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# BMJ Open

## Who is getting the COVID-19 vaccine in urban informal settlements in Nairobi, Kenya? An Exploratory Analysis Using Unsupervised Learning

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# Who is getting the COVID-19 vaccine in urban informal settlements in Nairobi, Kenya? An Exploratory Analysis Using Unsupervised Learning

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**Abstract**

**Introduction:** The COVID-19 vaccine has been available in Kenya since March 2021, and the city of Nairobi has fully vaccinated 52% of adults. Concerns about misinformation and vaccine hesitancy have circulated but it is unclear what types of people or sub-groups may be more or less likely to get the vaccine creating concerns around equitable distribution. Unsupervised learning methods, such as K-means clustering, are data-dependent tools that can be applied to discover important clusters or categories of people within a survey sample and identify predictive patterns. The aim of this study is to illustrate the utility of unsupervised learning compared to more traditional methods of analysis in identifying archetypes within the population that may be more or less likely to get the COVID vaccine, particularly in urban slums that face economic and structural barriers to vaccine uptake.

**Methods:** A longitudinal prospective cohort study (n = 2,009 households) with recurring phone surveys was conducted across five informal settlements in Nairobi, Kenya to investigate knowledge, attitudes, and practices regarding COVID-19. Respondents were asked about COVID-19 vaccine acceptance (in February 2021 survey) and vaccine uptake (March 2022 survey). Three distinct clusters were estimated using K-means clustering and analyzed against outcomes of interest using likelihood ratio tests.

**Results:** We find that young adults despite higher educational attainment and fewer reported concerns regarding the pandemic were also less likely to intend to and ultimately get the vaccine. Older adults with larger households and more fears regarding economic impacts of the pandemic were more likely to get vaccinated, despite believing certain COVID-19 myths, potentially due to employment requirements.

**Conclusion:** Findings suggest this methodology can be a useful tool to characterize populations, with potential utility for improved targeted policy, programs and behavioral messaging to promote uptake of healthy behaviors and equitable distribution of prevention measures.

### ***What is already known on the topic***

The COVID-19 vaccine has only been available since 2020, and in our review of the peer-reviewed and grey literature we identified very few studies of vaccine hesitancy based in African countries such as Kenya, though achieving high coverage is critical for protection and equity.

Unsupervised learning methods, such as K-means clustering, have proven to be a useful and effective tool to identify sub-groups in a population that may benefit from more targeted programming and policies, but have not been applied in this context.

### ***What this study adds***

Due to the novel nature of COVID-19 and recent availability of the vaccine, we conducted an analysis using K-means clustering to identify key sub-groups in urban informal settlements in Nairobi, Kenya to understand barriers in vaccine uptake, which may be useful to policymakers as they aim to achieve high COVID-19 vaccine coverage and vaccine equity.

### ***How this study might affect research, practice or policy***

Our novel methodological approach of k-means clustering found that though uptake of the COVID vaccine was high in urban informal settlements in Nairobi, Kenya, significantly different groups of individuals were more or less likely to have received the vaccine, and these identified clusters were more accurate than demographic information alone, suggesting additional utility in identifying groups of people to target.

This study demonstrates the potential utility in using unsupervised learning methods with survey data to identify and target important groups, in this case those who are less likely to get the COVID-19 vaccine and can be applied widely to other similar situations.

## Background

The World Health Organization (WHO) officially declared COVID-19, a disease caused by the novel coronavirus SARS-CoV-2, a pandemic on March 11, 2020<sup>1</sup>. The first case of COVID-19 in Kenya was reported shortly after on March 13, 2020. To curb transmission, the Kenyan Government swiftly instated lockdown policies including restrictions on travel and large gatherings, and business and school closures. Experts were concerned that due to limited resources for distancing and hand washing and rapid urbanization, that populations in urban informal settlements would be at greater risk<sup>2</sup>. Many studies around COVID-19 and other outbreaks, such as Ebola, have cited loss of income, food insecurity, gender-based violence, mental health, and lack of access to healthcare needs as major downstream impacts of disease mitigation policies<sup>3–5</sup>. In the years since the pandemic began, restrictions have eased and with the rollout of COVID-19 vaccines in early 2021, the focus has shifted to increasing vaccination coverage. While vaccination is critically important, to date 82% of globally available doses have gone to high and upper middle-income countries, with only 0.2% delivered to low- and middle-income countries, highlighting continued vaccine inequity and injustice<sup>6–10</sup>.

The government of Kenya launched a phased rollout of COVID-19 vaccination from March 2021, starting with essential workers such as health providers, then the elderly and those with comorbidities. As of summer 2022, the strategy has expanded to include vaccination of anyone over 12 years of age, booster shots for adults who have completed vaccination, and double boosters for the elderly are recommended by the National Immunization Technical Advisory Group (NITAG). Certain jobs require vaccination such as civil servants, teachers, and potentially some private employers<sup>11–14</sup>. Ongoing campaigns aim to increase vaccination coverage, assuage concerns about vaccines, and promote uptake to protect Kenyans from severe outcomes and death as well as to protect from new and emerging variants. Vaccination is one of the most effective interventions to control the ongoing pandemic but vaccine acceptance rates vary<sup>15</sup>.

Vaccine hesitancy is a major ongoing concern as it is likely there will continue to be new vaccines or boosters required as the pandemic evolves. A study across 23 countries including Kenya found that soon after the vaccines were available (June 2021) over three-quarters (75.2%) of respondents reported vaccine acceptance, with reasons for vaccine hesitancy reported related to lack of trust in COVID-19 vaccine safety and science, and skepticism about its efficacy<sup>15</sup>. Other factors include misperceptions regarding individual level risk of contracting COVID-19 and the severity of infections<sup>15–20</sup> and fear of side effects<sup>21</sup>. Some people surveyed, report a general lack of trust in scientific institutions or health authorities which can also increase vaccine hesitancy<sup>15</sup>.



The COVID-19 vaccine in Kenya was initially rolled out to health workers including community health volunteers; an early study found hesitancy ranged from 10.2 - 44.6% across the study's four counties, with Nairobi County having the highest proportion that reported they intended to get the vaccine, particularly among those who had received training from the Ministry of Health<sup>22</sup>. A 2022 study from six Kenyan health facilities found that while 81% reported it was important to get the vaccine, 40.5% also reported concerns, mainly regarding side effects<sup>6</sup>. This study also found that hesitancy was higher in government and faith-based health institutions compared to private ones<sup>6</sup>.

Studies have shown that those receiving COVID-19 information from social media and Facebook have the highest rates of vaccine hesitancy since this information is not scientifically filtered or reviewed<sup>6,22</sup>. An Africa CDC report found that among those surveyed in Kenya, 65% reported having seen or heard at least some rumors about COVID-19<sup>23</sup>.

Understanding who is vaccine hesitant, who still has not received the vaccine, and why, may help better target messaging and behavioral interventions to increase uptake. An African CDC report found that in Kenya, 78% of those surveyed say that TV is a trusted source of information, with many reporting social media is a popular source<sup>23</sup>. In Nairobi, a study using a mobile phone survey revealed that government health messages through television, radio and SMS were among the most common sources of information for residents in urban informal settlements at the initial onset of the COVID-19 pandemic<sup>24</sup>. Government messaging, TV and online sources may be effective communication channels. These may also be useful channels to reach younger adults, who some studies suggest may be extremely hesitant because of perceived low risk of severe outcomes, mistrust in authority, and fear regarding side effects especially around infertility and pregnancy outcomes<sup>25-27</sup>.

This study aims to use exploratory analysis techniques to understand the overall characteristics and predictive patterns of residents of informal settlements in Nairobi and how that relates to key outcomes of interest. Using novel statistical techniques, we will explore clustering of our participants based on demographics, knowledge, perceptions, risks, and other factors, to determine if certain archetypes are present, and if so, their vulnerability to impacts of COVID-19 infection and mitigation policies. We tested multiple approaches ultimately using K-means analysis; this is a data-driven approach, meaning that the patterns are derived from the data itself, not preconceived theory about what may characterize 'types' of participants. Given the novelty of COVID-19, we used this approach to explore our dataset. K-means have been used in previous studies to group together participants in a dataset to predict prevention and treatment



strategies for each group<sup>28</sup>. We will compare this statistical approach to a more basic one, to better understand characteristics of our sample as well as behaviors around COVID-19 prevention, treatment and vaccination and susceptibility to secondary impacts.

## Methods

### *Study Population and Survey Design*

The Population Council, along with the Kenya Ministry of Health, conducted a longitudinal prospective cohort study across five informal settlements (Kibera, Mathare, Kariobangi, Huruma, and Dandora) in Nairobi, Kenya to understand knowledge, attitudes and practices around COVID-19. Participants were sampled from two previous longitudinal cohorts, Adolescent Girls Initiative-Kenya (AGI-K) containing 2,565 randomly selected households with at least one adolescent resident and NISITU: Engaging men and boys in girl centered programming containing 4,519 randomly sampled households. Households (N = 7,500) were randomly sampled and stratified by informal settlement. The cohort for this study includes 2,009 adult household members interviewed on March 30<sup>th</sup> and 31<sup>st</sup> 2020 just after the pandemic was declared. Repeated mobile phone surveys were completed in April (N = 1,768), May (N = 1,750), June (N=1,525) of 2020, February 2021 (N=1,118), and March 2022 (N= 1,121). Survey questions include demographics, knowledge and awareness of COVID-19 transmission and symptoms, perceived risk, socioeconomic effects of the pandemic, health and mental health indicators, gender-based violence and uptake of various protective behaviors such as masking, isolating if sick, testing, and vaccination. All interviews were conducted by phone by a team of 77 Kenyan surveyors to adhere to national physical distancing policies to prevent the spread of COVID-19.

### *Explanatory Variables*

Relevant variables were selected based on how likely they are to influence behavior and vulnerability to the effects of COVID-19 and missing values were imputed using the mice package in R version 4.1.2. These include demographic and behavioral variables (age, gender, educational attainment, marital status, slum, perceived risk, knowledge of symptoms, what myths they believe, disease prevention measures taken, symptoms experienced, social and economic impacts, household size, government assistance received and fears around COVID-19). These variables were used to construct sub-groups using unsupervised learning and are included as a supplementary table (Supplementary Table 1).

### *Unsupervised Learning Analysis*

The data were analyzed using R version 4.1.2. To identify potentially relevant data-dependent subgroups, K-means clustering was utilized. This is an unsupervised, data-driven learning method of exploratory analysis often used to determine the number of 'clusters' that naturally exist within a high-dimensional space formed by a set of possible covariates. Advantages of this method include the ability to identify complex subgroups regardless of the structure of the underlying data with minimal input required from the analyst, while common disadvantages include the possibility of different clustering outputs across different runs due to the use of a random starting point to determine the optimal clustering as well as difficulty understanding and interpreting different subgroups when not immediately obvious. Silhouette plots were visualized to find the appropriate number of clusters, in this case three groups were identified (Supplementary Figure 1). Cluster means of each variable were calculated and tabulated to display the characteristic breakdown of each cluster but are not presented (Supplementary Table 1). Multinomial regression models were constructed to understand the relationship between the independent variables and clusters, by modeling the cluster group as the outcome and the variables used in the K-means clustering analysis as dependent variables.

### *Assessing the Value of K-means*

To assess the value of the K-means algorithm against more traditional methods, we ran likelihood ratio test to compare the fit of models containing covariates of interest versus the addition of a cluster indicator. P-values were calculated against outcomes of interest (see above) when nested ( $H_0$ : outcome ~ intercept + covariate) and complex ( $H_1$ : outcome ~ intercept + covariate + cluster indicator) models were compared, with significant p-values indicating that the model including the cluster indicator is a better fit for the data.

### *Predicting Outcomes of Interest using K-Means Clusters*

After creating the clusters, we selected outcome variables regarding reported vaccine acceptance from Round 5 (February 2021) and uptake from Round 6 (March 2022) to explore the ability of our clusters to predict groups that are less likely to participate in COVID-safe behaviors. For this analysis we looked at how likely each cluster was to take the vaccine if made available when asked in February 2021 (vaccine acceptance) and which group was the least likely to have taken at least one dose of the vaccine when asked one year later in March 2022 (vaccine uptake) as an example of the utility of K-Means generated clusters in predicting behavioral outcomes. To display the distribution of each cluster against both outcomes, regression forest analysis, a type of generalized random forest analysis which uses non-parametric statistical estimation based on random forests, was used to estimate the conditional mean of the outcomes of interest. The best fit tree was found, and the results were visualized using ggplot in R.

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3 *Patient and Public Involvement Statement*

4 It was not possible to involve participants in the study design or interpretation of results due to

5 the rapid response required around COVID-19 and the inability to engage face to face or hold

6 events during the pandemic. Questionnaires and reports are publicly available, with the full

7 deidentified data set available upon request.

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11 **Results**

12 Participants had an average age of 36.5 years (standard deviation 11.3), over half were

13 female (62.8%), and over half were married (58.5%) (**Table 1**). In 2021, before the

14 vaccine was available, most of the respondents (71.5%) said they would be willing to

15 get the vaccine when it became available, and this same percentage had received the

16 vaccine in 2022 (71.1%). However, this still means over a quarter (29%) still had not

17 received the vaccine at the time of the most recent survey.

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22 **Table 1: Cohort Demographics for Round 1 (N = 2,009).**

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Variable	Frequency (%)
Age (mean (SD))	36.46 (11.31)
Female Gender	1,258 (62.8)
Education	
Primary or less	866 (43.2)
Secondary	878 (43.9)
Higher	257 (12.8)
Marital Status	
Married	1,170 (58.5)
Single	502 (25.1)
Divorced/Separated	328 (16.4)
Vaccine acceptance (2021) <sup>b</sup>	799 (71.5)
Vaccine uptake (2022) <sup>c</sup>	797 (71.1)

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53 <sup>a</sup> Question added in round 2 (N=1,761) <sup>b</sup> Question added in round 5 (N=1,108) <sup>c</sup> Question added in round 6 (N=1,121)

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### *Sub-Groups Defined by K-Means Clusters*

Based on an analysis of cluster means from preliminary analyses, each of the three clusters defines slightly different ‘types’ of people. Cluster 1 contains older, married individuals who know less about common COVID-19 symptoms, are more likely to have believed common myths around COVID-19, live in the largest households and report less social support. Members of this cluster also had the most economic anxiety and had a higher perceived risk of COVID-19 early on in the pandemic. Cluster 2 primarily consists of less educated, married or divorced, middle-aged women who were the most economically impacted at the beginning of the pandemic. These individuals are also the most likely of the three groups to report a risk for gender-based violence and increased tensions at home due to the pandemic. Cluster 3 is a younger, more highly educated group of people who have a higher average knowledge of COVID-19 symptoms and expressed fewer fears around the economic impacts of lockdowns early in the pandemic. The silhouette plots presented in **Supplementary Figure 1** highlight the three clusters selected that best capture the variation in the dataset.

### *Utility of K-Means Clusters Compared to Traditional Methods*

Likelihood ratio tests were run to compare model fit for demographic information alone compared to the addition of the clusters. Models fit with key distinct characteristics of the clusters including age, education, marital status, household size, likely to know positive COVID-19 status, knowledge of COVID-19 symptoms, household gender-based violence risk, economic impacts (food insecurity and income loss) and economic anxiety around COVID-19 were included. Almost all of the likelihood ratio tests revealed that when included in the model, the clusters defined using the K-means algorithm are a better fit than individual characteristics alone (**Table 2** for outcome of vaccine hesitancy in survey round 5 and **Table 3** for the outcome of vaccine uptake in round 6).

