.9) compared to owners of houses at FCS of 22.9 and 22.7, respectively. Food aid distribution was only done among slum HHs during the COVID-19 lockdown. The mean FCS was significantly higher ($p<0.0001$) at borderline (24.5) among HHs that received food aid compared to poor FCS (18.2) among HHs that did not receive food aid.

Food insecurity status and its association with social inequalities during COVID-19 lockdown in Nansana municipality, Wakiso district Uganda

A binary outcome of food insecure and food secure HHs was created to assesses the social demographic characteristics of food insecurity during lockdown and partial lifting of local down. Table 4 shows bivariate and multivariate logistic regression analysis of factors associated with food insecurity during COVID-19 lockdown.

Households were food insecure and food secure if their FCS were 0 to < 35 (poor to borderline) and FCS > 35 (acceptable), respectively. In bivariate logistic analysis, HH heads who were daily wage earners and unemployed were 9.2 times (95% CI: 21-39.9) and 7.6 times (95% CI: 1.02-57.3) at risk to HHFI, respectively compared to the employed HH heads. In contrast, employment of HH heads prevented against food insecurity by 0.06 times (95% CI: 0.002-0.2) compared to wage earners and the unemployed HH heads. All other variables such as food aid distribution, size of HH members, age, place of residence, sex, house of ownership of HH head were not associated with food insecurity during the COVID-19 lockdown. In multivariate (adjusted) logistic regression analysis (table 4), being a wage earner and employed HH head significantly remained positively (AOR: 8.3, 95% CI: 1.9-36.2) and negatively (AOR: 0.07, CI: 0.02-0.2) associated with HHFI, respectively after adjusting for food aid, age, sex, place of residence, size of HH members, and HH head ownership of house.

Food insecurity status and its association with social inequalities during partial lifting of COVID-19 lockdown in Nansana municipality, Wakiso district Uganda

During partial lifting of COVID-19 lockdown, bivariate logistic analysis showed that slum HHs (COR: 12.3, 95%CI:1.6-93.8), female headed HHs (COR:13.5, 95% CI:1.8-102.9), daily wage earners (COR: 12.3, 95% CI:1.6-93.9) and tenant HH heads (COR: 4.6, 95%CI:1.3-16.5) were positively associated with food insecurity. In multivariate (adjusted) logistic regression analysis (table5), slum HHs (AOR: 11.8, 95% CI: 1.5-91.3), female headed HHs (AOR: 11.9, 95%CI: 1.5-92.7), HH head being a wage earner (AOR: 10.7, 95% CI: 1.4-82.9) and tenant (AOR: 4.0, 95% CI: 1.1-14.7) significantly remained positively associated with HHFI after adjusting for other covariates. On the other hand, non-slum HHs (AOR: 0.2, CI: 0.07-0.9), male headed HHs (AOR: 0.1, CI: 0.01-0.7), employed HH heads (AOR: 0.2, 95% CI: 0.06-0.7), having own house (AOR: 0.2, 95% CI: 0.7-0.9), significantly remained negatively associated with HHFI after adjusting for other covariates. Table 5 shows the bivariate and multivariate logistic regression analysis of factors associated with food insecurity during partial lifting of COVID-19 lockdown in Nansana municipality, Wakiso district, Uganda.

Discussion

Price volatility of staple foods, common bean and maize

This study demonstrates that the price of staple common beans and maize flour significantly increased during COVID-19 lockdown compared to before lockdown. However, the staple food price significantly reduced when the lockdown was partially lifted. These findings are consistent with what was reported that food prices had increased in Kampala, the capital city of Uganda during enforcing the COVID-19 lockdown [11] and in some European countries [39] and urban China [40]. However, the food price increase observed in this study was higher at over 17% compared to 1% in European countries during enforcing the covid-19 lockdown [39].

The increase in food prices revealed from this present study could be attributed to the interrupted food supply chain such as limited transportation of food from rural to urban centres including Nansana municipality, leading to low supply of food in the market amidst a high demand as reported by Readon and colleagues [20]. It is worth noting that food merchants in Uganda use cheap informal transport systems such as public transport vehicles including taxis and buses to transport both food and passengers from rural to urban areas [15]. However, public transport was suspended during the COVID-19 lockdown in Uganda, which might have contributed to the interrupted food supply chain from rural to urban centres such as Nansana Municipality. Moreover, private vehicles such as trucks might have been more expensive to individual small-scale farmers and food merchants to contract and transport food from rural to urban centres.

