The effects of COVID-19 on food insecurity, financial vulnerability and housing insecurity among women and girls living with or at risk of HIV in Nigeria‡

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Aim: Women and girls living with or at high risk of acquiring HIV (WGL&RHIV) in Africa are economically vulnerable. This study aims to advance understanding of the economic impact of COVID-19 on WGL&RHIV and to identify the factors associated with this insecurity.

Methods: Data were collected from a cross-sectional survey conducted among a convenience sample of WGL&RHIV in Nigeria between May and September 2021. Logistic regressions enabled the study of the role of HIV status, mental health and macrosocial characteristics (people with disability, transgender women, sex workers, persons engaged in transactional sex, substance users, and people on the move) on economic vulnerability, measured by food, financial and housing insecurity, since the COVID-19 pandemic began. The model accounted for the possible interactions between the macrosocial characteristics and controlled for confounders.

Results: There were 3 313 (76.1%) of 4 355 respondents facing food insecurity, 3 664 (83.6%) of 4 385 with financial vulnerability and 1 282 (36.2%) of 3 544 with housing insecurity. Being a member of the key and vulnerable groups was strongly associated with food insecurity, financial vulnerability and housing insecurity, regardless of HIV serostatus. For example, WGL&RHIV engaging in transactional sex were more than four times more likely (aOR 4.42; 95% CI 2.57–7.59) to face housing insecurity and more than twice more likely to face food insecurity (aOR 2.47, 95% CI 1.35–4.52) and financial vulnerability (aOR 2.87, 95% CI 1.39–5.93). This economic vulnerability may reduce their negotiating power for safer sex or the use of HIV prevention methods, exposing them to increased risks of HIV infection. Poor mental health was also associated with the three forms of economic vulnerability.

Conclusions: As the long-term impact of the COVID-19 crisis on African economies unfolds, HIV programmes at the country level must include economic vulnerability and mental unwellness mitigation activities for WGL&RHIV.

Keywords: COVID-19, HIV, economic impact, sex work, transgender people, women

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Introduction

The COVID-19 pandemic has been associated with the re-organisation of multiple national systems, significantly impacting individual, household and government finances. Since the outbreak of the pandemic, the real global gross domestic product (GDP) growth rate dropped by more than six percentage points between 2019 and 2020 (International Monetary Fund, 2022), reflecting a deeper recession than the financial crisis of 2008–2009 (Laborde et al., 2020). The number of undernourished people increased by about 150 million in 2021 compared to 2019, with the most worrisome increases in sub-Saharan Africa (Food and Agricultural Organization of the UN, 2022). Food production has been disrupted and household food insecurity has increased due to persistently low income and inadequate financial savings associated with a decline in consumption from low-income households (Éliás & Jámbor, 2021).

Food insecurity at the household level is driven mainly by financial vulnerability and less by food availability (Béné et al., 2021). The COVID-19 pandemic has deepened structural problems associated with low income, thereby increasing poverty (Éliás & Jámbor, 2021). The economic instability resulting from the pandemic is estimated to have caused the equivalent of 114 million job losses globally (International Labour Organization, 2021), increasing household vulnerability to multiple forces of poverty, one of which is housing insecurity. Housing insecurity is associated with mental distress (Linton et al., 2021), as are financial and food insecurities (Witteveen & Veilhors, 2020; Fang et al., 2021).

The COVID-19 pandemic has been associated with food insecurity in Nigeria. The pandemic caused significant agricultural productivity and market disruptions, negatively affecting people’s ability to produce, process and distribute food (USAID, 2021). This resulted in a 12 percentage-point reduction in the probability of participation in non-farm business activities (Amare et al., 2021) and a six to 15 percentage-point increase in households’ experience of food insecurity (ibid.). The impact has been most felt by vulnerable households, though the impact has differed by state (Martinez, 2021) and population (Folayan et al., 2021; Samuel et al., 2021).

Nigeria experienced a four percentage-point reduction in GDP growth in 2020, amounting to USD 18.7 billion. Households lost an estimated 33% of their incomes, with the heaviest losses occurring in rural non-farm and urban households. The pandemic caused a temporary 14 percentage-point increase in the poverty headcount rate, with 27 million additional people falling below the poverty line during the lockdown (Andam et al., 2020a; Andam et al., 2020b). As many as 56% of the people in Nigeria experienced financial loss (Folayan et al., 2021).

Little is known about the impact of the COVID-19 pandemic on housing insecurity in Nigeria. Nigeria has the largest homeless population globally due to displacement by natural disasters (United Nations, 2020). An estimated 108 million Nigerians have inadequate housing, and approximately 24.4 million people (13% of the nation’s population) have no roof over their heads (Kayode, 2018; United Nations, 2020; World Bank, 2020). Considering that poverty is strongly associated with homelessness, the reduction in household incomes (Andam et al., 2020a; Andam et al., 2020b) may have worsened the homelessness crisis in Nigeria.