**Table 2: Likelihood ratio test for vaccine acceptance “how likely are you to take the COVID-19 vaccine if it were offered today” (Feb 2021, prior to vaccine rollout in Kenya) where H0: outcome ~ intercept + covariate and H1: outcome ~ intercept + covariate + cluster indicator**

Covariate	P-Value
Education***	4.58E-10
Marital Status***	1.58E-09
Age	0.111
Household Size***	6.12E-11

Economic Anxiety***	2.51E-11
Likely to know if positive for COVID-19***	2.49E-11
Know at least 3 symptoms of COVID-19***	9.46E-11
Household GBV Risk***	2.28E-11
Eat less due to COVID-19***	6.22E-11
Loss of income due to COVID-19***	1.10E-10

\*\*\*p-value < 0.001; \*\*p-value < 0.001; \*p-value < 0.01

Table 3: Likelihood ratio test for vaccine uptake “Have you had at least one dose of the COVID-19 vaccine?” (March 2022) where H0: outcome ~ intercept + covariate and H1: outcome ~ intercept + covariate + cluster indicator

Covariate	P-Value
Education***	6.94E-4
Marital Status**	2.82E-3
Age	0.966
Household Size**	1.68E-3
Economic Anxiety**	1.30E-3
Likely to know if positive for COVID-19**	1.55E-3
Know at least 3 symptoms of COVID-19**	1.56E-3
Household GBV Risk**	1.51E-3
Eat less due to COVID-19**	1.75E-3
Loss of income due to COVID-19**	1.97E-3

\*\*\*p-value < 0.001; \*\*p-value < 0.001; \*p-value < 0.01

Predicting Vaccine Uptake using K-Means Clusters

When looking at vaccine acceptance in February 2021, 55.3% of people in cluster 1 said they would be ‘very likely’ to get the vaccine if offered today, statistically

significantly higher than the proportion in cluster 3 (41.5%) that said they would (**Figure 1**). Once the vaccine became available, there is a similar difference in these two clusters with regard to uptake of at least one dose of the vaccine; 78% of individuals in cluster 1 report having received at least one dose, statistically significantly higher than the proportion in cluster 3 (66.4%) (**Figure 2**). Of the 29% (n=324) in round 6 who have not gotten the vaccine, about half are hesitant (48%) and about half say they are very likely to still get the vaccine. Among the respondents who have not gotten the vaccine, there is no difference in reported hesitancy by cluster. The main reason for not having gotten the vaccine yet is concerns regarding side effects or safety. Among cluster 2 respondents, almost half said side effects or safety were the reason they were waiting (44%) and almost a third of cluster 3 said the same (33%).

**Figure 1: Vaccine acceptance by cluster as identified by K-means algorithm, Nairobi, Kenya February 2021 (N=1,117)**

**Figure 2: Have taken at least one dose of the coronavirus vaccine by cluster as identified by K-means algorithm, Nairobi, Kenya March 2022 (N=1,121).**

## Discussion

Our findings suggest that survey respondents from across Nairobi informal settlements fall into three clusters or archetypes each with distinct characteristics that can provide insight into COVID-19 vaccine hesitancy. Cluster 3 appear to be less concerned with COVID-19 infection and the economic impacts, and less likely to have gotten the vaccine (younger adults with higher education levels, better knowledge of COVID-19 symptoms and transmission). This could indicate less awareness or urgency around COVID-19 illness and a lack of perceived risk, as initially risks to the elderly were highlighted. Cluster 2 comprised of older women seem to carry higher risks of food insecurity and gender-based violence due to the pandemic. Respondents from Cluster 1, defined by large households and with less educational attainment, were found to have more economic anxieties and less knowledge about COVID-19 symptoms but also were most likely to have gotten the vaccine. These findings reveal clear risks and inequities that can be targeted and addressed when planning and rolling out public health interventions.

Based on the likelihood ratio tests conducted, it appears that the cluster indicator adds value to these analyses, capturing unmeasured characteristics of participants that are important to vaccine hesitancy. The tests we conducted are in no way exhaustive, but



exploratory in nature, and may be useful to identify archetypes of individuals in informal settlements and suggest avenues to explore for communication with sub-groups that have different vulnerabilities and risks.

It is concerning to find that primarily younger, more highly educated individuals in Cluster 3 are least likely to have gotten the vaccine. Potentially, younger people might be exposed to different information through their use of social media or may have a lower perceived risk to COVID-19 due to their age and general good health. For example, those in Cluster 3 were less likely to know someone who had tested positive for COVID-19 (17% vs 25% in cluster 2 and 27% in cluster 1). Public health messages tailored to youth around vaccination may highlight vaccine safety as 33% reported concern about side effects or wanting to wait and see if it's safe. Studies in other settings show young people may be concerned about myths regarding side effects that affect fertility or may want to skip the vaccine because they don't feel at risk. As a next step, it will be useful to explore where they receive their information regarding COVID-19 to see how and if this is impacting their behaviors. It would also be useful to ensure access to vaccines for this younger age group, potentially expanding current outreach to include mobile clinics or other options instead of requiring a visit to a health facility. Nairobi is already employing strategies for vaccine outreach including providing vaccines at social gatherings such as churches or social functions. This may increase uptake among younger populations that may not be going to health facilities.

Individuals in Cluster 1 have the lowest educational attainment and are the most likely to believe common myths around COVID-19 but have the highest perceived risk of infection and ultimately are the most likely to get the vaccine. This is likely since this cluster of individuals reported having an overall higher perceived risk of COVID-19 and are more likely to need to travel for work (considering themselves at high risk of infection). They also may hold jobs that require vaccination. Keeping employment by getting vaccinated may have been worth the risk, as this cluster also expressed economic concerns related to the pandemic.

Individuals in Cluster 2 seem to carry the highest risk of economic hardship and gender-based violence, so further investigation can be done to target these individuals and connect them to the support they need. Cluster 2, which consists of older, married or divorced women, appears to have a lower rate of vaccine uptake in proportion to their rate of likelihood to take the vaccine as seen in February 2021. This could point to issues around accessibility of the vaccine, especially for women who may have more familial responsibilities and fewer financial and transportation resources. Government assistance and social support interventions may provide a solution, as well as outreach



through churches and other venues, to reach women who are unable to travel to facilities.

By defining archetypes in the population and their risk and vulnerability to certain impacts of COVID-19, we can better inform and target policy to improve the efficacy of public health and social support interventions. These clusters can also be used to inform future modeling and predictive analysis of the data by providing insight into what characteristics and behaviors define sub-groups of interest, particularly in a situation with a novel disease where a lot is unknown about the dynamics at play and where we do not have prior information to inform messaging or policy. These are major strengths to this approach and can be an efficient way to let the data guide the analysis rather than commencing with preconceived beliefs about the population. Some limitations of this approach include possible changes to the clustering of the data when run multiple times due to the use of a random starting point and challenges in interpreting the data when clearly defined sub-groups are not present. This was not an issue in a population such as this one where there were distinct groups of people but can create challenges in interpretation when such is not the case. Further exploration needs to be conducted to realize the true value and potential of K-means clustering in describing and identifying populations vulnerable to the impacts of COVID-19 and other novel diseases.

Overall, respondents in our sample of residents of five informal settlements in Nairobi had higher vaccination rates reported than Nairobi as a whole (we found nearly 75% compared to the 52% reported for the city) as of March 2022. Of the remaining quarter of our participants, about half of those are interested in receiving the vaccine. This suggests that with additional access and messaging almost all individuals can be vaccinated. We also find that most respondents had received more than one dose, although about one in ten have still only received the first dose, suggesting additional outreach is needed to make sure everyone is fully vaccinated, particularly if new boosters are required. Variation across the three Clusters highlights different potential approaches to messaging and outreach, in particular younger adults who are more hesitant. This methodology and our results provide a starting point for more investigation into targeted vaccination strategies.

**Contributorship Statement:** NR conceptualized the project, conducted the data analysis and led development and writing of the manuscript. JP conceptualized the project and supported development and writing of the manuscript. CBB developed and led the data analysis and review of the manuscript. EB and TA supported with conceptualization of the project, interpretation of results, and review of the manuscript. EM, DM and FM supported with data collection, project management, data cleaning and interpretation of results, including review of the manuscript. KA managed the project and data collection, supported with interpretation of results and review of the manuscript.

**Competing interests:** None declared.

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**Data Sharing Statement:** Cleaned and deidentified dataset including questionnaire are publicly available on the Harvard Dataverse.

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## References

1. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Biomedica*. Published online 2020. doi:10.23750/abm.v91i1.9397
2. Corburn J, Vlahov D, Mberu B, et al. Slum Health: Arresting COVID-19 and Improving Well-Being in Urban Informal Settlements. *Journal of Urban Health*. Published online 2020. doi:10.1007/s11524-020-00438-6
3. Mukumbang FC, Ambe AN, Adebiyi BO. Unspoken inequality: How COVID-19 has exacerbated existing vulnerabilities of asylum-seekers, refugees, and undocumented migrants in South Africa. *Int J Equity Health*. Published online 2020. doi:10.1186/s12939-020-01259-4
4. Stanturf JA, Goodrick SL, Warren ML, Charnley S, Stegall CM. Social vulnerability and Ebola virus disease in rural Liberia. *PLoS One*. Published online 2015. doi:10.1371/journal.pone.0137208
5. Ahmed SAKS, Ajisola M, Azeem K, et al. Impact of the societal response to COVID-19 on access to healthcare for non-COVID-19 health issues in slum communities of Bangladesh, Kenya, Nigeria and Pakistan: results of pre-COVID and COVID-19 lockdown stakeholder engagements. *BMJ Glob Health*. Published online 2020. doi:10.1136/bmjgh-2020-003042
6. Shah H. COVID-19 recovery: science isn't enough to save us. *Gale Onfile Health and Medicine*. 2021;591(7851).
7. Rouw A, Wexler A, Kates J, Michaud J. Tracking Global COVID-19 Vaccine Equity. *Kaiser Family Foundation*. Published online July 21, 2021.
8. Lazarus J v, Abdool Karim SS, van Selm L, et al. COVID-19 vaccine wastage in the midst of vaccine inequity: causes, types and practical steps. *BMJ Glob Health*. 2022;7(4).
9. Harman S, Erfani P, Goronga T, Hickel J, Morse M, Richardson ET. Global vaccine equity demands reparative justice — not charity. *BMJ Glob Health*. 2021;6(6).
10. Khosla R, Gurskin S. Equity without human rights: a false COVID-19 narrative? *BMJ Glob Health*. 2021;6(7).
11. Adepoju P. Kenya Mandates COVID-19 Vaccines for Civil Servants as Africa's Vaccine Rollout Gathers Speed. *Health Policy Watch Independent Global Health Reporting*. August 13, 2021.
12. Wasike A. Kenyan teachers given 7 days to get COVID vaccine or face punishment. *Andalou Agency*. August 17, 2021.
13. Fick M. Kenya's Covid-19 vaccine mandate draws praise and criticism. *Reuters*. November 23, 2021.
14. Kenya: Vaccine Requirements Violate Rights. *Human Rights Watch*. December 13, 2021.

15. Lazarus J v., Wyka K, White TM, et al. Revisiting COVID-19 vaccine hesitancy around the world using data from 23 countries in 2021. *Nat Commun.* 2022;13(3801).

16. Ackah M, Ameyaw L, Gazali Salifu M, et al. COVID-19 vaccine acceptance among health care workers in Africa: A systematic review and meta-analysis. *PLoS One.* 2022;17(5).

17. Detoc M, Bruel S, Frappe P, Tardy B, Botelho-Nevers E, Gagneux-Brunon A. Intention to participate in a COVID-19 vaccine clinical trial and to get vaccinated against COVID-19 in France during the pandemic. *Vaccine.* 2020;38(45).

18. Orangi S, Pinchoff J, Mwanga D, et al. Assessing the Level and Determinants of COVID-19 Vaccine Confidence in Kenya. *Vaccines (Basel).* 2021;9(8).

19. Awang Bono S, Faria de Moura Villela E, Sin Siau C, et al. Factors Affecting COVID-19 Vaccine Acceptance: An International Survey among Low- and Middle-Income Countries. *Vaccines (Basel).* 2021;9(5).

20. Caserotti M, Girardi P, Rubaltelli E, Tasso A, Lotto L, Gavaruzzi T. Associations of COVID-19 risk perception with vaccine hesitancy over time for Italian residents. *Science Direct.* 2021;272.

21. Ackah BBB, Woo M, Stallwood L, et al. COVID-19 vaccine hesitancy in Africa: a scoping review. *Glob Health Res Policy.* 2021;7(21).

22. Osur J, Muinga E, Kuria S, Hussein S, Mugambi Ireri E. COVID-19 vaccine hesitancy: Vaccination intention and attitudes of community health volunteers in Kenya. *Plos Global Public Health.* Published online March 16, 2022.

23. *COVID 19 Vaccine Perceptions: A 15 Country Study.*; 2021.

24. Austrian K, Pinchoff J, Tidwell JB, et al. COVID-19 Related Knowledge, Attitudes, Practices and Needs of Households in Informal Settlements in Nairobi, Kenya. *The Lancet.* Published online April 14, 2020.

25. Hudson A, Montelpare WJ. Predictors of Vaccine Hesitancy: Implications for COVID-19 Public Health Messaging. *Int J Environ Res Public Health.* Published online July 29, 2021.

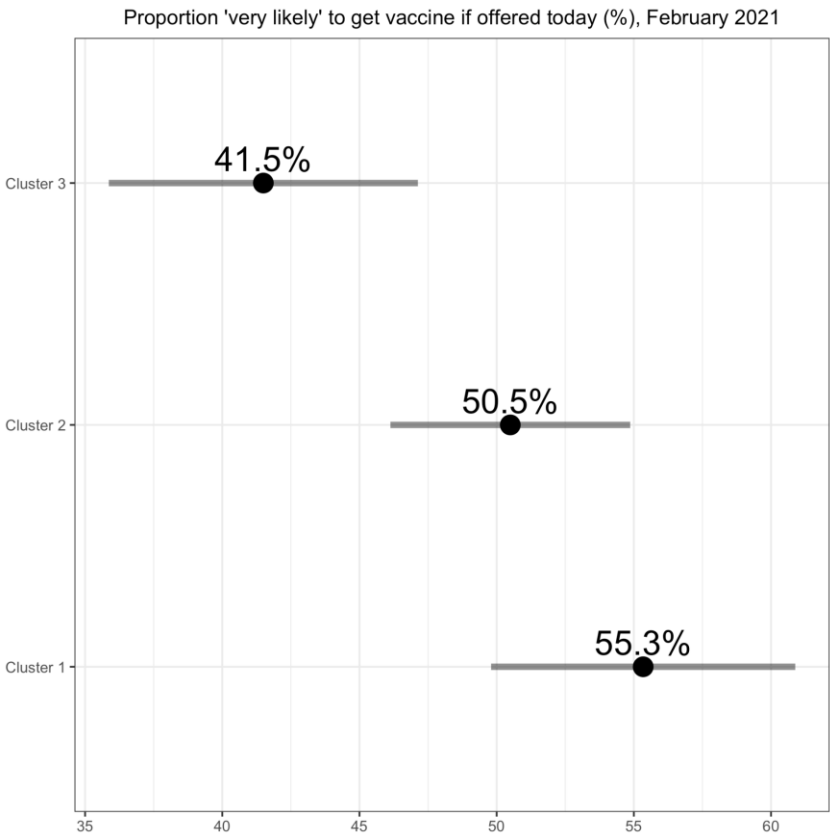
26. Abbasi J. Widespread Misinformation About Infertility Continues to Create COVID-19 Vaccine Hesitancy. *JAMA Medical News & Perspectives.* Published online February 22, 2022.