Furthermore, the Ugandan government contracted private companies to procure common beans and maize flour for use as food aid in general food distribution to the vulnerable poor in the slums of urban Kampala and Wakiso districts. The demand of common beans and maize increased as contracted suppliers procured a high proportion of common bean and maize from rural farmers and food merchants, which consequently might have reduced food supply on the local markets amidst high demand, hence increase in staple food prices. Staple food prices reduced on partial lifting of the COVID-19 lockdown probably because public transport was opened during this period when the COVID-19 lockdown was partially eased. Therefore, food

supply from rural to urban markets increased as food merchants might have used the eased public transport to deliver food to the urban markets. Besides, there was no food aid distribution during partial lifting of the lockdown, hence low demand from private contractors to supply food for food aid distribution by government. Since the majority of urban poor in Africa including Uganda depend on purchased food [15, 20], then such high staple food prices observed during COVID-19 lockdown and partial lifting of lockdown in this present study may prevent the urban poor from purchasing food for their HHs, hence leading to low HH food consumption scores and HHFI.

Food consumption scores and household food insecurity during and partial lifting of COVID-19 lockdown

Mean FCS for both slum (22.8) and non-slum HHs (22.9) were at borderline, and not significantly different from each other during the COVID-19 lockdown ($p=0.06$) probably because the vulnerable poor slum HHs were given food aid. The relief food packages included beans and maize flour, and were meant to cushion the vulnerable, unemployed or low income earners from the sudden COVID-19 lockdown imposed on March 30th 2020 [15, 41]. However, during partial lifting of COVID-19 lockdown, the mean FCS for slum HHs was significantly lower at 20.1 (poor) compared to non-slum HHs at 22.7 (borderline) probably because there was no food aid distribution to the vulnerable poor slum dwellers during the lifting period of COVID-19 lockdown in Uganda.

The HHFI established for female headed HHs in this study is consistent with findings by Acidri [42] and Nayiga et al [11], who showed that female HH heads raised a concern that hunger would kill their family members before COVID -19 does. This finding demonstrates gender inequality in HH food consumption and HHFI during enforcing and lifting COVID-19 lockdowns and suggests female headed HHs needed some form of food assistance. Similar findings of food insecurity among female headed HHs have been reported during enforcing COVID-19 lockdowns in Afghanistan [43]. The positive association between female headed HHs and HHFI could be explained by the fact that the vast majority of women in the developing world including Uganda are employed in the informal daily wage earning sectors and therefore, COVID-19 quarantine significantly reduces women's economic and livelihood activities, increasing poverty rates, and worsening food insecurity [11, 43, 44]. Food consumption scores were significantly higher in slum HHs that received food aid compared to those which did not receive. However, food aid distribution did not prevent against HHFI in slum HHs probably because it was of low quantity, and consequently did not reach a high proportion of the target population in slums. Moreover, it is difficult to conclude that recipients of food aid were able to cook and consume the raw food aid distributed to them because food aid recipients raised a concern of where they would get fuel such as charcoal to cook the distributed food [30], including common beans that have a long cooking time [45].

The insufficient quantity of food aid distributed could be attributed to the bribery and embezzlement of funds intended for food aid distribution which were reported in the office of the Prime Minister [46]. It was established that officials from the office of the prime minister inflated prices and rejected lower price offers from various suppliers of maize flour and beans [46], a situation which might have led to procurement and supply of low amounts and poor quality of food aid. To prevent corruption and embezzlement of funds associated with food aid procurement and distribution in the face of fighting HHFI during COVID-19

lockdown, cash transfers have been suggested as a better strategy compared to food aid distribution [41, 47, 48]. This is plausible because cash transfers through mobile money transfers are considered a better intervention to reach the poor than food distribution and less prone to corruption, as the funds pass through fewer middlemen, thus limiting the number of officials with discretionary powers and private interests [47]. It is worth noting that mobile telephone money cash transfers would be feasible because over 70% of Ugandans own mobile phones [49]. Other countries such as Kenya, India, Malaysia, Brazil and Singapore have successfully used cash transfer as a form of food assistance programme during the COVID-19 lockdown restrictions [50, 51].