Poverty worsens financial, food and housing insecurity. Women are more vulnerable to poverty (Bastos et al., 2009), and poverty is worse in female-headed households (Anyanwu, 2010). HIV also adversely affects households’ finances through the financial and opportunity costs of productive time reallocated to care (Greenier, 2004). Women and girls living with HIV in Nigeria are at risk of a syndemic of financial, food and housing insecurity due to the COVID-19 pandemic. We found no studies exploring the risks of women and girls living with or at risk for HIV concerning financial, food and housing insecurity. This study tried to address this knowledge gap. Therefore, we aimed to identify the proportion of women and girls living with or at risk of HIV who had to deal with financial, food and housing insecurity and the factors associated with financial, food and housing insecurity in this vulnerable population.

We designed the study using Bronfenbrenner’s ecological theory (1979) to conceptualise the analytical framework. The ecological theory unfolds the interconnectedness between the individual, household and structural factors and access to essential resources. In this instance, the socio-ecological approach helps us understand how individual and macrosocial factors may have exacerbated food, financial and housing insecurity.

Methods

Ethical considerations

The Institute of Public Health Research Ethics Committees approved the study protocol (IPH/OAU/12/1692). The study protocol was additionally approved by the ethics committee in the six states where venue-based and snowballing sampling were conducted (ADHEC07/06/2021 for Adamawa State; MH/AWK/M/321/363 for Anambra State; MH/PRS/99/Vol.V/994 for Akwa Ibom State; MOH/STA/208/Vol.1/183 for Benue State; MOD/ADM/774/Vol.1/1008 for Kaduna State; and LS/C.350/S.1/215 for Lagos State). Data were collected anonymously. The confidentiality, privacy, rights and welfare of the research participants were safeguarded through measures taken to prevent the unintended collection of IP addresses. Participants provided written informed consent before starting the online questionnaire by ticking a checkbox. Study participants also received airtime vouchers for data or internet usage of 1 000 naira (=USD 1.70).

Study design, study sites and study population

The data for this study came from a cross-sectional countrywide survey that collected data from 4,547 participants between 30 June and 1 October 2021. This period coincided with the interval between Nigeria’s second and third waves of the COVID-19 epidemic. Participants from Adamawa, Akwa Ibom, Anambra, Benue, Kaduna and Lagos states were recruited using venue-based and snowballing sampling methods. Participants were also recruited from Enugu, Nasarawa, Gombe and Niger states using the online river sampling method. (Supplementary Table S1 provides details on the distribution of the study participants per geopolitical zone.)

The survey recruited adolescent girls and women living...
with or at risk of HIV, with a focus on women with disabilities (women with long-term physical or sensory impairments), women who sell sex (women engaging in commercial sex work), women on the move (migrants, refugees, asylum seekers, returning migrants and displaced persons), women who use psychoactive substances (women injecting or using illegal drugs), women who engage in transactional sex (women entering into a sexual relationship with a man – not a husband or partner – to obtain necessities such as food, clothing, school fees and gifts) and transgender women.

**Study instrument**

The questionnaire for the survey contained validated instruments for collecting data from women and key populations. The questionnaire went through three steps of internal and external validation. It was first reviewed and revised by a multidisciplinary team of scientists, with particular attention given to the elaboration of questions, the selection of validated instruments and their relevance to the objectives of the survey. The revised questionnaire was then reviewed by 18 field workers and 36 community representatives. We pretested the final version of the questionnaire with 18 community members. Finally, we harmonised the questionnaire’s content with standard indicators and protocol checklists used in behavioural surveillance.

The data were collected using a web-based survey platform, LimeSurvey™. Data were stored encrypted on the European server, compliant with EU Regulation 2016/679 on the General Data Protection Regulation (GDPR). The survey was made available in English. Keywords in the questionnaires were translated into Yoruba, Igbo, Hausa and specific dialects or local languages predominant in the states identified for the study. Translation of keywords and phrases into local dialects were made in consultation with community leaders participating in the project. A similar approach was successfully implemented in the 2005 and 2007 National HIV/AIDS and Reproductive Health surveys, as well as the 2008 and 2010 Integrated Biological and Behavioural Surveillance surveys conducted in Nigeria.

**Study procedures**

The project team consulted with national networks of the community of women recruited for this study. The community network leaders selected the states where study participants were recruited by prioritising states where a community leader could facilitate access to a large population of community members and where the security of the research team members and community members would not be compromised. The network leaders also reviewed the study instrument for the use of community-sensitive languages. They identified the community leaders who would initiate the community entry for each population group in each target state.