27. Ainslie D, Ogwuru C, Sinclair R. *Coronavirus and Vaccine Hesitancy, Great Britain: 9 August 2021.*; 2021.

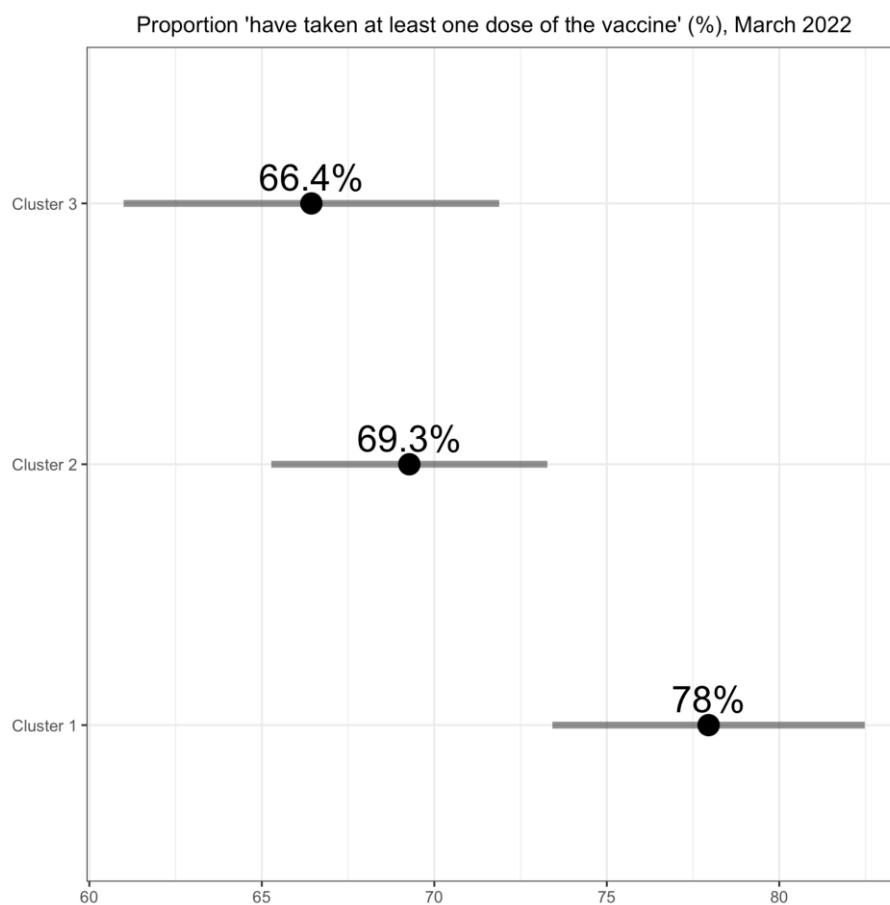
28. Ahlqvist E, Storm P, Käräjämäki A, et al. Novel subgroups of adult-onset diabetes and their association with outcomes: a data-driven cluster analysis of six variables. *Lancet Diabetes Endocrinol.* Published online 2018. doi:10.1016/S2213-8587(18)30051-2

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**Figure 1: Vaccine acceptance by cluster as identified by K-means algorithm, Nairobi, Kenya February 2021 (N=1,117)**

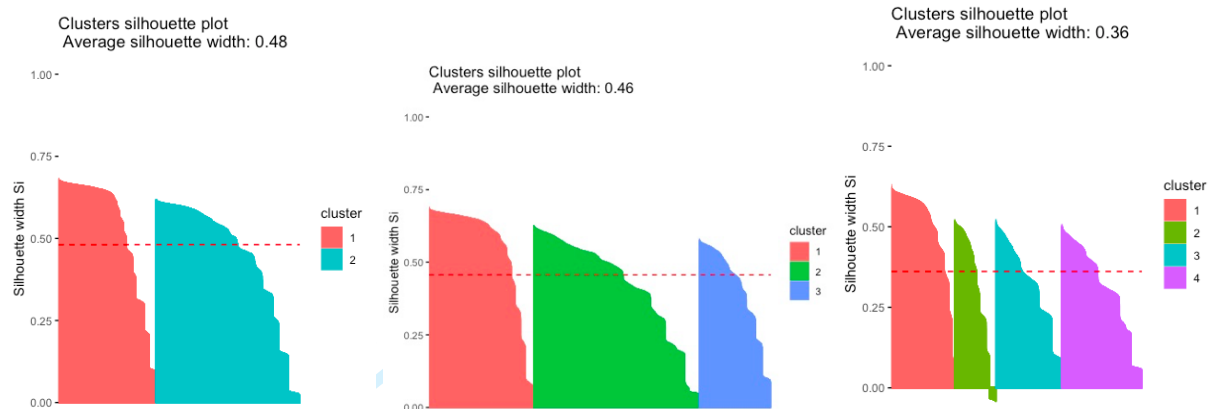


**Figure 2: Have taken at least one dose of the coronavirus vaccine by cluster as identified by K-means algorithm, Nairobi, Kenya March 2022 (N=1,121).**





# Supplementary Figure 1: Silhouette plot used to determine the best fit of clusters for K-Means algorithm



Supplementary Table 1: variables included in k-means clustering to create the clusters

Variable	Mean	SD	Min	Max	Question Description
<b>Education</b>					
Pre Primary/No Education	0.04	0.19	0	1	No Education/Pre Primary (0 = No, 1 = Yes)
Primary	0.4	0.49	0	1	Primary Education (0 = No, 1 = Yes)
Secondary	0.43	0.5	0	1	Secondary Education (0 = No, 1 = Yes)
Higher Education	0.13	0.34	0	1	Higher Education (0 = No, 1 = Yes)
Age	36.45	11.3	18	75	Age (continuous)
Gender	0.63	0.48	0	1	Gender (0 = Male, 1 = Female)
<b>Marital Status</b>					
Married	0.59	0.49	0	1	Married (0 = No, 1 = Yes)
Single	0.24	0.43	0	1	Single (0 = No, 1 = Yes)
Divorced/Separated	0.17	0.37	0	1	Divorced/Separated (0 = No, 1 = Yes)
<b>Slum</b>					
Kibera	0.22	0.42	0	1	Respondents from Kibera (0 = No, 1 = Yes)
Dandora	0.24	0.42	0	1	Respondents from Dandora (0 = No, 1 = Yes)
Huruma	0.13	0.34	0	1	Respondents from Huruma (0 = No, 1 = Yes)
Kariobangi	0.2	0.4	0	1	Respondents from Kariobangi (0 = No, 1 = Yes)

Mathare	0.21	0.41	0	1	Respondents from Mathare (0 = No, 1 = Yes)
Perceived Risk	1.07	0.83	0	2	Perceived Risk (0 = No/Low Risk, 1 = Medium Risk, 2 = High Risk)
Knowledge	Knowledge of common symptoms of COVID-19				
No Known Symptoms	0.07	0.26	0	1	No Known Symptoms (0 = No, 1 = Yes)
Fever	0.81	0.4	0	1	Fever (0 = No, 1 = Yes)
Headache	0.54	0.5	0	1	Headache (0 = No, 1 = Yes)
Cough	0.88	0.32	0	1	Cough (0 = No, 1 = Yes)
Diarrhea	0.06	0.23	0	1	Diarrhea (0 = No, 1 = Yes)
Difficulty Breathing	0.46	0.5	0	1	Difficulty Breathing (0 = No, 1 = Yes)
Loss of Taste	0.01	0.08	0	1	Loss of Taste (0 = No, 1 = Yes)
Loss of Smell	0.02	0.14	0	1	Loss of Smell (0 = No, 1 = Yes)
Tiredness/Fatigue	0.24	0.43	0	1	Tiredness/Fatigue (0 = No, 1 = Yes)
Chest Pain	0.05	0.22	0	1	Chest Pain (0 = No, 1 = Yes)
Chills	0.01	0.12	0	1	Chills (0 = No, 1 = Yes)
Rash	0.03	0.07	0	1	Rash (0 = No, 1 = Yes)
Dizziness	0.03	0.18	0	1	Dizziness (0 = No, 1 = Yes)
Sneezing	0.47	0.5	0	1	Sneezing (0 = No, 1 = Yes)
Sore Throat	0.08	0.26	0	1	Sore Throat (0 = No, 1 = Yes)

Body Ache	0.34	0.47	0	1	Bodyache (0 = No, 1 = Yes)
Know Three Symptoms	0.32	0.47	0	1	Know at least 3 symptoms of COVID-19 (0 = No, 1 = Yes)
Myths					
God	0.27	0.44	0	1	Believe myth that God protects (0 = No, 1 = Yes)
Hot Places	0.11	0.31	0	1	Believe myth that hot weather will prevent infection (0 = No, 1 = Yes)
Rural	0.05	0.23	0	1	Believe myth that rural areas are not affected (0 = No, 1 = Yes)
Any Myth	0.24	0.42	0	1	Believe any myth about COVID-19 (0 = No, 1 = Yes)
Know Hotline	0.6	0.49	0	1	Know hotline number (0 = No, 1 = Yes)
Know Positive	0.03	0.17	0	1	Know anyone who is positive for COVID-19 (0 = No, 1 = Yes)
If Sick					
Isolate	0.24	0.43	0	1	If sick, will isolate (0 = No, 1 = Yes)
Get Tested	0.27	0.44	0	1	If sick, will get tested (0 = No, 1 = Yes)
Distance 2m	0.1	0.3	0	1	If sick, will distance 2 meters from others (0 = No, 1 = Yes)
Go to Clinic	0.64	0.48	0	1	If sick, will go to clinic (0 = No, 1 = Yes)
Wear Mask	0.6	0.49	0	1	Will wear mask when going outside (0 = No, 1 = Yes)
Wear Mask Correctly	0.04	0.2	0	1	Will wear mask correctly when going outside (0 = No, 1 = Yes)
Eat Less	0.68	0.47	0	1	Skipped meals due to COVID-19 (0 = No, 1 = Yes)
Avoid Transport	0.72	0.45	0	1	Avoided public transport due to COVID-19 (0 = No, 1 = Yes)

Loss of Income					
Complete	0.47	0.5	0	1	Complete loss of income (0 = No, 1 = Yes)
Partial	0.58	0.49	0	1	Partial Loss of Income (0 = No, 1 = Yes)
Symptoms					
Fever	0.03	0.17	0	1	Has fever (0 = No, 1 = Yes)
Difficulty Breathing	0	0.07	0	1	Has difficulty breathing (0 = No, 1 = Yes)
Cough	0.04	0.2	0	1	Has cough (0 = No, 1 = Yes)
Aches	0.02	0.14	0	1	Has body aches (0 = No, 1 = Yes)
Sore Throat	0.01	0.09	0	1	Has sore throat (0 = No, 1 = Yes)
Tired	0.01	0.11	0	1	Is tired (0 = No, 1 = Yes)
Lost sense of Taste/Smell	0	0.05	0	1	Lost sense of taste and/or smell (0 = No, 1 = Yes)
Sum of Symptoms	0.12	0.44	0	6	Sum of COVID=19 symptoms present
Have Two Symptoms	0.02	0.14	0	1	Have two COVID-19 symptoms present (0 = No, 1 = Yes)
Household Size	2.61	0.93	1	4	Household size (# members)
Travel Far	0.53	0.5	0	1	Have to travel far for work (0 = No, 1 = Yes)
Have Electricity	0.72	0.45	0	1	Have electricity at home (0 = No, 1 = Yes)
Have Social Support	0.43	0.49	0	1	Have access to social support (0 = No, 1 = Yes)
Received Assistance	0.09	0.29	0	1	Have received some form of government assistance (0 = No, 1 = Yes)

Assistance Meets Needs	0.34	0.47	0	1	Government assistance received meets needs (0 = No, 1 = Yes)
Gender Based Violence Risk	0.37	0.48	0	1	Risk of gender-based violence at home (0 = No, 1 = Yes)
Fears					
Increased Crime	0.04	0.19	0	1	Increased crime due to lockdown (0 = No, 1 = Yes)
Crowds	0.04	0.2	0	1	Difficult to keep away from crowds (0 = No, 1 = Yes)
Deadly Virus	0.59	0.49	0	1	It is a deadly virus (0 = No, 1 = Yes)
Food Shortages	0.3	0.46	0	1	Food shortages (0 = No, 1 = Yes)
Hospitalization	0.06	0.24	0	1	Fear of being hospitalized (0 = No, 1 = Yes)
Infect Others	0.21	0.41	0	1	Fear of infecting others (0 = No, 1 = Yes)
Being Lied To	0	0.04	0	1	Fear being lied to by the Government (0 = No, 1 = Yes)
Loss of Income	0.43	0.49	0	1	Fear loss of income (0 = No, 1 = Yes)
No Cure	0.42	0.49	0	1	There is no cure for this virus (0 = No, 1 = Yes)
No Transport	0.02	0.14	0	1	No transport available (0 = No, 1 = Yes)
Quarantine	0.11	0.32	0	1	Fear of being quarantined (0 = No, 1 = Yes)
Rent	0.12	0.33	0	1	Fear of not being able to pay rent (0 = No, 1 = Yes)
Separated from Family	0.18	0.38	0	1	Fear of being separated from family (0 = No, 1 = Yes)
Treatment	0.02	0.14	0	1	Don't know where to get treatment (0 = No, 1 = Yes)

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STROBE Statement—Checklist of items that should be included in reports of *cohort studies*

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-5
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up (b) For matched studies, give matching criteria and number of exposed and unexposed	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) If applicable, explain how loss to follow-up was addressed (e) Describe any sensitivity analyses	6
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	7
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) Summarise follow-up time (eg, average and total amount)	7
Outcome data	15*	Report numbers of outcome events or summary measures over time	7-8

Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	7-8
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7-8
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	8
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	8-10
Generalisability	21	Discuss the generalisability (external validity) of the study results	9-10
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	10

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at <http://www.strobe-statement.org>.

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## Exploring COVID-19 vaccine hesitancy and uptake in Nairobi's urban informal settlements: An unsupervised machine learning analysis from 2021-2022

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Keywords:	COVID-19, Public health < INFECTIOUS DISEASES, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, STATISTICS & RESEARCH METHODS

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# Exploring COVID-19 vaccine hesitancy and uptake in Nairobi's urban informal settlements: An unsupervised machine learning analysis from 2021-2022

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## Abstract

**Objectives:** The aim of this study is to illustrate the utility of unsupervised machine learning compared to more traditional methods of analysis in identifying archetypes within the population that may be more or less likely to get the COVID vaccine, particularly in urban slums that face economic and structural barriers to vaccine uptake.

**Design:** A longitudinal prospective cohort study (n = 2,009 households) with recurring phone surveys from 2020 to 2022 to assess knowledge, attitudes, and practices regarding COVID-19.

**Setting:** This study was conducted across five informal settlements in Nairobi, Kenya

**Participants:** Individuals from 2,009 households participated in this study.

**Primary and Secondary Outcome Measures:** Respondents were asked about COVID-19 vaccine acceptance (February 2021 survey) and vaccine uptake (March 2022 survey). Three distinct clusters were estimated using K-Means clustering and analyzed against vaccine acceptance and vaccine uptake using likelihood ratio tests.

**Results:** We find that young adults (Cluster 3) despite higher educational attainment and fewer reported concerns regarding the pandemic were less likely to intend to and ultimately get the vaccine (41.5% and 66.4%, respectively;  $p < 0.01$ ). Older adults with larger households and more fears regarding economic impacts of the pandemic (Cluster 1) said they were more likely to get vaccinated and ultimately received at least one dose (55.3% and 78% respectively,  $p < 0.01$ ) despite believing certain COVID-19 myths, potentially due to employment requirements. Middle-aged women who are married or divorced and reported higher risk of gender-based violence in the home (Cluster 2) had lower than expected rates of vaccine uptake compared to vaccine acceptance, likely indicating some gaps in access and broader need for social support.

**Conclusions:** Findings suggest this methodology can be a useful tool to characterize populations, with potential utility for improved targeted policy, programs and behavioral messaging to promote uptake of healthy behaviors and ensure equitable distribution of prevention measures.

### **Strengths and Limitations**

- A strength of modern statistical methods, such as K-Means clustering, is the ability to facilitate data-driven analysis, objectively revealing sub-groups without the researchers preconceived assumptions potentially biasing the analysis.
- This is one of very few studies assessing COVID-19 perceptions, beliefs and vaccination uptake in urban informal settlements in an African urban context.
- Some limitations to K-Means clustering include possible changes to the clustering of the data when run multiple times due to the use of random starting points and challenges in interpreting the data when distinct sub-groups are not present.
- Limitations in the study design include potential selection bias favoring respondents who had mobile phones as well as social desirability bias where respondents may have answered questions to be socially acceptable to the interviewer.