Moreover, food markets remained open and functional during the COVID-19 lockdown in Uganda. Therefore, the money received through cash transfer could be used by HH members to procure a variety of food items from the local market. Lack of fuel such as charcoal to cook food distributed during the COVID-19 lockdown was a concern for food aid recipients [30]. Therefore, in addition to procuring foods of their choice, cash transfer recipients would use the received cash to procure fuel for cooking food. Moreover, mobile telephone money cash transfers would reduce the costs of labour, transport and time associated with food aid distribution, while avoiding the massive gatherings that food distributions can draw, which can fuel the spread of the disease [52].

As expected, low mean FCS or HHFI were significantly higher in HH heads of unemployed, wage earners, uneducated and tenants for several reasons. First, most urban Ugandan dwellers depend on procured food from the local markets, and therefore, their loss in incomes due to COVID-19 lockdown would affect their purchasing power of nutritious food [23]. Such similar findings have been reported elsewhere in China, confirming that COVID-19 lockdown travel restrictions made it impossible for the unemployed and the wage earners to travel to either look for a job or work to earn income for use in procuring food for HH members, which subsequently led to poor food consumption and HHFI [19]. Moreover, in this present study, loss of income was more likely, since the majority of daily wage earners were workers in business sectors that were suspended either during enforcing or lifting the COVID-19 lockdown [23]. The suspended business included public transport sector such as boda-boda (motorbike) taxi riders; minibus taxi and bus drivers/conductors; barbers; arcade shop attendants, food vendors, bar and hotel or guest house attendants.

Findings of high prevalence of HHFI and low FCS reported from this study could also be attributed to the disrupted food supply chains nationwide, with the urban poor worst affected due to dependence on market purchases [23]. For example, due to movement restrictions, daily wage food vendors were unable to reach HHs to sell their food items to get income for use to purchase foods preferred by their HH members in Fort Portal town, western Uganda [44]. Restricted movements of food vendors due to COVID-19 lockdown enforcement did not only negatively affect incomes of food vendors but also led to inadequate HH food access because social distancing restrictions prevent imposed to prevent the spread of COVID-19 could not allow food vendors to access HHs, where potential consumers of their food products reside [44].

During the period of partial lifting of COVID-19 lockdown, low FCS and HHFI was positively associated with slum HHs, wage earners, female headed HHs and HH heads who were tenants probably because all these are among the vulnerable urban poor. Similar findings have been reported in China and India where COVID-

19 related lockdowns have shown to be positively associated with the HHFI of the vulnerable poor HHs in China and India [17, 18]. Furthermore, findings from this study are in agreement with previous studies that showed that wage earners, female headed HHs and tenants in urban setting are at a high risk of HHFI during disasters or aftermath of disasters including disease outbreaks [35, 53]. The positive association between HHFI and low FCS or HHFI observed in this present study may be due to some reasons. First, most jobs of daily wage earners such as motorbike taxis, arcade attendants, bar and hotel attendants, and barbers remained closed during enforcement of partial lifting of COVID-19 lockdown, suggesting that majority of vulnerable poor in the study population including slum dwellers, wage earners, female headed HHs and tenant HHs would find it difficult generate income to procure food for their HH members as reported in the Uganda food security outlook update of April 2020 [23]. Moreover, no food aid distribution to the vulnerable poor during the partial lifting of the COVID-19 lockdown in Uganda [23]. Besides, HH heads who were tenants might have found it difficult to share their little or saved incomes between paying rent and buying food for HH members, which might have led to the low FCS and HHFI among house tenants.

Study Strengths And Limitations

Currently, there is no convincing evidence of confirmed vaccine against COVID-19 disease, and therefore, second waves of COVID-19 outbreaks are expected in future [54]. One strength of this present study is that it provides a baseline information about vulnerable HHs that may need social protection interventions such as food assistance to improve HH food security in the ongoing partial COVID-19 lockdown and future COVID-19 lockdowns in case subsequent waves of COVID-19 disease outbreaks emerge in Uganda. Several limitations are also inherent in this present study. Firstly, this is a cross-sectional study, therefore a cause effect relationship cannot be ascertained from this present study. Therefore, it is difficult to establish whether the high prevalence of HHFI observed in the study area was there before COVID-19 lockdown, or it is entirely attributed the COVID-19 lockdown enforcement. It is worth noting that a reporting bias of food consumption is likely in this study. For example, HH heads might have over reported not eating any food sometimes in the previous week thinking that if they do so they would get some form of food assistance during the COVID-19 lockdown, hence leading a higher prevalence of HHFI reported in this present study. Furthermore, this study has a potential of recall bias during data collection. For example, respondents might have forgotten to mention all the foods they consumed in the previous 7 days, leading to over estimation of HHFI.