The research team conducted a three-day online training session for all data collectors and supervisors. They were trained on the administration of the questionnaire, communication with participants, ethics of research engagement and the study implementation process. Data collectors were linked to community leaders for each target group and state.

In each state, the data collectors and their supervisors held a two-day training session with community leaders about the study protocol, the study tools and their role as seeds for recruitment of community members. Recruitment strategies were discussed and adjusted to ensure a diversity of locations (rural, urban and semi-urban) and socio-economic strata of study participants. The supervisors monitored the sampling diversity in each state.

Participants were recruited through two non-probabilistic, purposive sampling methods – venue-based and snowball. For venue-based sampling, community leads working with civil society organisations, community-based organisations and networks at the state level discussed the study with community members. Study participants were provided with a weblink to the survey to enable them to fill in the questionnaire independently using phone, tablet or computer-assisted self-interviewing. If the participant had literacy issues, the interviewer offered computer-assisted personal interviewing. For snowball sampling, respondents who completed the survey were given coupons to invite up to five peers who may not have been connected to community organisations. Participants recruited through the online river sampling method in Enugu, Gombe and Niger states were asked by the community leaders in these states to post the survey link on social media (Facebook, Twitter, Instagram and WhatsApp groups) or email networks and invite peers to take the survey.

**Dependent variables of the study**

We selected three key variables to examine the change in the vulnerability of adolescent girls and women living with or at risk of HIV: food insecurity, financial vulnerability and housing insecurity.

Food insecurity was measured using a self-reported response to the question “Since the COVID-19 crisis began, do you eat less or skip meals because there was not enough money for food?” The answer was either “yes” or “no”. The question was adapted from a validated questionnaire (Santos et al., 2020).

Financial vulnerability was measured using self-reported response to the question “Do you have enough money today to cover the daily expenses of today and tomorrow?” The possible response options were “yes” and “no”. Negative responses were categorised as being financially vulnerable in the time of COVID-19. This is a standard question used in surveys (Santos et al., 2020).

Housing insecurity was measured using the self-reported response to the question “Since the COVID-19 crisis began, did you move in with other people, even for a little while, because of financial problems?” The possible response options were “yes”, “no” and “I cannot or do not wish to answer the question”. The “yes” responses were classified as facing housing insecurity in the time of COVID-19 and the “no” responses as not facing housing insecurity. The question was adapted from a validated questionnaire (Santos et al., 2020).

**Independent variables of the study**

**Individual-level factors**

Individual-level factors that could affect vulnerability status include age, education status, residential location, HIV status
and mental well-being. Age groups were 15–24 years, 25–44 years and ≥45 years old. Education status was categorised into no formal education and primary, secondary/vocational and post-secondary/university levels. Residential location was dichotomised into urban and not urban. HIV status was self-reported in response to the question “Do you know your HIV status?”. The response options were “I am HIV positive”, “I am HIV negative”, “Do not know” and “I cannot or do not want to answer this question”. Considering that people do not test for the same reasons they do not disclose their HIV status (Kingdon et al., 2016; Grainger, 2017; Nwaozuru et al., 2019), the responses “I don’t know” and “I cannot or do not want to answer this question” were combined into a single response.

Mental well-being was measured using the Patient Health Questionnaire-4 (PHQ-4), a four-item Likert-type scale instrument to screen for depression and anxiety (Kroenke et al., 2009). The tool has been validated for brief screening of self-reported depression and anxiety and used for the assessment of psychological distress during the COVID-19 pandemic in Nigeria (Workneh et al., 2021). The possible range of scores is from 0 to 12. Psychological distress was categorised into none (0–2), mild (3–5), moderate (6–8) and severe (9–12). For this study, the Cronbach’s alpha score was 0.879.

Macrosocial factors
The survey collected specific information on six key and vulnerable population groups: people with disabilities, transgender women, women who sell sex, women who use psychoactive substances, people on the move and people engaged in transactional sex. These categories were not mutually exclusive. Participants could identify themselves in more than one category. We adjusted the models to account for interactions between each of these categories.

Data analysis
We first conducted a bivariate analysis to determine the associations between the dependent and independent variables. We used Pearson’s chi-squared for the test of associations. The results are presented in supplementary Table S2. Subsequently, we performed three multivariable logistic regression models for the three dependent variables of food insecurity, financial vulnerability and housing insecurity, with interactions between each key and vulnerable population group, one for each dependent variable as a result of the COVID-19 pandemic. We additionally controlled for confounders and interaction between education levels and age groups. We considered statistical significance at a p-value less than 0.05. All statistical analyses were performed using STATA16 (StataCorp., 2019).