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## Introduction

The World Health Organization (WHO) officially declared COVID-19, a disease caused by the novel coronavirus SARS-CoV-2, a pandemic on March 11, 2020(1). The first case of COVID-19 in Kenya was reported shortly after on March 13, 2020. To curb transmission, the Kenyan Government swiftly instated lockdown policies including restrictions on travel and large gatherings, and business and school closures. Experts were concerned that due to limited resources for distancing and hand washing, that populations in urban informal settlements would be at high risk of transmission(2). Many studies regarding COVID-19 and other outbreaks, such as Ebola, have cited loss of income, food insecurity, gender-based violence, mental health, and lack of access to healthcare needs as major downstream impacts of disease mitigation policies(3–5). In the years since the pandemic began, restrictions have eased and with the rollout of COVID-19 vaccines to the general public in early 2021, the focus has shifted to increasing vaccination coverage. While vaccination is critically important, during initial phases of the rollout, 82% of globally available doses went to high and upper middle-income countries, with only 0.2% delivered to low- and middle-income countries, highlighting continued vaccine inequity and injustice(6–10). As of July 2023, 65.9% of individuals globally have taken both doses of the COVID-19 vaccine(11).

The government of Kenya launched a phased rollout of COVID-19 vaccination from March 2021, starting with essential workers such as healthcare providers, then the elderly and those with comorbidities. In June 2022, the Kenyan Ministry of Health expanded their reach and aimed to vaccinate 27 million eligible adults and 5.8 million teenagers by the end of the year(12). Certain jobs require vaccination such as civil servants, teachers, and some private employers(13–16). Ongoing campaigns aim to increase vaccination coverage, assuage concerns about vaccine safety, and promote uptake to protect Kenyans from severe outcomes and death as well as to protect against new and emerging variants. Vaccination is one of the most effective interventions to control the ongoing pandemic but vaccine acceptance rates around the world vary(17–19).

Vaccine hesitancy is a major ongoing global concern as it is likely there will continue to be new vaccines or boosters required as the pandemic evolves. A study across 23 countries worldwide (including Kenya) found that soon after the vaccines were available (June 2021) over three-quarters (75.2%) of respondents reported vaccine acceptance, meaning they would get the vaccine. Reasons for vaccine hesitancy related to lack of trust in COVID-19 vaccine safety and science, and skepticism about its efficacy(19). Other factors included misperceptions regarding individual level risk of contracting COVID-19, the severity of infections(19–24) and fear of side effects(25). Some people

surveyed reported a general lack of trust in scientific institutions or health authorities which can also increase vaccine hesitancy(19).

Looking closer at COVID-19 vaccine hesitancy in Kenya, an early study in four Kenyan counties found hesitancy ranged from 10.2 - 44.6%, with Nairobi County having the highest proportion that reported they intended to get the vaccine, particularly among those who had received training from the Ministry of Health(26). A 2022 study from six Kenyan health facilities found that while 81% reported it was important to get the vaccine, 40.5% also reported concerns, mainly regarding side effects(6). This study also found that hesitancy was higher in government and faith-based health institutions compared to private ones(6). Another study conducted in February 2022 found that more than 45% of individuals eligible for vaccination in Kenya had not taken a single dose(19,27,28).

To increase vaccine uptake, it is important to address hesitancy by identifying sources of information, perceived trustworthiness of sources, and how messaging can be adapted to drive positive behavior change. Studies have shown that individuals who report receiving COVID-19 information from social media, primarily Facebook, have the highest rates of vaccine hesitancy(6,26). An Africa CDC report found that among those surveyed in Kenya, 65% reported having seen or heard at least some misinformation about COVID-19 from social media(29). Overall, the potential for social media to contribute to misinformation is concerning, as the information shared is not scientifically filtered or reviewed. Other sources commonly reported for COVID-19 information include TV, SMS from government agencies, and health providers. An African CDC report found that in Kenya, 78% of those surveyed say that TV is a trusted source of information(29). In Nairobi, a study revealed that government health messages through television, radio and SMS were among the most common sources of information for residents in urban informal settlements at the initial onset of the COVID-19 pandemic(30). In particular, it is important to understand how young adults receive and interpret information regarding COVID-19, as some studies suggest this age group may be extremely hesitant because of perceived low risk of severe outcomes, mistrust in authority, and fear regarding side effects especially around infertility and pregnancy outcomes(31–33). A global study found young people were most likely to search for COVID-19 and other health information from social media, raising concerns about exposure to misinformation(34).

This study analyzes data from a sample of individuals residing in urban informal settlements in Nairobi, surveyed in 2021 and 2022, before and after the distribution of the first COVID-19 vaccine. An exploratory analysis was implemented to understand how the characteristics of respondents could point to vaccine acceptance/hesitancy

(prior to availability) and uptake (after the vaccine was available). We explored the utility of K-Means clustering to characterize participants based on demographics, knowledge, perceptions, risks, and other factors, to determine if certain archetypes or sub-groups are present in the cohort; and if so, how likely they are to want to take the COVID-19 vaccine and ultimately get it. We selected K-Means analysis because it is a data-driven approach, meaning that the patterns are derived from the data itself, a less biased method to characterize 'types' of participants. K-Means have been used in previous studies to group together participants in a dataset to predict health prevention and treatment strategies for each group(35). We compared this statistical approach to a more basic one, to highlight the utility of K-Means clustering to understand unmeasured characteristics of the groups. Ultimately, K-Means clustering identified three sub-groups in the dataset with implications for COVID-19 vaccination policy and messaging.

## Methods

### *Sample and Survey Design*

The Population Council, in collaboration with the Kenya Ministry of Health, conducted a longitudinal prospective cohort study across five informal settlements (Kibera, Mathare, Kariobangi, Huruma, and Dandora) in Nairobi, Kenya to understand knowledge, attitudes and practices around COVID-19. Participants were sampled from two previous longitudinal cohorts, Adolescent Girls Initiative-Kenya (AGI-K) (n=2,565) and *Nisikilize Tujengane* (NISITU): Engaging men and boys in girl centered programming (n=4,519). For AGI-K and NISITU surveys, household listings were generated and eligible households contained at least one adolescent member were sampled. For the COVID-19 survey, households were randomly sampled from the AGI-K and NISITU cohorts and stratified by informal settlement, so they are somewhat representative but had to have at least one adolescent household member (e.g., a household with only one adult member would not have been eligible for inclusion). The resulting cohort for this COVID-19 study includes 2,009 adult household members interviewed on March 30<sup>th</sup> and 31<sup>st</sup> 2020 just after the pandemic was declared. Repeated mobile phone surveys were completed in April (N = 1,768), May (N = 1,750), June (N=1,525) of 2020, February 2021 (N=1,117), and March 2022 (N= 1,121). Attrition was high given the frequent repeat nature of the survey and possibility of mobile phone numbers being discontinued, but given the unknowns early on in the pandemic, the possibility of attrition was weighed against gathering critically needed information.

Survey questions include demographics, knowledge and awareness of COVID-19 transmission and symptoms, perceived risk, socioeconomic effects of the pandemic, health and mental health indicators, gender-based violence and uptake of various protective behaviors such as masking, isolating if sick, testing, and vaccination (see

questionnaires in Supplementary Files 1 and 2). All interviews were conducted by phone by a team of 77 Kenyan surveyors to adhere to national physical distancing policies to prevent the spread of COVID-19. Respondents gave informed consent over the phone before commencing the survey. The same approach was used for all surveys at each time point. Only the questionnaire changed, with questions added or adapted between rounds.

### *Measures of Variables*

Relevant variables were selected based on how likely they are to influence behavior and vulnerability to the effects of COVID-19 and missing values were imputed using the mice R package. The included demographic and behavioral variables were age, gender, educational attainment, marital status, slum, perceived risk, knowledge of symptoms, what myths they believe, disease prevention measures taken, symptoms experienced, social and economic impacts, household size, government assistance received and fears around COVID-19. These variables were used to construct sub-groups using unsupervised machine learning, a variable description and summary statistics are included as a supplementary table (**Supplementary Table 1**).

### *Data Analysis*

The data were analyzed using R version 4.1.2. To identify potentially relevant data-dependent subgroups, K-Means clustering was applied. This is an unsupervised, data-driven machine learning method of exploratory analysis often used to determine the number of 'clusters' that naturally exist within a high-dimensional space formed by a set of possible covariates. K-Means clustering was run, and three clusters were identified, even with repeated attempts, suggesting distinct sub-groups. Silhouette plots (**Supplementary Figure 1**) were visualized to find the appropriate number of clusters, and cluster means of each variable were calculated and tabulated (**Supplementary Table 2**) to display the characteristic breakdown of each cluster.

To assess the value of the K-Means algorithm against more traditional methods, we ran likelihood ratio tests. The likelihood ratio test compared the fit of a model containing demographic covariates of interest alone versus a model with the addition of a cluster indicator. We conducted this analysis twice, once for the outcome of vaccine hesitancy (in 2021, prior to vaccine availability) and again for the outcome of vaccine uptake (in 2022, once the vaccine was widely available). For each of these outcomes of interest, p-values were calculated for each model containing a demographic covariate of interest when nested ( $H_0$ : outcome ~ intercept + covariate) and complex ( $H_1$ : outcome ~ intercept + covariate + cluster indicator), with significant p-values indicating that the model with the cluster indicator (complex model) is a better fit for the data. Overall, significant p-values for the likelihood ratio tests for each demographic covariate highlight

that the cluster variable adds additional, unmeasured information about the sub-groups in the dataset versus the demographic covariate alone. Separate models were fit for age, education, marital status, household size, likely to know positive COVID-19 status, knowledge of COVID-19 symptoms, household gender-based violence risk, economic impacts (food insecurity and income loss) and respondent concerns around loss of income due to COVID-19.

After creating the clusters, we used the newly defined cluster variable to compare vaccine hesitancy and vaccine uptake across the three groups using regression forest analysis, an approach which uses non-parametric statistical estimation based on random forests, to estimate the conditional mean of the outcomes of interest. The best fit tree was found, and the results were visualized as forest plots using ggplot in R. P-values were calculated for three-way and pairwise comparisons of the clusters for vaccine acceptance and vaccine uptake using Wald tests.

#### *Patient and Public Involvement Statement*

*None*

#### **Results**

Participants had an average age of 36.5 years (standard deviation 11.3) with 59% of participants between ages 30-40, 28.7% of participants aged 18-29, and 12.4% of participants aged 50+, over half were female (62.8%), and over half were married (58.5%) (**Table 1**). In 2021, before the vaccine was widely available, most of the respondents (71.5%) said they would be willing to get a vaccine, and about this same percentage had received the vaccine in 2022 once it was available (71.1%). However, this means over a quarter (29%) still had not received the vaccine at the time of the most recent survey.

Variable	Frequency (%)
Age (mean (SD))	36.5 (11.3)
Age in categories	
Age 18-29	576 (28.7)
Age 30-49	1,184 (59.0)
Age 50+	248 (12.4)
Female Gender	1,258 (62.8)



<b>Education</b>	
<b>Primary or less</b>	<b>866 (43.2)</b>
<b>Secondary</b>	<b>878 (43.9)</b>
<b>Higher</b>	<b>257 (12.8)</b>
<b>Marital Status</b>	
<b>Married</b>	<b>1,170 (58.5)</b>
<b>Single</b>	<b>502 (25.1)</b>
<b>Divorced/Separated</b>	<b>328 (16.4)</b>
<b>Vaccine acceptance (2021) <sup>a</sup></b>	<b>799 (72.1)</b>
<b>Vaccine uptake (2022) <sup>b</sup></b>	<b>797 (71.1)</b>

<sup>a</sup>Question added in round 5 (N=1,108) <sup>b</sup>Question added in round 6 (N=1,121)

**Table 1: Cohort Demographics for Round 1 (N = 2,009) respondents from five informal settlements in Nairobi, Kenya April 2020**

Based on the results of the K-Means clustering, each of the three clusters that emerged define slightly different 'types' of people. Cluster 1 contained older, married individuals who knew less about common COVID-19 symptoms, were more likely to have believed common myths around COVID-19 and lived in the largest households. Members of this cluster also had the most concern about potential economic harms (fear of food shortages and loss of income) and had a higher perceived risk of COVID-19 early in the pandemic. Cluster 2 primarily consisted of less educated, married or divorced, middle-aged women who were the most economically impacted (eat less, loss of income, lack electricity, lack social support) at the beginning of the pandemic. These individuals were also the most likely of the three groups to report a perceived risk for gender-based violence from increased tensions at home due to the pandemic. Cluster 3 was the youngest group with higher educational attainment, who had a higher average knowledge of COVID-19 symptoms and expressed fewer fears around the economic impacts of lockdowns early in the pandemic. The mean values of each demographic variable per cluster is presented in **Supplementary Table 2**, and Clusters are described in **Supplementary Table 3**. The silhouette plots presented in **Supplementary Figure 1** highlight the three clusters selected that best capture the variation in the dataset.

We then ran the likelihood ratio tests to compare each variable to see if the fit was better with the variable alone (nested model) or with the addition of the cluster indicator (complex model). All of the likelihood ratio tests except for age were significant, revealing that when included in the model, the clusters defined using the K-Means algorithm are a better fit for the data than individual characteristics alone (**Table 2** presents for outcome of vaccine hesitancy in survey round 5 and **Table 3** for the outcome of vaccine uptake in round 6).

Outcome: vaccine acceptance	
“how likely are you to take the COVID-19 vaccine if it were offered today”	
Covariate	Likelihood Ratio Test P-Value
Education	<0.0001
Marital Status	<0.0001
Age	0.111
Household Size	<0.0001
Concerned the pandemic will impact income	<0.0001
Likely to test if symptomatic, know if positive for COVID-19	<0.0001
Know at least 3 symptoms of COVID-19	<0.0001
Household Gender-Based Violence Risk	<0.0001
Eat less due to COVID-19	<0.0001
Loss of income experienced due to COVID-19	<0.0001

Table 2: Likelihood ratio test for vaccine hesitancy (Nairobi survey round 5; Feb 2021, prior to vaccine rollout in Kenya) significance where H0: outcome ~ intercept + covariate and H1: outcome ~ intercept + covariate + cluster indicator

Outcome: vaccine uptake:
“Have you had at least one dose of the COVID-19 vaccine?”



Covariate	Likelihood Ratio Test P-Value
Education	<0.0001
Marital Status	<0.0001
Age	0.966
Household Size	<0.0001
Concerned the pandemic will impact income	<0.0001
Likely to test if symptomatic, know if positive for COVID-19	<0.0001
Know at least 3 symptoms of COVID-19	<0.0001
Household Gender-Based Violence Risk	<0.0001
Eat less due to COVID-19	<0.0001
Loss of income experienced due to COVID-19	<0.0001

**Table 3: Likelihood ratio test for vaccine uptake (Nairobi survey round 6, March 2022) where H0: outcome ~ intercept + covariate and H1: outcome ~ intercept + covariate + cluster indicator**

After completing the likelihood ratio tests and concluding that the clusters offer more information than demographic variables alone, we used regression forest analysis to explore the association between cluster identification and the two vaccine related outcomes. For vaccine acceptance (2021), Cluster 3 was significantly less likely to say they would get the vaccine if it became available compared to Cluster 1 (41.5% vs 55.3%; p-value <0.01) and compared to Cluster 2 (41.5% vs 50.5%; p=0.014) (**Figure 1**). Once the vaccine became available and participants were asked about vaccine uptake in 2022, Cluster 1 was significantly more likely to have gotten at least one dose of the vaccine compared to Cluster 2 (78.0% vs 69.3%; p-value <0.01), and more likely than Cluster 3 (78.0% vs 66.4%, p-value <0.01) (**Figure 2**). Of the 29% (n=324) in round 6 who have not gotten the vaccine, about half are hesitant (48%) and about half say they are very likely to still get the vaccine (not shown).

## Discussion

Our findings suggest that survey respondents from across Nairobi informal settlements fall into three clusters or archetypes each with distinct characteristics that can provide insight into COVID-19 vaccine uptake. Kenya, and our sample specifically, achieved high vaccination coverage (almost three-quarters of respondents). This estimate is in line with a global study that suggested a maximum share of 70% of the total population could be vaccinated, without application of coercive policies or restrictions(36). Our exploratory analyses suggest the cluster indicator adds value to basic models describing characteristics associated with vaccine uptake, capturing unmeasured characteristics of participants that are associated with the outcome. The clusters may be useful to identify archetypes of individuals in informal settlements and suggest avenues to explore for communication with sub-groups that have different vulnerabilities and risks. Our results suggest some variation between the three groups of respondents in vaccine uptake, information that can be used to better target or improve messaging to increase awareness and adoption of healthy behavior(37–42).