Conclusion

Staple food prices significantly increased during enforcing and partial lifting of COVID-19 lockdown compared to before lockdown restriction were enforced in Nansana municipality. The prevalence of HHFI was unacceptably higher either during enforcing or partial lifting the of COVID-19 lockdown in both slum and non-slum HHs. Food aid distribution during COVID-19 lockdown improved FCS among slum HHs, however, it did not prevent against HHFI. To contribute towards improving household FCS, during enforcing the COVID-19 lockdown, the government of Uganda should have not only targeted the urban slum HHs, but should also have targeted the vulnerable non slum HHs whose heads were daily wage earners and

unemployed. If other similar lockdowns emerge due to subsequent COVID-19 lockdowns, the Uganda government should consider giving food assistance in form of cash transfers, since cash transfers seem to favour social distancing to combat the spread of COVID-19, more cost effective and allow beneficiary choices on how to best meet their nutritional needs compared to food aid distribution.

Abbreviations

AOR: Adjusted odds ratio; ANOVA: Analysis of variance; CI: Confidence interval; COR: Crude odds ratio; COVID-19: Corona virus Disease 2019; FCS: Food Consumption Scores; HH: Household; HHs: Households; HHFI: Household Food Insecurity; Ug Shs: Uganda shillings Ug Shs

Declarations

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Author contributions:

E.B conceptualized the study; EB collected and analysed the data; EB wrote the first draft of the manuscript; S.O supervised the research study; S.O reviewed and edited the draft of the manuscript. All authors have edited, read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

Permission to carry out the study was granted by the Office of the Mayor, Nansana Municipality. Prior to any enrolment to the study, informed and verbal consent was sought and obtained from study participants through phone calls. Signed consent was not obtained individually from study participants because of the COVID-19 lockdown restrictions such as social distancing and avoiding physical contact with study participants

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Tables

Table 1. Food group and weights for calculating food consumption scores [34].

Food group	Weight
Main Staples	2
Pulses	3
Vegetables	1
Fruit	1
Meat/Fish	4
Milk	4
Sugar	0.5
Oil	0.5

Table 2. Socio demographic characteristics of study participants during COVID-19 lockdown and partial lifting of lockdown in Nansana municipality, Uganda

Variable	Frequency (n=405)	Percent (%)
Residence		
Slum dwellers	205	50.6
Non slum dwellers	200	49.4
Sex of HH head		
Female	185	45.7
Male	220	54.3
Age of HH head		
18-24	108	26.7
25- 44	209	51.6
45-64	85	21.0
65+	3	0.7
HH size		
1-4	246	60.7
5-8	158	39
9+	1	0.3
Education of HH head		
Uneducated	18	4.4
Primary	187	46.2
Secondary	69	17.0
Advanced and above	131	32.4
Occupation of HH head		
Unemployed*	96	23.7
Employed**	133	32.8
Daily wage earner	176	43.5
House ownership		
Owner	201	49.6
Tenant	204	50.4
Received food aid***	n=205	
Yes	179	87.3

No	26	22.7
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*Includes those who get remittances

**Includes those employed by either government or non-government agencies and are assured of monthly salary

***Food aid was only in slum households

HH=Household

Table 3. Association between socio demographic characteristics and mean food consumption scores during lockdown and partial lifting of lockdown in Nansana municipality Uganda