Results
Sociodemographic characteristics
A total of 4,556 consenting women older than 15 years at high risk of HIV or living with HIV completed the survey across the six geopolitical zones. The sociodemographic characteristics of the sample per HIV status are provided in Table 1. The survey purposefully sampled HIV-positive women, therefore these proportions do not reflect general population prevalence values. Most participants (53.9%) were adults (25–44 years old), and 45.4% had completed secondary school. Overall, 81.7% of the cohort were cisgender women, and 96.1% were Nigerian. Among all participants, 63.0% were living in urban areas, more than 42% belonged to the middle subjective socio-economic status quintile, and the majority (65.7%) had worked in the last 30 days.

Overall reporting of the impact of the COVID-19 pandemic on economic vulnerability
Table 2 shows the results of the multivariable regressions for the three variables of interest, i.e., food insecurity, financial vulnerability and housing insecurity. The results for each model are presented below.

Food insecurity
Adolescent girls and young women with an adjusted odds ratio (aOR) of 0.60 and a 95% confidence interval (95% CI) of 0.46–0.78 and participants with higher education (aOR 0.60; 95% CI 0.46–0.80) and living in urban settings (0.75, 95% CI 0.61–0.92) had significantly lower odds of reporting food insecurity since the COVID-19 pandemic started. There was no statistical difference between participants living with HIV and those who were HIV negative regarding food insecurity. Despite being non-significant at a 95% confidence interval, those who ignored their HIV status ($p = 0.054$) had 1.36 times (95% CI 0.99–1.85) higher odds of reporting food insecurity since the COVID-19 pandemic started. Symptoms of anxiety and depression were associated with food insecurity, with those with severe symptoms having 1.72 times (95% CI 1.28–2.30) significantly higher odds of reporting food insecurity. Participants engaging in sex work had over three times (aOR 3.02; 95% CI 1.03–8.89) and those who engaged in transactional sex had almost two and half times (aOR 2.47; 95% CI 1.35–4.52) significantly higher odds of food insecurity since the COVID-19 pandemic started, compared to those not engaging in these practices. People on the move had almost two times significantly higher odds of reporting food insecurity since the COVID-19 crisis started (aOR 1.93; 95% CI 1.90–3.56). Finally, women and girls living with a disability had slightly higher odds (aOR 1.42; 95% CI 1.04–1.95) of food insecurity since the COVID-19 crisis started compared to those without a disability.

Financial vulnerability
Participants with no formal education or a primary level of education reported higher odds (1.41; 95% CI 1.01–1.98) of facing financial vulnerability compared to those with secondary education. No statistical difference existed between participants living in urban or rural settings regarding economic vulnerability. Participants living with HIV had slightly lower odds (aOR 0.74; 95% CI 0.60–0.92) of not having enough money to cover current expenses. Those who ignored their HIV status, or did not want to disclose it, had non-significantly ($p = 0.053$) higher odds (aOR 1.45; 95% CI 1.00–2.12) of reporting financial vulnerability. Women and girls reporting severe symptoms of anxiety and depression were associated with more than twice higher odds (aOR 2.17; 95% CI 1.54–3.10) of not having enough money to cover current expenditures. Participants engaging in transactional sex were the most exposed group, with
an increase of almost three times in their odds of being financially vulnerable (aOR 2.87; 95% CI 1.39–5.93). People who used drugs (aOR 2.29; 95% CI 1.23–4.24) and those living with a disability (aOR 2.00, 95% CI 1.35–2.97) had twice significantly higher odds of being financially vulnerable compared to participants who were not members of these key and vulnerable population groups.

Housing insecurity
Participants living in urban areas, i.e., a town or large city, reported slightly higher odds of housing insecurity since the COVID-19 pandemic started when compared to respondents living in rural areas (aOR 1.27; 95% CI 1.02–1.58). Mental unwellness was associated with increased housing insecurity. Participants with severe symptoms of anxiety and depression had more than two times significantly higher odds (aOR 2.20; 95% CI 1.64–2.96) of reporting housing insecurity. No statistical difference existed between HIV status, but we found significant differences in categories of key and vulnerable groups. Except for participants living with a disability and people on the move, all key and vulnerable groups included in the study had higher odds of reporting housing insecurity. Participants engaging in transactional sex had more than four times higher odds (aOR 4.41; 95% CI 2.57–7.59) and those engaging in sex work had more than three times higher odds (aOR 3.51; 95% CI 1.47–8.38) of reporting housing insecurity. Women and girls who used drugs (aOR 2.57; 95% CI 1.51–4.40) and transgender women (aOR 2.26; 95% CI 1.24–4.11) had more than twice higher odds of reporting housing insecurity.