It is concerning to find that primarily younger, more highly educated individuals, with highest knowledge of COVID-19 transmission in Cluster 3 are least likely to have gotten the vaccine. They reported being less concerned with COVID-19 infection and the economic impacts, potentially indicating less urgency due to a lack of perceived risk, as initially risks to the elderly were highlighted. A recent study confirms this link, and that lack of perceived risk and low perceived disease severity were leading factors for not getting vaccinated(42). Relatedly, those in Cluster 3 were less likely to know someone who had tested positive for COVID-19 (17% vs 25% in Cluster 2 and 27% in Cluster 1) reinforcing their lower perceived risk (**Supplementary Table 2**). It's also likely younger people might be exposed to different information through their higher use of social media. Public health messages tailored to youth(43) could highlight vaccine safety, as our participants' main concerns were about side effects or wanting to wait and see if it's safe. Studies in other settings show young people may be concerned about myths regarding vaccine side effects that affect fertility(44). Lastly, it would also be useful to ensure access to vaccines for young people, potentially expanding current outreach to include mobile clinics or other options instead of requiring a visit to a health facility. Nairobi is already employing strategies for vaccine outreach including providing vaccines at social gatherings such as churches or social functions, this may increase uptake.

Respondents from Cluster 1, mostly men, defined by large households and with less educational attainment, were found to have more economic anxieties due to the pandemic and less knowledge about COVID-19 symptoms but also were most likely to have gotten the vaccine. They were also the most likely to believe common myths

around COVID-19 but have the highest perceived risk of infection. This may be because this cluster of individuals reported being more likely to need to travel for work (a factor in considering themselves at high risk of infection)(45). They also may hold jobs that require vaccination. Keeping employment by getting vaccinated may have been worth the risk, as this cluster also expressed economic concerns related to the pandemic and potentially were responsible for bringing in income to their large households. This is supported by a recent study that found older adults particularly with chronic illnesses had the highest vaccination rates, and that this group was responsive to messages to increase vaccination(46).

Individuals in Cluster 2, older women who were married or divorced, seem to carry the highest risk of economic hardship and gender-based violence due to the pandemic(37–41), so further investigation to not only vaccinate but also support this group is critical. Cluster 2 was comprised of older women, with higher risks of food insecurity and gender-based violence due to the pandemic(37–41). This group had a lower rate of vaccine uptake in relation to their willingness or interest in getting the vaccine expressed in February 2021. This could point to issues around accessibility of the vaccine, especially for women who may have more familial responsibilities and fewer financial and transportation resources. Government assistance and social support interventions may provide a solution, as well as outreach through churches and other venues, to reach women who are unable to travel to facilities and face other challenges in food and economic insecurity and potential violence risks.

By defining archetypes or groups in the population, we can better inform and target policy to improve the efficacy of public health and social support interventions. These clusters can also be used to inform future modeling and predictive analysis of the data by providing insight into what characteristics and behaviors define sub-groups of interest, particularly in a situation with a novel disease such as COVID-19 where a lot is unknown and where no prior information is available to inform messaging or policy. These are major strengths to this statistical approach as it is an efficient way to let the data guide the analysis without potential bias related to the analysts' preconceived beliefs about the population. Some limitations of this approach include possible changes to the clustering of the data when run multiple times due to the use of a random starting point and challenges in interpreting the data when clearly defined sub-groups are not present. Another limitation to note was the issue of social desirability bias that possibly arose during the phone interviews. Respondents may have felt compelled to provide socially acceptable responses rather than responses that reflect their true attitudes and beliefs, which may clarify some of the inconsistencies observed in vaccine acceptance and uptake. It is also important to note that the cohort of respondents are not truly representative of the underlying population but rather a subset that have a mobile

phone and an adolescent household member that participated in recent survey rounds through AGI-K and NISITU. It is also important to note that vaccine acceptance was recorded before the vaccine was available to the general public, and that there is a gap between the vaccine acceptance and uptake measures during which time perceptions may have shifted.

Overall, respondents in our sample of residents of five informal settlements in Nairobi had higher vaccination rates reported than Nairobi as a whole (nearly 75% compared to the 52% reported for the city(47)) as of March 2022. Of the unvaccinated participants, about half reported interest in receiving the vaccine. This suggests that with additional access and messaging almost all individuals can be vaccinated. We also found that most respondents had received more than one dose, although about one in ten had only received the first dose, suggesting additional outreach is needed to make sure everyone is fully vaccinated. As vaccine immunity wanes and new variants emerge, continued messaging and vaccination will be critical, but also uptake of other non-pharmaceutical interventions to prevent transmission(48,49). Studies to understand how to improve governance to increase vaccination and to determine optimal levels of vaccination, are important to inform policy(50–52). K-Means clustering may be a useful statistical tool when survey data are available to rapidly understand variation in the population and to highlight different potential approaches to messaging and outreach. This paper summarizes our methodology and results to provide a starting point for more investigation into targeted vaccination strategies.

## Conclusion

Machine learning techniques, such as K-Means clustering, are useful investigate the factors that may predict behaviors related to disease prevention and mitigation. By letting the data guide the analysis and identifying naturally occurring sub-groups, we identified characteristics associated with vaccine hesitancy and vaccine uptake, useful for informing policies and messages to target different vulnerable groups within a population. Our results highlight that the highest risk individuals (Cluster 1) are most likely to get vaccinated, but that younger, more educated respondents (Cluster 3) may require additional messaging and persuasion. One group identified (Cluster 2) faced many different challenges and barriers, not only to vaccination but in economic security, food security, and risk of violence. This group may require not only more ways to access the vaccine, but also may require additional access to social support systems. Based on the results of this study, K-Means clustering may be a useful tool to explore to better identify and target vulnerable groups in public health policy at a national and global level. Though this study primarily focused on vaccine acceptance and uptake, these methods can be applied to a wide range of public health behaviors in future use.

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**Data Sharing Statement:** Cleaned and deidentified dataset including questionnaire are publicly available on the Harvard Dataverse. Questionnaires and reports are publicly available, with the full deidentified data set available upon request.

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References

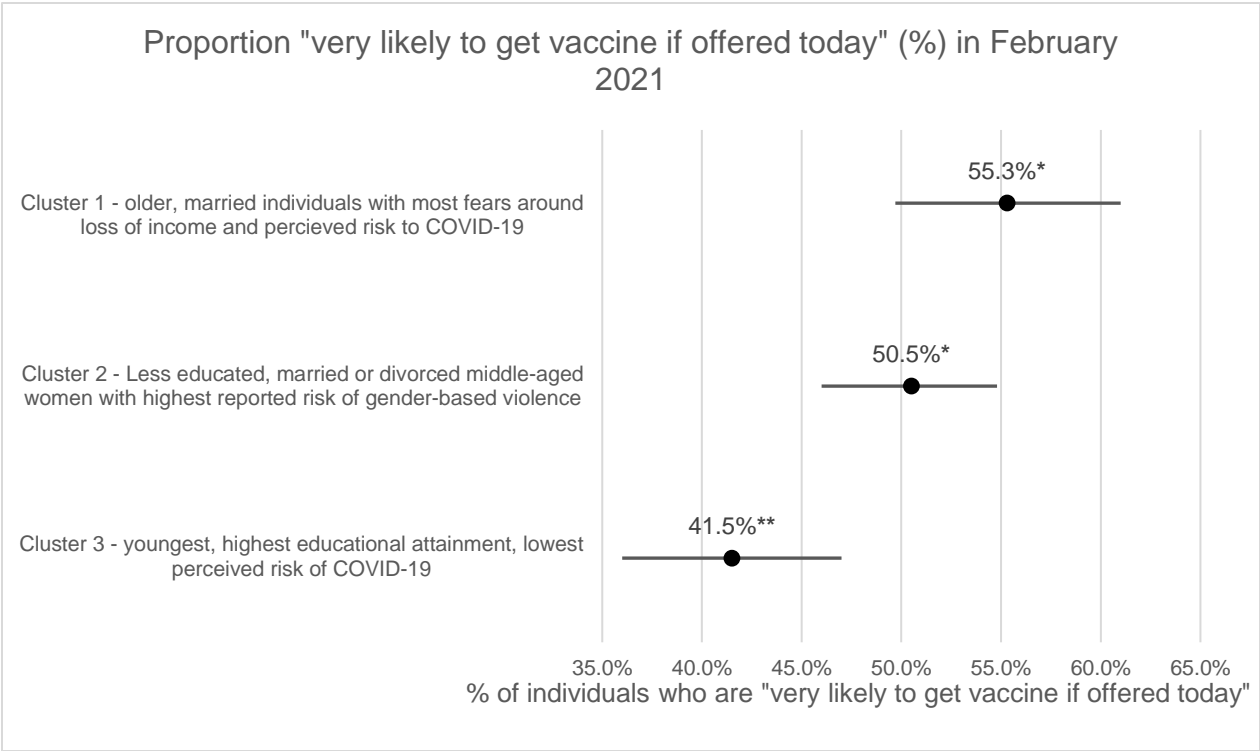
1. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Biomedica*. 2020.
2. Corburn J, Vlahov D, Mberu B, Riley L, Caiaffa WT, Rashid SF, et al. Slum Health: Arresting COVID-19 and Improving Well-Being in Urban Informal Settlements. *Journal of Urban Health*. 2020;
3. Mukumbang FC, Ambe AN, Adebisi BO. Unspoken inequality: How COVID-19 has exacerbated existing vulnerabilities of asylum-seekers, refugees, and undocumented migrants in South Africa. *Int J Equity Health*. 2020;
4. Stanturf JA, Goodrick SL, Warren ML, Charnley S, Stegall CM. Social vulnerability and Ebola virus disease in rural Liberia. *PLoS One*. 2015;
5. Ahmed SAKS, Ajisola M, Azeem K, Bakibinga P, Chen YF, Choudhury NN, et al. Impact of the societal response to COVID-19 on access to healthcare for non-COVID-19 health issues in slum communities of Bangladesh, Kenya, Nigeria and Pakistan: results of pre-COVID and COVID-19 lockdown stakeholder engagements. *BMJ Glob Health*. 2020;
6. Shah H. COVID-19 recovery: science isn't enough to save us. *Gale Onefile Health and Medicine*. 2021 Mar 25;591(7851).
7. Rouw A, Wexler A, Kates J, Michaud J. Tracking Global COVID-19 Vaccine Equity. Kaiser Family Foundation. 2021 Jul 21;
8. Lazarus J v, Abdool Karim SS, van Selm L, Doran J, Batista C, ben Amor Y, et al. COVID-19 vaccine wastage in the midst of vaccine inequity: causes, types and practical steps . *BMJ Glob Health*. 2022;7(4).
9. Harman S, Erfani P, Goronga T, Hickel J, Morse M, Richardson ET. Global vaccine equity demands reparative justice — not charity . *BMJ Glob Health*. 2021 Jun 21;6(6).
10. Khosla R, Gurskin S. Equity without human rights: a false COVID-19 narrative? . *BMJ Glob Health*. 2021 Jul 15;6(7).
11. World Health Organization. WHO Coronavirus (COVID-19) Dashboard.
12. Kenya Ministry of Health. <https://www.kenyanews.go.ke/health-ministry-calls-on-kenyans-to-go-for-covid-19-jab/>. Health Ministry Calls On Kenyans To Go For Covid-19 Jab.
13. Adepoju P. Kenya Mandates COVID-19 Vaccines for Civil Servants as Africa's Vaccine Rollout Gathers Speed. *Health Policy Watch Independent Global Health Reporting*. 2021 Aug 13;
14. Wasike A. Kenyan teachers given 7 days to get COVID vaccine or face punishment. *Andalou Agency*. 2021 Aug 17;
15. Fick M. Kenya's Covid-19 vaccine mandate draws praise and criticism. *Reuters*. 2021 Nov 23;
16. Kenya: Vaccine Requirements Violate Rights. *Human Rights Watch*. 2021 Dec 13;
17. Ackah BBB, Woo M, Stallwood L, Fazal ZA, Okpani A, Ukah UV, et al. COVID-19 vaccine hesitancy in Africa: a scoping review. Vol. 7, *Global Health Research and Policy*. BioMed Central Ltd; 2022.
18. Sallam M, Al-Sanafi M, Sallam M. A Global Map of COVID-19 Vaccine Acceptance Rates per Country: An Updated Concise Narrative Review. Vol. 15, *Journal of Multidisciplinary Healthcare*. Dove Medical Press Ltd; 2022. p. 21–45.

19. Lazarus J V., Wyka K, White TM, Picchio CA, Rabin K, Ratzan SC, et al. Revisiting COVID-19 vaccine hesitancy around the world using data from 23 countries in 2021. *Nat Commun.* 2022 Jul 1;13(3801).
20. Ackah M, Ameyaw L, Gazali Salifu M, Afi Asubonteng DP, Osei Yeboah C, Narkotey Annor E, et al. COVID-19 vaccine acceptance among health care workers in Africa: A systematic review and meta-analysis. *PLoS One.* 2022 May 18;17(5).
21. Detoc M, Bruel S, Frappe P, Tardy B, Botelho-Nevers E, Gagneux-Brunon A. Intention to participate in a COVID-19 vaccine clinical trial and to get vaccinated against COVID-19 in France during the pandemic. *Vaccine.* 2020 Oct 21;38(45).
22. Orangi S, Pinchoff J, Mwanga D, Abuya D, Hamaluba M, Warimwe G, et al. Assessing the Level and Determinants of COVID-19 Vaccine Confidence in Kenya. *Vaccines (Basel).* 2021 Aug 23;9(8).
23. Awang Bono S, Faria de Moura Villela E, Sin Siau C, Sun Chen W, Pengpid S, Hasan MT, et al. Factors Affecting COVID-19 Vaccine Acceptance: An International Survey among Low- and Middle-Income Countries. *Vaccines (Basel).* 2021 May 17;9(5).
24. Caserotti M, Girardi P, Rubaltelli E, Tasso A, Lotto L, Gavaruzzi T. Associations of COVID-19 risk perception with vaccine hesitancy over time for Italian residents. *Science Direct.* 2021 Mar;272.
25. Ackah BBB, Woo M, Stallwood L, Fazal ZA, Okpani A, Ukah UV, et al. COVID-19 vaccine hesitancy in Africa: a scoping review. *Glob Health Res Policy.* 2021 Sep 3;7(21).
26. Osur J, Muinga E, Kuria S, Hussein S, Mugambi Ireri E. COVID-19 vaccine hesitancy: Vaccination intention and attitudes of community health volunteers in Kenya. *Plos Global Public Health.* 2022 Mar 16;
27. Nasimiyu C, Ngere I, Dawa J, Amoth P, Oluga O, Ngunu C, et al. Near-Complete SARS-CoV-2 Seroprevalence among Rural and Urban Kenyans despite Significant Vaccine Hesitancy and Refusal. *Vaccines (Basel).* 2023 Jan 1;11(1).
28. Lazarus J V., Wyka K, White TM, Picchio CA, Gostin LO, Larson HJ, et al. A survey of COVID-19 vaccine acceptance across 23 countries in 2022. *Nat Med.* 2023 Jan 9;29:377–375.
29. COVID 19 Vaccine Perceptions: A 15 country study. 2021 Mar.
30. Austrian K, Pinchoff J, Tidwell JB, White C, Abuya T, Kangwana B, et al. COVID-19 Related Knowledge, Attitudes, Practices and Needs of Households in Informal Settlements in Nairobi, Kenya. *The Lancet.* 2020 Apr 14;
31. Hudson A, Montelpare WJ. Predictors of Vaccine Hesitancy: Implications for COVID-19 Public Health Messaging. *Int J Environ Res Public Health.* 2021 Jul 29;
32. Abbasi J. Widespread Misinformation About Infertility Continues to Create COVID-19 Vaccine Hesitancy. *JAMA Medical News & Perspectives.* 2022 Feb 22;
33. Ainslie D, Ogwuru C, Sinclair R. Coronavirus and vaccine hesitancy, Great Britain: 9 August 2021. 2021 Aug.
34. Blandi L, Sabbatucci M, Dallagiaco G, Alberti F, Bertuccio P, Odone A. Digital Information Approach through Social Media among Gen Z and Millennials: The Global Scenario during the COVID-19 Pandemic. *Vaccines (Basel).* 2022 Nov 1;10(11).