Variables	F	%	Mean	p value	Mean FCS ²	p value
FCS ¹						
Residence						
Slum dwellers	205	50.6	22.8	0.06	20.1	0.01
Non slum dwellers	200	49.4	22.9		22.7	
Sex of HH head						
Female	185	45.7	21.7	<0.00001	20.3	<0.00001
Male	220	54.3	24.7		23.4	
Occupation of HH head						
Unemployed	96	23.7	20.9 ^b		20.5 ^b	
Employed	133	32.8	26.5 ^a		25.2 ^a	
Daily wage	176	43.5	22.3 ^b		20.3 ^b	
Education of HH head						
Uneducated	18		21.8 ^a		22.4 ^a	
Primary	187		22.3 ^b		20.5 ^a	
Secondary	69		21.7 ^a		21.4 ^a	
Advanced level and above	131		25.2 ^c		24.3 ^b	
House ownership						
Owner	201	49.6	22.9	0.03	22.7	0.01
Tenant	204	50.4	21.0		20.9	
Food aid*						
Yes	179	87.3	24.5	<0.0001	Not applicable ³	
No	26	22.7	18.2			

FCS¹: Food consumption scores during lockdown; FCS²: Food consumption scores during partial lifting of lockdown; HH: Household. ³ No food aid distribution was given during partial lifting of COVID-19 lockdown

*Food aid targeted only slum households, and was given only during lockdown

Values in the same column (for occupation and education of HH head) with different superscript letters are significantly different ($p < 0.05$) according to the Bonferroni test.

Table 4. Bivariate and multivariate logistic regression analysis of factors associated with food insecurity during COVID-19 lockdown in Nansana municipality, Wakiso district, Uganda

Variables	Food insecurity		COR (95%CI)	AOR (95% CI)
	Yes (%)	No (%)		
Residence				
Slum dwellers	194 (94.6)	11(5.4)	1.2(0.5-2.8)	
Non slum dwellers	187 (93.5)	13(6.5)	0.8(0.4-1.9)	
Sex of HH head				
Female	176 (95.1)	9(4.9)	1.4 (0.6-3.3)	
Male	205 (93.2)	15(6.8)	0.7 (0.3-1.6)	
Age range				
18-24	99(91.7)	9(8.3)		
25-44	199(95.2)	10(4.8)		
45-64	80(94.1)	5(5.9)		
65+	3(100)	0(0)		
HH size				
1-4	234 (95.1)	12(4.9)		
5-9	146(92.4)	12 (7.6)		
9+	1(100)	0(0)		
Occupation				
Daily wage	174(98.9)	2 (1.1)	9.2 (2.1-39.9)*	8.3(1.9-36.2)*
Unemployed ^a	95 (99)	1 (1.0)	7.6 (1.02-57.3)*	6.9(0.9-52.8)
Employed	112 (84.2)	21(15.8)	0.06(0.02-0.2)*	0.07(0.02-0.2)*
Received food aid				
Yes	71(96)	3(4)	1.6 (0.5-5.5)	
No	310(93.7)	21(6.3)	1.1(0.5-2.5)	
House ownership				
Owner	187 (93)	14(7)	0.7(0.3-1.6)	
Tenant	194(95)	10 (5)	1.5(0.6-3.4)	

HH = Household, COR = Crude odds ratio, AOR = adjusted odds ratio, CI = confidence interval; *Significant association at 95% CI and $p < 0.05$; ^a Includes those who get remittance as source of income.

Table 5. Bivariate and multivariate logistic regression analysis of factors associated with food insecurity during partial lifting of COVID-19 lockdown in Nansana municipality, Wakiso district, Uganda

Variables	Food insecurity		COR (95%CI)	AOR (95% CI)
	Yes (%)	No (%)		
Residence				
Slum	202(98.5)	3(1.5)	12.3(1.6-93.8)*	11.8(1.5-91.3)*
Non slum	188(94.0)	12(6.0)	0.2(0.06-0.8)*	0.2(0.07-0.9)*
Sex of HH head				
Female	184 (99.5)	1(0.5)	13.5(1.8-102.9)*	11.9(1.5-92.7)*
Male	205 (93.2)	15(6.8)	0.1 (0.01-0.6)*	0.1(0.01-0.7)
Age range				
18-24	104(96.3)	4(3.7)		
25-44	199 (95.2)	10(4.8)		
45-64	83(97.6)	2 (2.4)		
65+	3 (100)	0(0)		
HH size				
			0.6(0.2-1.7)	
1-4	238(96.7)	8(3.3)		
5-8	150 (94.9)	8(5.1)		
9+	1(100)	0(0)		
Occupation				
Daily wage	175(99.4)	1(0.6)	12.3(1.6-93.8)*	10.7(1.4-82.9)*
Unemployed	93(96.9)	3(3.1)	1.4(0.4-4.9)	
Employed ^a	121 (91)	12(9.0)	0.2(0.05-0.5)*	0.2(0.06-0.7)*
House ownership				
Owner	188(93.5)	13(6.5)	0.2(0.06-0.76)*	0.2(0.7-0.9)*
Tenant	201(98.5)	3(1.5)	4.6 (1.3-16.5)*	4.0(1.1- 14.7)*