The study highlighted the strong relationship between poor mental health and food insecurity, financial vulnerability and housing insecurity. An increasing probability of exposure exists for the three dependent variables as symptoms of anxiety and depression increase. As illustrated in Figure 1, both the food and housing insecurity elasticities of mental unwellness are positive and monotonic. This highlights the constantly increasing probability of facing these types of vulnerability as symptoms of anxiety and depression increase.

### Table 1. Sociodemographic characteristics of women at high risk of HIV or living with HIV

| Characteristic                               | Total (N = 4 456) | Self-reported HIV-positive (n = 2 076) | Self-reported HIV-negative (n = 1 884) | Don’t know or don’t want to disclose HIV status (n = 496) |
|----------------------------------------------|-------------------|----------------------------------------|----------------------------------------|----------------------------------------------------------|
|                                             | (%) (n)           | (%) (n)                                | (%) (n)                                | (%) (n)                                                  |
| Age group                                   | (χ²(4) = 87.82, p < 0.001) |                                       |                                       |                                                          |
| Adolescent girls & young women (15–24 years) | 38.15 1 700       | 37.28 1 441                            | 34.39 1 089                           | 56.05 1 441                                              |
| Adults (25–44 years)                        | 53.86 2 400       | 54.77 1 137                            | 57.80 1 089                           | 35.08 1 441                                              |
| Older adults (45+ years)                    | 7.99 356          | 7.95 165                               | 7.80 147                             | 8.87 1 441                                              |
| Highest level of education                  | (χ²(4) = 48.96, p < 0.001) |                                       |                                       |                                                          |
| From none to primary education              | 50.08 2 228       | 50.51 1 084                            | 50.51 1 084                           | 50.51 1 084                                              |
| Secondary education                         | 45.40 2 023       | 46.48 965                              | 46.48 965                            | 46.48 965                                                |
| Post-secondary or university degree         | 4.52 20           | 3.01 10                                | 3.01 10                              | 3.01 10                                                  |
| Missing                                     | 0.45 20           | 0.48 10                                | 0.48 10                              | 0.48 10                                                  |
| Location                                    | (χ²(12) = 94.82, p < 0.001) |                                       |                                       |                                                          |
| A large city                                | 10.41 464         | 9.3 193                                | 9.3 193                              | 9.3 193                                                  |
| A town                                      | 52.78 2 352       | 55.11 1 144                            | 55.11 1 144                           | 55.11 1 144                                              |
| A village                                   | 33.19 1 479       | 30.49 633                              | 30.49 633                            | 30.49 633                                                |
| A farm or isolated house                    | 2.69 120          | 4 83                                   | 4 83                                 | 4 83                                                     |
| Missing                                     | 0.92 41           | 1.11 23                                | 1.11 23                              | 1.11 23                                                  |
| Nationality                                 | (χ²(9) = 32 000, p < 0.001) |                                       |                                       |                                                          |
| Nigeria                                     | 96.10 4 282       | 96.97 2 013                            | 96.97 2 013                           | 96.97 2 013                                              |
| Other African countries                     | 3.01 134          | 1.83 38                                | 1.83 38                              | 1.83 38                                                  |
| Other non-African countries                 | 0.04 2            | 0.05 1                                 | 0.05 1                               | 0.05 1                                                   |
| Missing                                     | 0.85 38           | 1.16 24                                | 1.16 24                              | 1.16 24                                                  |
| Gender identity                             | (χ²(12) = 110.78, p < 0.001) |                                       |                                       |                                                          |
| Woman                                       | 81.69 3 640       | 80.88 1 679                            | 80.88 1 679                           | 80.88 1 679                                              |
| Transgender                                 | 14.30 637         | 15.75 327                              | 15.75 327                            | 15.75 327                                                |
| I cannot or do not wish to answer           | 0.61 27           | 0.82 17                                | 0.82 17                              | 0.82 17                                                  |
| Other                                       | 1.53 68           | 0.67 14                                | 0.67 14                              | 0.67 14                                                  |
| I don’t know                                | 0.74 33           | 0.48 10                                | 0.48 10                              | 0.48 10                                                  |
| Missing                                     | 1.14 51           | 1.4 29                                 | 1.4 29                               | 1.4 29                                                   |
| Subjective socio-economic status            | (χ²(9) = 14 000, p < 0.001) |                                       |                                       |                                                          |
| Lowest tercile                              | 35.82 1 596       | 37.52 779                              | 37.52 779                            | 37.52 779                                                |
| Middle tercile                              | 42.15 1 878       | 38.39 797                              | 38.39 797                            | 38.39 797                                                |
| Highest tercile                             | 20.76 925         | 22.06 458                              | 22.06 458                            | 22.06 458                                                |
| Missing                                     | 1.28 57           | 2.02 42                                | 2.02 42                              | 2.02 42                                                  |
| Had work in the last 30 days                | (χ²(6) = 975.13, p < 0.001) |                                       |                                       |                                                          |
| Yes                                         | 65.73 2 929       | 64.31 1 335                            | 64.31 1 335                           | 64.31 1 335                                              |