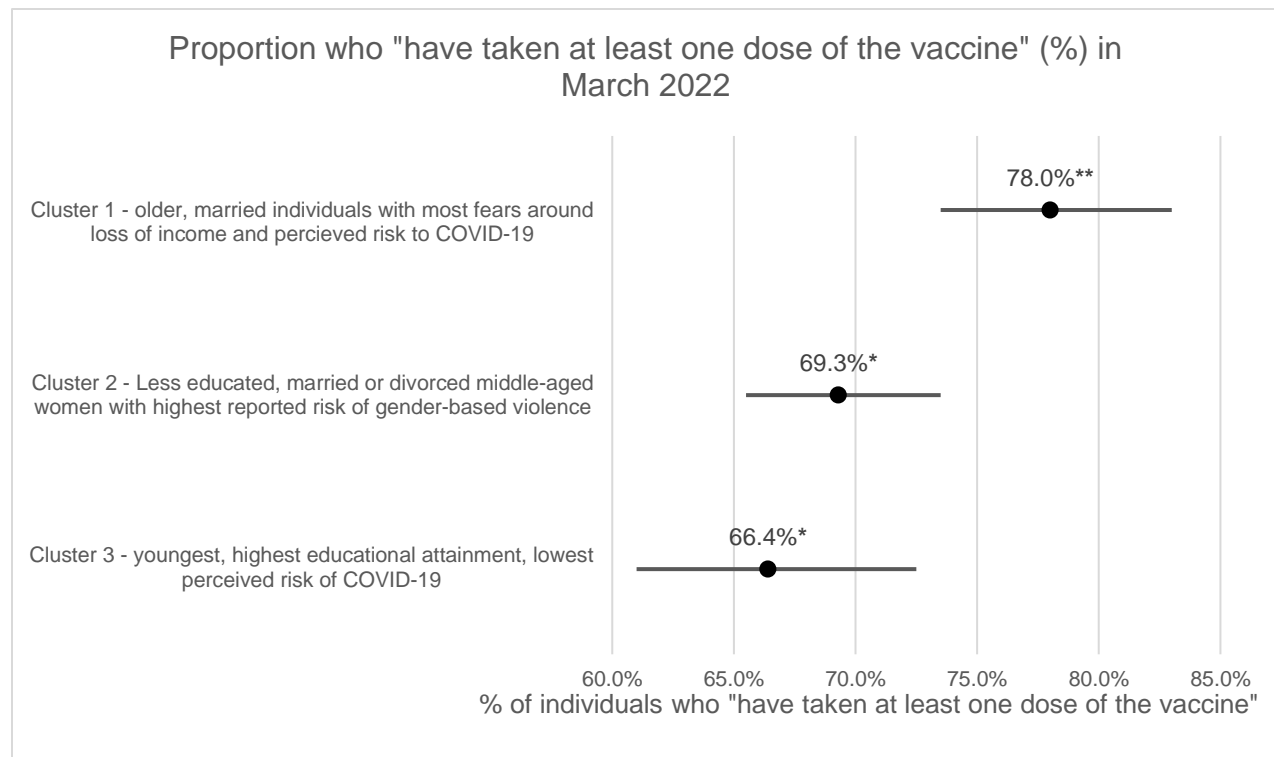
35. Ahlqvist E, Storm P, Käräjämäki A, Martinell M, Dorkhan M, Carlsson A, et al. Novel subgroups of adult-onset diabetes and their association with outcomes: a data-driven cluster analysis of six variables. *Lancet Diabetes Endocrinol*. 2018;
36. Coccia M. Improving preparedness for next pandemics: Max level of COVID-19 vaccinations without social impositions to design effective health policy and avoid flawed democracies. *Environ Res*. 2022 Oct 1;213.
37. Wenham C, Smith J, Morgan R. COVID-19: the gendered impacts of the outbreak. *The Lancet*. 2020.
38. John N, Casey SE, Carino G, McGovern T. Lessons Never Learned: Crisis and gender-based violence. *Dev World Bioeth*. 2020;
39. Gould C. Gender-Based Violence During Lockdown - Looking for Answers [analysis]. Market Watch [Internet]. Available from: <https://www.marketwatch.com/press-release/gender-based-violence-during-lockdown---looking-for-answers-analysis-2020-05-12>
40. Azcona G, Bhatt A, Ndugwa Robert. COVID-19 exposes the harsh realities of gender inequality in slums. [Internet]. Available from: <https://data.unwomen.org/features/covid-19-exposes-harsh-realities-gender-inequality-slums>
41. Pinchoff J, Austrian K, Rajshekhar N, Abuya T, Kangwana B, Ochako R, et al. Gendered economic, social and health effects of the COVID-19 pandemic and mitigation policies in Kenya: Evidence from a prospective cohort survey in Nairobi informal settlements. *BMJ Open*. 2021 Mar 3;11(3).
42. Davis TP, Yimam AK, Kalam MA, Tolossa AD, Kanwagi R, Bauler S, et al. Behavioural Determinants of COVID-19-Vaccine Acceptance in Rural Areas of Six Lower-and Middle-Income Countries. *Vaccines (Basel)*. 2022 Feb 1;10(2).
43. Limaye RJ, Balgobin K, Michel A, Schulz G, Erchick DJ. What message appeal and messenger are most persuasive for COVID-19 vaccine uptake: Results from a 5-country survey in India, Indonesia, Kenya, Nigeria, and Ukraine. *PLoS One*. 2022 Sep 1;17(9 September).
44. Diaz P, Reddy P, Ramasahayam R, Kuchakulla M, Ramasamy R. COVID-19 vaccine hesitancy linked to increased internet search queries for side effects on fertility potential in the initial rollout phase following Emergency Use Authorization. *Andrologia*. 2021 Oct 1;53(9).
45. Pinchoff J, Kraus-Perrotta C, Austrian K, Tidwell JB, Abuya T, Mwanga D, et al. Mobility Patterns During COVID-19 Travel Restrictions in Nairobi Urban Informal Settlements: Who Is Leaving Home and Why. *Journal of Urban Health*. 2021 Apr 1;98(2):211–21.
46. Yego J, Korom R, Eriksson E, Njavika S, Sane O, Kanorio P, et al. A Comparison of Strategies to Improve Uptake of COVID-19 Vaccine among High-Risk Adults in Nairobi, Kenya in 2022. *Vaccines (Basel)*. 2023 Feb 1;11(2).
47. Report of the OAG, as at 31 March, 2022, of Covid-19 Vaccine Roll Out for Nairobi City.
48. Coccia M. Sources, diffusion and prediction in COVID-19 pandemic: lessons learned to face next health emergency. *AIMS Public Health*. 2023;10(1):145–68.
49. Dobrev Z, Gimma A, Rohan H, Djoudalbaye B, Tshangela A, Jarvis CI, et al. Characterising social contacts under COVID-19 control measures in Africa. *BMC Med*. 2022 Dec 1;20(1).

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50. Coccia M. COVID-19 Vaccination is not a Sufficient Public Policy to face Crisis Management of next Pandemic Threats. Public Organization Review. 2022;
51. Coccia M. Optimal levels of vaccination to reduce COVID-19 infected individuals and deaths: A global analysis. Environ Res. 2022 Mar 1;204.
52. Benati I, Coccia M. Global analysis of timely COVID-19 vaccinations: improving governance to reinforce response policies for pandemic crises. International Journal of Health Governance. 2022 May 31;27(3).



**\*\***Cluster 3 is significantly lower than Cluster 1 and Cluster 2 ( $p<0.01$  and  $p=0.014$  respectively)  
**\***Cluster 1 and 2 are significantly different than Cluster 3, but not each other

**Figure 1: Regression forest analysis plot of vaccine acceptance by cluster, Nairobi, Kenya February 2021 (N=1,117)**



**\*\*Cluster 1 is significantly higher than Cluster 2 and Cluster 3 ( $p < 0.01$  for both)**

**\*Cluster 2 and 3 are significantly different than Cluster 1, but not each other**

**Figure 2: Regression forest analysis plot of vaccine uptake by cluster, Nairobi, Kenya March 2022 (N=1,121).**

Supplementary Table 1: variables included in K-Means clustering to create the clusters with variable description, means and standard deviation

Variable Name	Mean	SD	Question Description
<b>Educational attainment</b>			
Pre-Primary/None	0.04	0.19	No Education/Pre-Primary (0 = No, 1 = Yes)
Primary	0.4	0.49	Primary Education (0 = No, 1 = Yes)
Secondary	0.43	0.5	Secondary Education (0 = No, 1 = Yes)
Higher Education	0.13	0.34	Higher Education (0 = No, 1 = Yes)
<b>Age in years</b>	36.45	11.3	Age (continuous)
<b>Gender</b>	0.63	0.48	Gender (0 = Male, 1 = Female)
<b>Marital Status</b>			
Married	0.59	0.49	Married (0 = No, 1 = Yes)
Single	0.24	0.43	Single (0 = No, 1 = Yes)
Divorced/Separated	0.17	0.37	Divorced/Separated (0 = No, 1 = Yes)
<b>Slum of residence</b>			
Kibera	0.22	0.42	Respondents from Kibera (0 = No, 1 = Yes)
Dandora	0.24	0.42	Respondents from Dandora (0 = No, 1 = Yes)
Huruma	0.13	0.34	Respondents from Huruma (0 = No, 1 = Yes)
Kariobangi	0.2	0.4	Respondents from Kariobangi (0 = No, 1 = Yes)
Mathare	0.21	0.41	Respondents from Mathare (0 = No, 1 = Yes)
<b>Perceived Risk of COVID-19</b>	1.07	0.83	Perceived Risk (0 = No/Low Risk, 1 = Medium Risk, 2 = High Risk)
<b>Knowledge of COVID-19 symptoms</b>			Participants were asked if they knew common symptoms of COVID-19
No Known Symptoms	0.07	0.26	No Known Symptoms (0 = No, 1 = Yes)

<b>Fever</b>	0.81	0.4	Fever (0 = No, 1 = Yes)
<b>Headache</b>	0.54	0.5	Headache (0 = No, 1 = Yes)
<b>Cough</b>	0.88	0.32	Cough (0 = No, 1 = Yes)
<b>Diarrhea</b>	0.06	0.23	Diarrhea (0 = No, 1 = Yes)
<b>Difficulty Breathing</b>	0.46	0.5	Difficulty Breathing (0 = No, 1 = Yes)
<b>Loss of Taste</b>	0.01	0.08	Loss of Taste (0 = No, 1 = Yes)
<b>Loss of Smell</b>	0.02	0.14	Loss of Smell (0 = No, 1 = Yes)
<b>Tiredness/Fatigue</b>	0.24	0.43	Tiredness/Fatigue (0 = No, 1 = Yes)
<b>Chest Pain</b>	0.05	0.22	Chest Pain (0 = No, 1 = Yes)
<b>Chills</b>	0.01	0.12	Chills (0 = No, 1 = Yes)
<b>Rash</b>	0.03	0.07	Rash (0 = No, 1 = Yes)
<b>Dizziness</b>	0.03	0.18	Dizziness (0 = No, 1 = Yes)
<b>Sneezing</b>	0.47	0.5	Sneezing (0 = No, 1 = Yes)
<b>Sore Throat</b>	0.08	0.26	Sore Throat (0 = No, 1 = Yes)
<b>Body Ache</b>	0.34	0.47	Bodyache (0 = No, 1 = Yes)
<b>Know Three Symptoms</b>	0.32	0.47	Know at least 3 symptoms of COVID-19 (0 = No, 1 = Yes)
<b>Believe myths about COVID-19</b>			
<b>God</b>	0.27	0.44	Believe myth that God protects (0 = No, 1 = Yes)
<b>Hot Places</b>	0.11	0.31	Believe myth that hot weather will prevent infection (0 = No, 1 = Yes)
<b>Rural</b>	0.05	0.23	Believe myth that rural areas are not affected (0 = No, 1 = Yes)
<b>Any Myth</b>	0.24	0.42	Believe any myth about COVID-19 (0 = No, 1 = Yes)
<b>Know Hotline for COVID-19 concerns and information</b>	0.6	0.49	Know hotline number (0 = No, 1 = Yes)
<b>Know someone positive for COVID-19</b>	0.03	0.17	Know anyone who is positive for COVID-19 (0 = No, 1 = Yes)

If Sick, would ...			
Isolate	0.24	0.43	If sick, will isolate (0 = No, 1 = Yes)
Get Tested	0.27	0.44	If sick, will get tested (0 = No, 1 = Yes)
Distance 2m	0.1	0.3	If sick, will distance 2 meters from others (0 = No, 1 = Yes)
Go to Clinic	0.64	0.48	If sick, will go to clinic (0 = No, 1 = Yes)
Wears a Mask	0.6	0.49	Will wear mask when going outside (0 = No, 1 = Yes)
Wears Mask Correctly	0.04	0.2	Will wear mask correctly when going outside, meaning over the nose and mouth (0 = No, 1 = Yes)
Food insecurity	0.68	0.47	Skipped meals due to COVID-19 (0 = No, 1 = Yes)
Avoid Transport due to COVID-19 risks	0.72	0.45	Avoided public transport due to COVID-19 (0 = No, 1 = Yes)
Loss of Income			
Complete	0.47	0.5	Complete loss of income (0 = No, 1 = Yes)
Partial	0.58	0.49	Partial Loss of Income (0 = No, 1 = Yes)
Experience of symptoms			
Fever	0.03	0.17	Has fever (0 = No, 1 = Yes)
Difficulty Breathing	0	0.07	Has difficulty breathing (0 = No, 1 = Yes)
Cough	0.04	0.2	Has cough (0 = No, 1 = Yes)
Aches	0.02	0.14	Has body aches (0 = No, 1 = Yes)
Sore Throat	0.01	0.09	Has sore throat (0 = No, 1 = Yes)
Tired	0.01	0.11	Is tired (0 = No, 1 = Yes)
Lost sense of Taste/Smell	0	0.05	Lost sense of taste and/or smell (0 = No, 1 = Yes)
Sum of Symptoms	0.12	0.44	Sum of COVID=19 symptoms present
Have Two Symptoms	0.02	0.14	Have two COVID-19 symptoms present (0 = No, 1 = Yes)
Household Size	2.61	0.93	Household size (# members)



<b>Travel Far for work</b>	0.53	0.5	Have to travel far for work (0 = No, 1 = Yes)
<b>Have Electricity</b>	0.72	0.45	Have electricity at home (0 = No, 1 = Yes)
<b>Have Social Support</b>	0.43	0.49	Have access to social support system meaning people who would bring food, bring medicine, and check in on them if sick (0 = No, 1 = Yes)
<b>Received government support</b>	0.09	0.29	Have received some form of government assistance, financial, food, or other (0 = No, 1 = Yes)
<b>Perceives Assistance Meets Needs</b>	0.34	0.47	Government assistance received meets needs (0 = No, 1 = Yes)
<b>Gender-Based Violence Risk</b>	0.37	0.48	Risk of gender-based violence at home (0 = No, 1 = Yes)
<b>Fears related to COVID-19</b>			
<b>Increased Crime</b>	0.04	0.19	Increased crime due to lockdown (0 = No, 1 = Yes)
<b>Crowds</b>	0.04	0.2	Difficult to keep away from crowds (0 = No, 1 = Yes)
<b>Deadly Virus</b>	0.59	0.49	It is a deadly virus (0 = No, 1 = Yes)
<b>Food Shortages</b>	0.3	0.46	Food shortages (0 = No, 1 = Yes)
<b>Hospitalization</b>	0.06	0.24	Fear of being hospitalized (0 = No, 1 = Yes)
<b>Infect Others</b>	0.21	0.41	Fear of infecting others (0 = No, 1 = Yes)
<b>Being Lied To</b>	0	0.04	Fear being lied to by the Government (0 = No, 1 = Yes)
<b>Loss of Income</b>	0.43	0.49	Fear loss of income (0 = No, 1 = Yes)
<b>No Cure</b>	0.42	0.49	There is no cure for this virus (0 = No, 1 = Yes)
<b>No Transport</b>	0.02	0.14	No transport available (0 = No, 1 = Yes)
<b>Quarantine</b>	0.11	0.32	Fear of being quarantined (0 = No, 1 = Yes)
<b>Rent</b>	0.12	0.33	Fear of not being able to pay rent (0 = No, 1 = Yes)
<b>Separated from Family</b>	0.18	0.38	Fear of being separated from family (0 = No, 1 = Yes)
<b>Awareness of treatment</b>	0.02	0.14	Don't know where to get treatment (0 = No, 1 = Yes)