*Significant association at 95% CI and $p < 0.05$

^a Includes those who get remittance as source of income

HH = Household, COR = Crude odds ratio, AOR = adjusted odds ratio, CI = Confidence interval

Figures



Figure 1

Uganda peoples' defense forces distributing food and a woman in a slum household who has received food of common beans and maize flour during COVID-19 lockdown in urban Kampala Uganda [30].

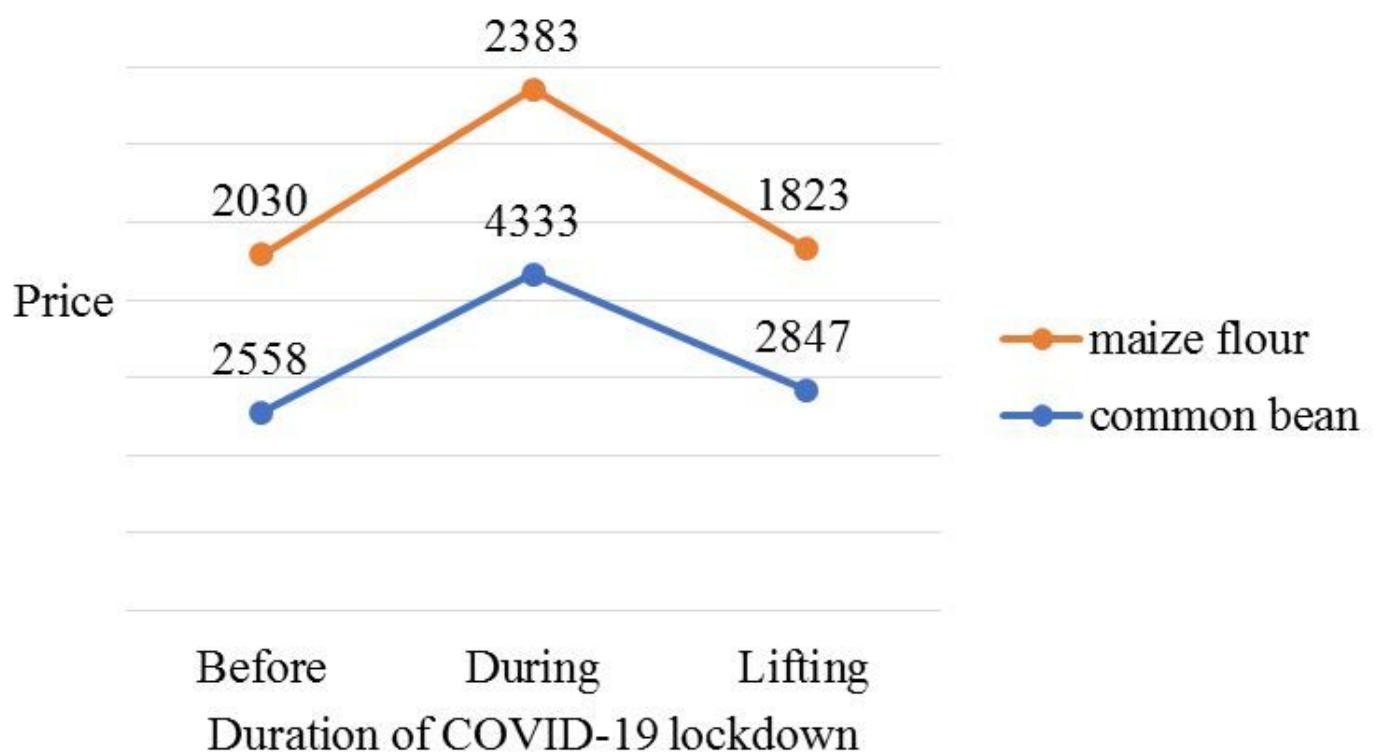


Figure 2

Maize flour and common bean price volatility before, during and after lifting COVID-19 lockdown in Nansana Municipality Wakiso district Uganda.