| No                                          | 31.87 1 420       | 32.85 682                              | 32.85 682                            | 32.85 682                                                |
| Missing                                     | 2.40 107          | 2.84 59                                | 2.84 59                              | 2.84 59                                                  |
| Variable                                | Food insecurity | Financial vulnerability | Housing insecurity |
|----------------------------------------|-----------------|-------------------------|--------------------|
|                                        | aOR             | p-value                 | 95% CI             | aOR              | p-value | 95% CI   | aOR         | p-value | 95% CI   |
| Age groups                             |                 |                         |                    |                  |         |           |             |         |           |           |
| Adolescent girls & young women (15–24 years) | 0.602           | <0.001                  | 0.463              | 0.783             | 0.870   | 0.358     | 0.647       | 1.171   | 0.862     | 0.289     | 0.654     | 1.135     |
| Adults (25–44 years)                   | base            |                         | base               | base             |         |           |             |         |           |           |           |           |
| Older adults (45+ years)               | 2.037           | 0.070                   | 0.944              | 4.395             | 1.332   | 0.432     | 0.652       | 2.721   | 0.853     | 0.664     | 0.416     | 1.750     |
| Education level                        |                 |                         |                    |                  |         |           |             |         |           |           |           |           |
| From none to primary education         | 0.820           | 0.177                   | 0.615              | 1.094             | 1.413   | 0.043     | 1.010       | 1.977   | 0.796     | 0.145     | 0.586     | 1.082     |
| Secondary education                    | base            |                         | base               | base             |         |           |             |         |           |           |           |           |
| Post-secondary or university degree    | 0.602           | <0.001                  | 0.463              | 0.783             | 0.870   | 0.358     | 0.647       | 1.171   | 0.894     | 0.449     | 0.670     | 1.194     |
| Location                               |                 |                         |                    |                  |         |           |             |         |           |           |           |           |
| Urban                                  | 0.749           | 0.005                   | 0.612              | 0.916             | 0.861   | 0.203     | 0.684       | 1.084   | 1.270     | 0.032     | 1.021     | 1.580     |
| Not urban                              | base            |                         | base               | base             |         |           |             |         |           |           |           |           |
| HIV status                             |                 |                         |                    |                  |         |           |             |         |           |           |           |           |
| HIV-negative                           |                 |                         | base               | base             |         |           |             |         |           |           |           |           |
| HIV-positive                           | 1.041           | 0.668                   | 0.866              | 1.252             | 0.744   | 0.005     | 0.604       | 0.915   | 0.912     | 0.357     | 0.749     | 1.110     |
| Don’t know or cannot answer            | 1.356           | 0.054                   | 0.994              | 1.850             | 1.453   | 0.053     | 0.995       | 2.122   | 1.027     | 0.883     | 0.720     | 1.466     |
| Symptoms of anxiety and depression     |                 |                         |                    |                  |         |           |             |         |           |           |           |           |
| None                                   |                 |                         |                    |                  |         |           |             |         |           |           |           |           |
| Mild symptoms                          | 1.197           | 0.105                   | 0.963              | 1.488             | 1.564   | <0.001    | 1.222       | 2.002   | 1.131     | 0.363     | 0.867     | 1.475     |
| Moderate symptoms                      | 1.412           | 0.004                   | 1.114              | 1.788             | 1.254   | 0.083     | 0.971       | 1.619   | 1.533     | 0.002     | 1.173     | 2.003     |
| Severe symptoms                        | 1.715           | 0.000                   | 1.278              | 2.302             | 2.177   | <0.001    | 1.535       | 3.089   | 2.201     | <0.001    | 1.638     | 2.956     |
| Macrosocial categories of vulnerability|                 |                         |                    |                  |         |           |             |         |           |           |           |           |
| Living with a disability               | 1.424           | 0.027                   | 1.040              | 1.948             | 2.003   | 0.001     | 1.353       | 2.966   | 1.187     | 0.453     | 0.759     | 1.857     |
| Transgender                            | 1.120           | 0.654                   | 0.683              | 1.837             | 1.685   | 0.089     | 0.923       | 3.075   | 2.256     | 0.008     | 1.239     | 4.108     |
| People who use drugs                   | 1.490           | 0.097                   | 0.930              | 2.389             | 2.285   | 0.009     | 1.233       | 4.236   | 2.573     | 0.001     | 1.505     | 4.399     |
| Engaged in sex work                    | 3.023           | 0.044                   | 1.028              | 8.891             | 1.790   | 0.249     | 0.665       | 4.820   | 3.512     | 0.005     | 1.473     | 8.377     |
| Engaged in transactional sex           | 2.467           | 0.004                   | 1.345              | 4.524             | 2.873   | 0.004     | 1.392       | 5.929   | 4.418     | <0.001    | 2.571     | 7.592     |
| People on the move                     | 1.529           | <0.001                  | 1.346              | 2.765             | 0.952   | 0.967     | 0.690       | 1.427   | 1.309     | 0.264     | 0.816     | 2.101     |
| Constant                               | 2.598           | <0.001                  | 1.894              | 3.564             | 3.156   | <0.001    | 2.225       | 4.481   | 0.077     | <0.001    | 0.052     | 0.115     |
| Number                                 | 3 177           |                         | 3 145              | 3 193             | 1 655.6 |            | 1 365.4     | 1 463.69| 182.27    | 172.46    | 291.34    |
| Log likelihood                         | −2 145          |                         | −1 365.4           | −1 463.69         | 1 655.6 |            | 1 365.4     | 1 463.69| 182.27    | 172.46    | 291.34    |
| Likelihood ratio                       | χ²(47) = 182.27  |                         | χ²(42) = 172.46     |                   | χ²(49) = 291.34 |
| Probability > χ²                        | 0.0000          |                         | 0.0000             |                   | 0.0000  |            | 0.0000      | 0.0000  | 0.0000    | 0.0000    | 0.0000    | 0.0000    |
tied to job loss and income. Women are more likely to use lifetime coping mechanisms. The financial crises people are prepared to face financial insecurity due to developing better financial status than those who were HIV negative. Women living with HIV may also be less likely to face financial vulnerability than those who were HIV negative. This economic vulnerability many African women faced, i.e. food, financial and housing insecurity.