Supplementary Table 2: cluster means of each variable by cluster used in K-Means clustering

Variable	Cluster 1 (mean)	Cluster 2 (mean)	Cluster 3 (mean)
<b>Educational Attainment</b>			
Pre Primary/None	0.13	0.08	0.11
Primary	0.4	0.17	0.45
Secondary	0.38	0.53	0.35
Higher Education	0.09	0.21	0.09
<b>Age in years</b>	51.31	22.99	37.72
<b>Gender</b>	0.56	0.58	0.7
<b>Marital Status</b>			
Married	0.64	0.34	0.67
Single	0.12	0.58	0.13
Divorced/Separated	0.23	0.07	0.2
<b>Slum of residence</b>			
Kibera	0.26	0.16	0.22
Dandora	0.23	0.34	0.27
Huruma	0.14	0.09	0.12
Kariobangi	0.17	0.23	0.16
Mathare	0.19	0.18	0.24
<b>Perceived Risk of COVID-19</b>	0.95	0.9	0.94
<b>Knowledge of COVID-19 Symptoms</b>			
No Known Symptoms	0.02	0.01	0.02
Fever	0.55	0.58	0.55
Headache	0.47	0.44	0.44
Cough	0.8	0.84	0.8
Diarrhea	0.03	0.03	0.02
Difficulty Breathing	0.42	0.43	0.44
Loss of Taste	0.05	0.07	0.04
Loss of Smell	0.05	0.04	0.04

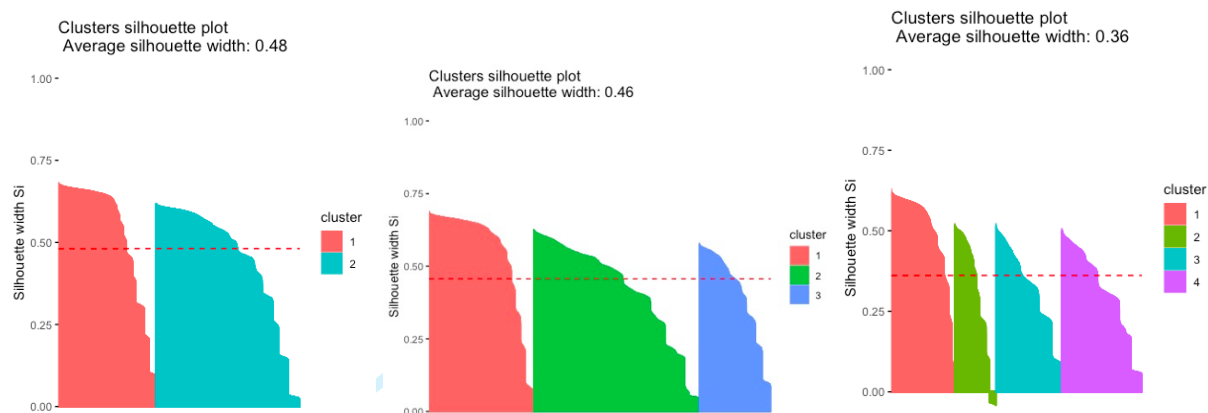
Tiredness/Fatigue	0.16	0.13	0.16
Chest Pain	0.09	0.08	0.1
Chills	0.03	0.02	0.03
Rash	0.01	0.01	0.02
Dizziness	0.19	0.21	0.19
Sneezing	0.51	0.49	0.51
Sore Throat	0.15	0.17	0.16
Body Ache	0.19	0.19	0.18
Know Three Symptoms	0.36	0.39	0.4
Believe Myths about COVID-19			
God	0.17	0.11	0.17
Hot Places	0.44	0.44	0.44
Rural	0.47	0.48	0.49
Any Myth	0.24	0.2	0.24
Know Hotline for COVID-19 concerns and information	0.25	0.24	0.23
Know someone positive for COVID-19	0.03	0.03	0.02
If Sick, would ...			
Isolate	0.28	0.41	0.3
Get Tested	0.33	0.35	0.36
Distance 2m	0.08	0.1	0.08
Go to Clinic	0.73	0.68	0.73
Wear a Mask	0.7	0.67	0.7
Wears Mask Correctly	0.06	0.16	0.15
Food Insecurity	0.47	0.42	0.52
Avoid Transport due to COVID-19 risks	0.63	0.64	0.63
Loss of Income			
Complete	0.5	0.46	0.51
Partial	0.33	0.28	0.34
Experience of Symptoms			
Fever	0.02	0.02	0.02

Difficulty Breathing	0	0	0
Cough	0.03	0.03	0.03
Aches	0.02	0.01	0.01
Sore Throat	0.01	0.01	0
Tired	0.01	0.01	0.01
Lost sense of Taste/Smell	0	0	0
Sum of Symptoms	0.1	0.09	0.09
Have Two Symptoms	0.02	0.02	0.02
Household Size	2.44	2.01	2.42
Travel Far for Work	0.64	0.63	0.63
Have Electricity	0.57	0.59	0.56
Have Social Support	0.61	0.65	0.61
Received Government Support	0.12	0.06	0.09
Perceived Assistance Meets Needs	0.53	0.57	0.5
Gender-Based Violence Risk	0.37	0.36	0.39
Fears related to COVID-19			
Increased Crime	0.02	0.03	0.02
Crowds	0.05	0.04	0.05
Deadly Virus	0.7	0.77	0.72
Food Shortages	0.33	0.28	0.32
Hospitalization	0.05	0.05	0.05
Infect Others	0.21	0.23	0.23
Being Lied To	0	0	0
Loss of Income	0.32	0.27	0.3
No Cure	0.27	0.27	0.27
No Transport	0.02	0.01	0.02
Quarantine	0.11	0.13	0.11
Rent	0.21	0.22	0.22
Separated from Family	0.1	0.1	0.12
Awareness of Treatment	0.08	0.06	0.07

Supplementary Table 3: key characteristics of each cluster used in K-Means clustering

Cluster	Description
Cluster 1	<ul style="list-style-type: none"> <li>• Older, less educated</li> <li>• Married (mostly) or divorced</li> <li>• Know less about the symptoms and are more likely to believe myths</li> <li>• Less likely to know positive for COVID-19, get tested, and isolate if sick</li> <li>• Live in largest households</li> <li>• Have more economic anxieties (fear of food shortages and loss of income), but have electricity, social support, and assistance</li> <li>• Second most likely to eat less due to COVID-19</li> </ul>
Cluster 2	<ul style="list-style-type: none"> <li>• Middle-aged, less educated women</li> <li>• Likely to be married, some divorced</li> <li>• Know symptoms, but more likely to believe myths</li> <li>• Most economically impacted (eat less, loss of income, lack electricity, lack social support)</li> <li>• Highest risk of gender-based violence/increased tension at home</li> </ul>
Cluster 3	<ul style="list-style-type: none"> <li>• Younger, more highly educated</li> <li>• Mostly single</li> <li>• Average knowledge of COVID-19 symptoms, but are less likely to believe most myths</li> <li>• Have electricity and social support</li> <li>• Live in smaller households</li> <li>• Less fear around economic impacts (loss of income and food shortages)</li> </ul>

## Supplementary Figure 1: Silhouette plot used to determine the best fit of clusters for K-Means algorithm



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			<p>duruufo nololeed oo dadku badan yahay / Musqulaha la wadaago</p> <p>j. Handle cash Waxaan qabte lacag caadan ah 0 1</p> <p>k. Am sick/have a health condition Waan xanuunsanahay / Waxaan qaba xaalad caafimaad 0 1</p> <p>l. Someone in my household is high risk (for any reason) Qof ka mid qoyskeyga ayaa halis ku sugan (sababi ahadaba) 0 1</p> <p>m. Live in or near a hotspot/place with many confirmed cases Waxaan ku noolahay/ u dhowahay meelaha qatarita ah / mise meelaha ugu badan maralada la xaqiijiyaay 0 1</p> <p>n. My kids are back in school Carurteyda waxay ku labtan skuulka 0 1</p> <p>o. I have gone back to work Waxaan ku labte shaqo 0 1</p> <p>p. Other (specify) Kuwa ( sheg) 0 1</p>	
204	8	<p>Do you know anyone in your family, neighborhood or workplace who has been infected with the Coronavirus? Your answer is confidential and no action will be taken based on your answer. Would you say: Adhiga maginayso qof (qoyskiisa, darsiga ama mesha shaqada) uu ku dacey corona virus? Jawaabtaada waa sir ah oo ficlaha kuma salaysnaan doona jawaabtaada. Miyaad dihi lahed:</p> <p>Read answer options aloud Kor u akhri jawabaha</p>	<p>a. Yes, I know someone who tested positive Haa, waxan garanaya qof laga helay cudurka corona virus 1</p> <p>b. Yes, I know someone who is suspected of being positive but hasn't gone for a test Haa, waxan garanaya qof looga shakisaa yaha corona virus lahin aan iska caabinin 2</p> <p>c. No, I don't know anyone Maya, Cofna garan maayo 3</p>	302
501	9	<p>Who had Coronavirus? Yaa qaaba corona virus?</p>	<p>a. Me Aniga 0 1</p> <p>b. Someone in my family Qof la miid qarabadeyda 0 1</p> <p>c. Someone in a friend's family Qof ka miid ah qarabada saxibadey 0 1</p> <p>d. Someone in my neighborhood/community Qof ka miid ah daariskeyga / bulshadeyda 0 1</p> <p>e. My friend Saxibkey 0 1</p> <p>f. Co worker Qof aan isla shaqayno 0 1</p> <p>g. Someone at my child's school Qof kujira skuulka curugeyga 0 1</p> <p>h. Someone else Qof kale 0 1</p> <p>i. Refuse Wan diidhe inaan ka jawabo 0 1</p>	
302	10	<p>Now I want you to imagine that people suspected that you were infected with Coronavirus, or that you have tested positive for Coronavirus. How do you think that people in your family and neighborhood would treat you. For each statement tell me if you think it's true or false. Hada waxaan rabaa inaad qiyaasid inn dadku say kaga shakisaa yahiin innu kugu dhacay corona virus ama laga helay corona virus. Sideed u malaynayso in dada qoyskaaga ama darsigaaga ay kuula dhaqmayaan. Qoraal kasta ii sheg hadii aad u malaynayso inay run tahay ama been.</p>	<p>a. People would stop talking to me Dadka waxay iska reeban inay ila hadlan 0 1</p> <p>b. People would gossip about me Dadku way ilga shekaynan 0 1</p> <p>c. People I know would bring me food I need Dad aan garanayo ayaa ii keena cuntada aan uu bahanay 0 1</p> <p>d. People I know would bring me the medicines I need Dad aan garanayo ayaa ii keena dawada aan uu bahanay 0 1</p> <p>e. People in the community would treat my family badly Dadka bulshada dhexdhexda ayaa si xun ulaa dhaqma qarabadheyda 0 1</p> <p>f. After I have recovered from Corona virus, people in the community would still avoid me Kadib marka aan corona virus ka bogsodday, dadka bulshada dhexdhexda ayaa weli iiga fogaanay 0 1</p> <p>g. After I have recovered from Coronavirus, I would not be welcome back into my house by family 0 1</p> <p>h. After I have recovered from Coronavirus, I would not be welcome back at my place of work Kadib marka aan ka bogsodday corona virus weli liima o'goda inaan taago mesha shaqada 0 1</p> <p>i. After I have recovered from Coronavirus I would still not be welcome back to my place of worship Kadib marka aan ka bogsodday corona virus weli liima o'goda inaan ku dhukado masjidka 0 1</p> <p>j. After I have recovered from Coronavirus my child would not be welcomed back to school Kadib marka aan ka bogsodday corona virus curugeyga weli liima o'goda inn u ku labto skuulka 0 1</p>	
502	11	<p>How true are the following sentences describing the people in your community? Side ay run u yihiin qoralka soo socda ee sharxaya dadka ka tirsan bulshadada?</p> <p>People in my community are taking steps to protect themselves and others from coronavirus (COVID-19). Would you say: Very true, somewhat true, not very true, not true at all. Dadkanool bulshadeyda ayaa qasdaya tilaaboyin ay iskaga ilaalinayaan niftooda iyo kuwa kale corona virus ka (COVID-19). Miyaad dihi lahayd: Ruun ma ahan dhamaan, Waxay run , Aad run ma ahan , Ruun ma ahan dhamaan</p>	<p>a. Very true Aad ba run utahay 1</p> <p>b. Somewhat true Waxay run 2</p> <p>c. Not very true Aad run ma ahan 3</p> <p>d. Not true at all Ruun ma ahan dhamaan 4</p>	
503	12	<p>People in my community are angry about the social distancing measures put in place due to coronavirus (COVID-19). Would you say very true, somewhat true, not very true or not true at all. Dadka ku nool bulshadeyda waxay ka xanaqan wax ku sabasan tilmamaha ee kala fogashada ee corona virus ka awoode ( COVID-19). Miyaad dihi lahayd: Ruun ma ahan dhamaan, Waxay run , Aad run ma ahan , Ruun ma ahan dhamaan</p>	<p>a. Very true Aad ba run utahay 1</p> <p>b. Somewhat true Waxay run 2</p> <p>c. Not very true Aad run ma ahan 3</p> <p>d. Not true at all Ruun ma ahan dhamaan 4</p>	
504	13	<p>People in my community work together to prevent and fight the coronavirus (COVID-19). Would you say: Very true, somewhat true, not very true, not true at all. Dadka ku nool bulshadeyda waa isla shaqayn si ay ugu hortaga oo ula dagaalan corona virus ka ( COVID-19). Miyaad dihi lahayd: Ruun ma ahan dhamaan, Waxay run , Aad run ma ahan , Ruun ma ahan dhamaan.</p>	<p>a. Very true Aad ba run utahay 1</p> <p>b. Somewhat true Waxay run 2</p> <p>c. Not very true Aad run ma ahan 3</p> <p>d. Not true at all Ruun ma ahan dhamaan 4</p>	
505	14	<p>Would you say that the current government guidance/regulation on COVID-19 are very easy to follow, somewhat easy to follow, somewhat difficult to follow or very difficult to follow? Miyaad dihi lahayd tilmamaha / sharciya dowlada ee COVID-19 Aad ba u fudud yihiin inn la raaco, waxay ay fudud yihiin inn la raaco, waxay ay adag yihiin inn la raaco, Aad ba u adag yihiin inn la raaco.</p>	<p>a. Very easy to follow Aad ba u fudud yihiin inn la raaco 1</p> <p>b. Somewhat easy to follow waxay ay fudud yihiin inn la raaco 2</p> <p>c. Somewhat difficult to follow waxay ay adag yihiin inn la raaco 3</p> <p>d. Very difficult to follow Aad ba u adag yihiin inn la raaco. 4</p>	
506	15	<p>Now I want to ask you a few questions about a Coronavirus vaccine. As you may know, several vaccines that protect you from Coronavirus have been developed and approved, although they are not yet in Kenya. When the vaccine becomes available here, how likely it is that you would get the vaccine. Would you say very likely, somewhat likely, very unlikely. Hada waxaan raba inaan ku weydio su'aalo yar oo ku saabsan tallaalka corona virus ka. Sideed ogahay waxa soo isare oo la oggolaaday dhowr tallal oo ka dhacaya corona virus ka, Lakin weli so ma gaarin Kenya. Sidee u badan tahay inaad heli karto tallaalka. Miyaad dihi lahayd aad ba u badan tahay, waxay ay badan tahay, waxay ma badno, aad uma badno</p>	<p>a. Very likely aad ba u badan tahay 1</p> <p>b. Somewhat likely waxay ay badan tahay 2</p> <p>c. Somewhat unlikely waxay ma badno 3</p> <p>d. Very unlikely aad uma badno 4</p> <p>e. Don't know Maagi 5</p>	
507	16	<p>If the Coronavirus vaccine would be available for free, how likely is it that you would get it. Would you say very likely, somewhat likely, somewhat unlikely or very unlikely? Hadii talaalka corona virus ka uu bilaash ahan lahay, sidee u badan tahay inaad heli karto. Miyaad dihi lahayd aad ba u badan tahay, waxay ay badan tahay, waxay ma badno, aad uma badno</p>	<p>a. Very likely aad ba u badan tahay 1</p> <p>b. Somewhat likely waxay ay badan tahay 2</p> <p>c. Somewhat unlikely waxay ma badno 3</p> <p>d. Very unlikely aad uma badno 4</p> <p>e. Don't know Maagi 5</p>	
508	17	<p>Which are some of the reasons that may keep you from getting the vaccine Maxay yihiin sababaha qaarkood ee ka rebaya inaan qaadatai tallaalka.</p> <p>Read all answer options aloud Kor u akhri dhamaan jawabaha</p>	<p>a. I do not trust the vaccine Ma aaminsani tallaalka 0 1</p> <p>b. I worry about the side effects Waxan ka walwalsanahay dhibaatooyinka ka ii maadhi doona 0 1</p> <p>c. I will not be able to afford it Ma awoodi inaan iibasado 0 1</p> <p>d. I am not worried that I will get infected with Coronavirus Kama walwalsanay innu igu dhici corona vir 0 1</p> <p>e. I do not think the vaccine will be effective Uma maleynayo in tallaalka waxay yeelan doono 0 1</p> <p>f. I am too busy to get vaccinated Aad ba uga mashquuli inaan qaato tallaalka 0 1</p> <p>g. I am afraid that I will get infected with Coronavirus if I get vaccinated Waan baqay inn corona virus 0 1</p> <p>h. It will be hard for me to access the place where I can get vaccinated Waa igu adag tahay inaan h 0 1</p> <p>i. Other (specify) Kuwa kale (sheg) 0 1</p> <p>j. I am scared of needles / jabs Waan ka baqaa ciirbadaha / baritanka 0 1</p> <p>k. For religious and cultural reasons Sababi dinta iyo dhaganka awoode 0 1</p>	
509	18	<p>If the vaccine was available for free here in Kenya, how likely is it that you would take your kids to get the vaccine that protects them from getting Coronavirus. Would you say very likely, somewhat likely, somewhat unlikely, or very unlikely? Hadii talaalka uu bilaash ahan lahay halan Kenya sidee u badan tahay inaad naan tartas naan tartas si ay u helaan tallaalka ee ka dhacaya corona virus ka. Miyaad</p>	<p>a. Very likely aad ba u badan tahay 1</p> <p>b. Somewhat likely waxay ay badan tahay 2</p>	