Adolescent girls and women living with or at high risk of HIV can belong to more than one category of vulnerability to HIV, such as being young, using drugs, engaging in transactional sex, or all three together. The models developed in this study account for the multiple interactions between the different dimensions of vulnerability to HIV infection.

Age does not appear to be a vulnerability-increasing factor. Adolescent girls and young women from 15 to 24 years old were the least exposed to food insecurity and economic vulnerability since the COVID-19 crisis started. There seems to be no significant difference between adults (25–44 years old) and older adults (45+ years old). The latter were less exposed to housing insecurity compared to the reference age group of 25–44-year-olds.

There are two important findings from this study. First, it appears that being a member of key and vulnerable population groups exposes women and girls to economic vulnerability due to the COVID-19 crisis more than their HIV status. This economic vulnerability was measured in terms of food, financial and housing insecurity. This statement still holds after controlling for the potentially confounding role of HIV status among key and vulnerable population groups. Moreover, for the particular case of financial vulnerability, women living with HIV were slightly less likely to face financial vulnerability than those who were HIV negative. Women living with HIV may also be better prepared to face financial insecurity due to developing lifetime coping mechanisms. The financial crises people experienced during the pandemic have been primarily tied to job loss and income. Women are more likely to be self-employed in Africa (Lain, 2019). People living with HIV are also more likely to be self-employed to reduce the risk of stigma and discrimination. Self-employed people fared better during the pandemic (Mindes & Lewin, 2021). The results also suggested, but with a lower confidence interval, that women and girls who did not know their HIV status may have specific risks that women and girls who are knowingly either HIV negative or positive. An estimated 10% (95% CI 2%–33%) of people living with HIV in Nigeria do not know their HIV status (UNAIDS, 2022). Prior studies seem to suggest that people who do not know their HIV status or do not want to disclose their HIV status are a large enough and distinct enough population to be managed as an independent population to plan for. This should be confirmed with additional studies.

Second, the study showed that transgender women, adolescents and women living with disabilities, those who use drugs, those engaging in sex work and those engaging in transactional sex are significantly more likely to face increased vulnerability since COVID-19 started. The two latter groups are the most severely impacted by the social and economic situation generated in the wake of the COVID-19 pandemic. Adolescent girls and women engaging in sex work were more than three times more likely to face food insecurity and housing insecurity. Women and girls engaging in transactional sex were twice more likely to face food insecurity, almost three times more likely to face financial vulnerability and more than four times more likely to face housing insecurity. The economic vulnerability accompanying the COVID-19 crisis can put these women and girls in situations where their negotiating power for safer sex or adequate HIV prevention methods with their clients or transactional sex partners is reduced.

This study provides the first insight into how the COVID-19 pandemic has affected the well-being of women and girls living with or at high risk of HIV in Nigeria. The COVID-19 pandemic is associated with financial downturns at the national and global levels that can cause psychological distress (Sekścińska et al., 2022). In particular, social isolation, anxiety and stress are causes of psychological distress for people living with HIV during the COVID-19 pandemic (Paris et al., 2022). Psychologically distressed individuals are less likely to be economically optimistic and are at risk of financial insecurity during a crisis (Sekścińska et al., 2022). Women and girls may be at increased risk for financial insecurity because of the increased risk for

Discussion

Based on the responses from more than 3,000 adolescent girls and women living with or at high risk of HIV in Nigeria, we observed multiple and convergent signs of increased vulnerability among the different most-at-risk population groups. We estimated the impact of the COVID-19 crisis and its sanitary measures on three key variables that reflect the economic vulnerability many African women faced, i.e. food, financial and housing insecurity.

Adolescent girls and women living with or at high risk of HIV can belong to more than one category of vulnerability to HIV, such as being young, using drugs, engaging in transactional sex, or all three together. The models developed in this study account for the multiple interactions between the different dimensions of vulnerability to HIV infection.

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There are two important findings from this study. First, it appears that being a member of key and vulnerable population groups exposes women and girls to economic vulnerability due to the COVID-19 crisis more than their HIV status. This economic vulnerability was measured in terms of food, financial and housing insecurity. This statement still holds after controlling for the potentially confounding role of HIV status among key and vulnerable population groups. Moreover, for the particular case of financial vulnerability, women living with HIV were slightly less likely to face financial vulnerability than those who were HIV negative. Women living with HIV may also be better prepared to face financial insecurity due to developing lifetime coping mechanisms. The financial crises people experienced during the pandemic have been primarily tied to job loss and income. Women are more likely to be self-employed in Africa (Lain, 2019). People living with HIV are also more likely to be self-employed to reduce the risk of stigma and discrimination. Self-employed people fared better during the pandemic (Mindes & Lewin, 2021). The results also suggested, but with a lower confidence interval, that women and girls who did not know their HIV status may have specific risks that women and girls who are knowingly either HIV negative or positive. An estimated 10% (95% CI 2%–33%) of people living with HIV in Nigeria do not know their HIV status (UNAIDS, 2022). Prior studies seem to suggest that people who do not know their HIV status or do not want to disclose their HIV status are a large enough and distinct enough population to be managed as an independent population to plan for. This should be confirmed with additional studies.

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![Figure 1](image1.png)  
**Figure 1:** Probability of facing food insecurity, housing insecurity and financial vulnerability as symptoms of anxiety and depression increase among adolescent girls and women living with or at high risk of HIV in Nigeria
depression (Piccinelli & Wilkinson, 2000; Lavretsky & Newhouse, 2012; Markkula et al., 2015). Therefore, women and girls living with or at high risk of HIV need to be given priority in the aftermath of the COVID-19 crisis.

Our analysis provides an interesting starting point for developing a more nuanced understanding of the impact that COVID-19 has had on key and vulnerable groups. Importantly, we reached key and vulnerable population groups in sufficient numbers to meaningfully interpret the findings both through inter-group comparisons and against literature and other studies simultaneously developed as Nigeria and the African continent are witnessing the magnitude of the impact of the COVID-19 pandemic.

However, this study has some limitations. First, participants were recruited from a cross-sectional convenience sample. It was designed to understand the effect of COVID-19 on already-known vulnerable populations, and the sample was purposefully selected to represent very vulnerable groups in Nigeria. This survey was thus not a random sample for generalisability to the whole population. Comparisons to the general population should be made with caution. We believe that the study design was appropriate for the research question. Second, variables including the impact of COVID-19 on food insecurity, financial vulnerability, housing insecurity and HIV status were self-reported. Thus, we may have overestimated some factors due to the limitations of the self-report measures. Third, the study would have benefited from a pre-COVID-19 assessment as a legitimate baseline comparator. Such a baseline comparator does not exist because of the suddenness of and unpreparedness for the COVID-19 pandemic. We tried to answer this question using existing knowledge and built on it to generate the missing data. This approach seemed a most appropriate strategy when working with a lot of uncertainty requiring extraordinary solutions. The study limitations call for future confirmation studies.

Conclusion

The findings provide some preliminary insights into how the COVID-19 pandemic may have enhanced and exacerbated pre-existing economic vulnerabilities among adolescent girls and women living with or at high risk of HIV in an African country such as Nigeria. Being a member of key and vulnerable population groups disproportionately increases the likelihood of women and girls facing food insecurity, financial vulnerability and housing insecurity, regardless of their HIV status. Moreover, the study highlighted the deterrent relationship between the mental unwellness of Nigerian women and girls on the three dimensions of economic vulnerability, i.e. food, financial and housing insecurity. As African countries are witnessing the medium- and long-term impact of the COVID-19 pandemic on their population, HIV programmes at the country level need to include economic and mental unwellness mitigation activities for key and vulnerable adolescent girls and women living with or at high risk of HIV.

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