		<p>adhaa lahayd hadda u badan tahay, wayyar ay badan tahay, wayyar ma badno, aad uma badno</p> <p>c. Somewhat unlikely wayyar ma badno 3</p> <p>d. Very unlikely aad uma badno 4</p> <p>e. Don't know Maagi 5</p> <p>f. I do not have any children Malahi wax carur ah</p>	
510	19	<p>If the vaccine were not available for free, how much would you be willing to pay in total? Remember that you will need two shots about one month apart. Hadi tallaalka an lagu heli karin blaash, immisa guud ahan diyaar utahay inaad bixiso? Xasunow waxad u bahantahay labo cirobadood hal bil guudahad.</p> <p>Note: if not willing to pay mark zero Ogow: Hadi ay rabin inay bixiyaan waxa u qoray eber</p>	<p>KES [Range: 0-20000]</p> <p>Don't know Maagi 99999</p> <p>sidhe inaan ka jawabo 88888</p>
511	20	<p>Which of the following statements best describes you: I used to follow COVID-19 prevention guidelines (i.e. washing hands, social distancing, wearing a mask when around others, avoiding gatherings, etc.) and I still do, I used to follow guidelines but now I don't as much, I didn't used to follow guidelines but now I do, or I never used to follow guidelines that much and I still don't. Qorashada soo socda kuwe adhiiga aad ku tilmaana. Waxan raace jiray sharciyada ee ka hortaga COVID-19 (Tusaale ahan: gacma dhaqashada, kala loogashada, xirashada afka iyo sanka marka aan la jooga dadka kale, inaan taagin meelaha layskugu imaana, iyo kuwa kale) welina waan sameysa, waan raace jiray sharciyada lakin hada inta badan ma raaci, Ma raace jirin sharciyada lakin hada waan raaca ama weligey ma raacin sharciyada inta badan oo hadana ma raaca</p>	<p>I used to follow guidelines and I still do Waxan raace jiray sharciyada welina waan sameysa 1</p> <p>I used to follow guidelines and now I don't as much waan raace jiray sharciyada lakin hada inta bak 2</p> <p>I never followed guidelines that much and now I do Ma raace jirin sharciyada lakin hada waan raaca 3</p> <p>I never used to follow guidelines that much and I still don't weligey ma raacin sharciyada inta badan oo I 4</p> <p>Don't know Maagi 5</p>
211	21	<p>Do most public areas in the area where you live - markets, public toilets, etc. - have hand washing stations available with water and soap? Ma qaban inta badan gobaha dadweynaha ee ku yaal meesha aad ku nooshahay -Suqyada, Makhaayadaha, Dukamada, Musqulaha dadweynaha iyo kuwa kale meel gacma dhaq oo leh biyo iyo sabuun.</p>	<p>a. No Maya 0</p> <p>b. Yes Haa 1</p> <p>c. Don't know Maagi 2</p>
304	22	<p>Do you have a designated place in your house to wash hands? Majirta gurigaaga meel gooni ah oo lagu dhaqdo gacmaha</p>	<p>No Maya 1</p> <p>Yes Haa 2</p>
305	23	<p>Do you currently have water available at the handwashing place in your home? Hada ma qabta biyo meesha lagu dhaqdo gacmaha gurigaaga</p>	<p>No Maya 1</p> <p>Yes Haa 2</p>
306	24	<p>Do you currently have soap available at the handwashing place in your home? Hada majirta sabuun meesha lagu dhaqdo gacmaha gurigaaga</p>	<p>No Maya 1</p> <p>Yes Haa 2</p>
212	25	<p>In the past one week, have you worn a face mask? Isuubuci la soo dhaafay, ma xiratay maaska</p>	<p>a. No Maya 0</p> <p>b. Yes Haa 1</p>
213	26	<p>When you are outside of your house, did you wear the facemask covering your nose and your mouth, always, sometimes, or rarely? Marka aad joogta baranka guunkaaga, Mayaad ku xirta maaska la sanka iyo afka, markasta, waqti qaar, ama mar mar?</p>	<p>a. Always markasta 1</p> <p>b. Most of the time inta badan 2</p> <p>c. Sometimes waqti qaar, 3</p> <p>d. Rarely mar mar 3</p>
215	27	<p>What keeps you from wearing a face mask all the time? Maxaa ka celinayo inaad xirato maaska waqti kasta?</p> <p>Do not read answer aloud Ha u ahirin jawabaha kor</p> <p>Probe - anything else? Weydi: Maxa kale</p>	<p>a. I don't have one because I cannot afford it Mid ma lihi maxaa yeelay ma awoodi 0 1</p> <p>b. I don't have one because I don't know how to get one/can't find one Mid ma lihi maxaa yee 0 1</p> <p>c. I don't think they work Ma u maleynayo inaad wax taaro 0 1</p> <p>d. They are uncomfortable Waxa wayo raaxo la'aan 0 1</p> <p>e. I'm not allowed to wear one Maynsan ogolayn inuu mid xirto 0 1</p> <p>f. I don't leave the house Ka ma baxso guriga 0 1</p> <p>h. It interferes with religious practice/dress Waxay faara gaalini dhaqanka diinta / Libiska 0 1</p> <p>i. Other Kuwa kale 0 1</p>
512	28	<p>Compared to the first few months of Coronavirus, would you say that you wear a mask covering your nose and mouth more, less or about the same?Marka la barbar dhigo bilaha ugu horeyay ee corona virus ka, Ma dhihi lahayd waxaad xiraneysay maaska inn badan, inn yar ama mid la mid ah</p>	<p>a. More inn badan 1</p> <p>b. Less inn yar 2</p> <p>c. About the same Mid la mid ah 3</p>
WAJ 2	29	<p>Have you been tested for Coronavirus (Please note - this is not the temperature test)? Ma lagaa baray corona virus? (Fadlan ogow - tan ma ahan baritanka heerkuuka</p>	<p>No Maya 0</p> <p>Yes Haa 1</p>
FOOD SECURITY/ASSISTANCE			
216	30	<p>In the past seven days have you/your household eaten less or skipped meals because you did not have enough money or food? Todobaadka la soo dhaafay miyaad adhiiga / qoyskaaga cuntin cunno yar ama maba cunin sababto ah ma haystid lacag kugu filaan ama cunno</p>	<p>No Maya 0</p> <p>Yes Haa 1</p>
318	31	<p>How frequently are you skipping meals or eating less. Would you say every day, a couple times a week or once a week? Sidhe si joogto ah aad cunno uu cunin ama uu cunto cunno yar. Miyaad dhihi lahad maalin kasta, marka qaar isbuuci ama hal mar isbuuci?</p>	<p>a. Every day Maalin kasta 1</p> <p>b. A couple times a week Marka qaar isbuuci, 2</p> <p>c. Once a week Hal mar isbuuci 3</p>
217	32	<p>Was eating less/skipping meals related to the situation with Coronavirus? Waxan cunay cunno yar / maba helin cunno ee xaaladaha la xirta corona virus</p>	<p>No Maya 0</p> <p>Yes Haa 1</p>
220	33	<p>In the past seven days have you received any cash, vouchers, food, soap/sanitizer or other goods because of Corona virus. Your response will not increase or decrease your chances of getting any of these items, so please answer as honestly as you can. Would you say, Todobaadka la soo dhaafay ma heshay wax lacag caadan ah, fojarada, sabuun/ waxa lagu naadifado gacmaha ama alaabada kale corona virus dertis, jawabahaagu ma kordhinayo ama ma yareeyso fursadahaaga aad ku heli karto wayabahaan.Miyaad dhihi lahayd.</p> <p>Read all options out loud</p>	<p>a. No assistance received Majiro wax caawimaad aan heli 0</p> <p>b. Yes, received assistance due to Coronavirus Haa, waxaan heli caawimaad corona virus dertis 1</p> <p>c. Yes, received assistance due to another reason Haa, waxaan heli caawimaad sabab kale dertis 2</p> <p>d. Yes, received assistance but do not know the reason for it Haa, waxaan heli caawimaad laakin magaraanayo sababta 3</p>
221	34	<p>Where did you get the assistance from? Xagee ka heshay caawimadka</p> <p>Read all answer categories aloud kor uu aqi jawabaha</p>	<p>a. Government, Dowlada 0 1</p> <p>b. NGO; Hayada 0 1</p> <p>c. Church/mosque, qanizada / Masajidka 0 1</p> <p>d. Good samaritan/Philanthropist/ Corporate Sponsorship, Deeq-bixiye wanagsan/ Kafaalasho shirkadeed 0 1</p> <p>e. Family/relatives; Qoyska / qarabada 0 1</p> <p>f. Other: Kuwa kale 0 1</p>
222	35	<p>What have you received? Maxaad heshay</p> <p>Ask all answer categories aloud weydi su'alaha dhamaan kor</p>	<p>a. Cash/Money Lacag caadan ah 1</p> <p>b. Food Cunno 2</p> <p>c. Water Biyo 3</p> <p>d. Soap/hand sanitizer Saabuun/ wayabaha gacmaha lagu naadifado 4</p> <p>e. Medicine Daawo 5</p> <p>f. Other Kuwa kale 9</p>

[illegible]

513	45	In what month and year did they get married? Bisha iyo sanadkii guursaday?	Month (drop down) Bisha (hoos u dhig) Year (2020/2021) Sanadka (2020 / 2021)	
WAJ 12	11	46	I'm going to read some statements about that marriage. For each one tell me if it is true or false. Waxaan ku aqirin doona qoraal qaar kusabsan guurkaas. Midkasta waxaad ii sheegi inay run tahay mise ben.	<p>a. The marriage was planned to happen before Coronavirus Guurka waxaa la qorsheeyay inuu dhicin ka hor corona virus 0 1</p> <p>b. The marriage happened because the person was out of school before Coronavirus started Guurka wuu dhacay sababto ah qofka ku ma jirin sko skoolka ka hor intuu corona virus bilaabanin 0 1</p> <p>c. The marriage happened because schools were closed for Coronavirus Guurka wuu dhacay sababto ah Skoolada aysa loo xiray corona virus dantis 0 1</p> <p>d. The marriage happened because our family needed money Guurka wuu dhacay sababto ah qoyska waxuu uu bahney lacag 0 1</p> <p>e. The marriage happened to cope with changes in that person's life, or their families' lives, that were caused by the Coronavirus pandemic Guurku wuxuu u dhacay xilli ula qabsan laha isbedelada nololaha qofka ama nololaha qoyskooda ee u sababay cudurka faafa ee corona virus ka. 0 1</p> <p>f. There was another reason why the marriage happened(specify) Waxaa jiray sabab kale oo guurka uu dhacay [sheg] 0 1</p>
RELATIONSHIP/PREGNANCY/FP				
415	47	Which statement best describes your current situation? Qoorka adhiga xalada aad u tilmaama	<p>a. Have a husband/partner and currently living with them Waxad leedahay nin / lamaana oo hadana was 1</p> <p>b. Have a husband/partner and NOT currently living with them Waxad leedahay nin / lamaana oo hadana 2</p> <p>c. Do not have a husband/partner Ma lehi nin / lamaana 0</p> <p>d. Partner deceased wuu iga dhintay ninka</p>	417
Read all answer categories aloud. Choose only one				
416	48	When was the last time you saw this husband/partner? Goorma ahayd marki ugu dambeysa ee aad aragto ninkan / lalamaanaha	<p>a. Within the past 2 weeks labadi isbuuc ee la soo dhafnay 1</p> <p>b. Between 2-4 weeks ago Inta u dhaweenyo 2-4 isbuuc 2</p> <p>c. More than 1 month ago Inta ka badan hal bil kahor 3</p>	
417	49	Are you currently satisfied in your relationship with your main partner? Would you say: Miyaad ku qanacsan tahay xirirka aad la leedahay/lamaanaahaga weyn. Miyaad leedahay?	<p>a. Very satisfied Aad ba ugu qanacsan tahay 1</p> <p>b. Somewhat satisfied wax ayad ku qanacsan tahay 2</p> <p>c. Not satisfied or unsatisfied Kuma qanacsanid ama kuma qancinin 3</p> <p>d. Somewhat unsatisfied Wax yar kuma qanacsanid 4</p> <p>e. Very unsatisfied Aad ba ugu qanacsanin 5</p>	
Read answer categories aloud and select one. Soma majibu kwa sauti. Chagua jibu moja				
F1	IF MALE → SKIP			320
IF 47=c Skip 68, 69 and 71				
Now I would like to ask a few questions about pregnancy and if and how Coronavirus may have affected you or your partner's use of family planning. I know these questions may be a bit personal, but please be as honest as you can. Hada waxaan jeclaan lahay inaan ku weydiyo su'aalo yar oo ku sabsan uurka iyo sidaas uu corona virus ka u saameeyey adhiga ama lamaanahaga ee isticmaalka qabka qorsheynta qoyska ee lagu kala dheenya carurta. Waan ogahay su'aalyinka wa kuwa shaqsi ah, lakin fadlan si dhaqdhaqaaq ugu jawaab.				
514	50	Have you been pregnant any time since March, 2020 regardless of the state of the pregnancy or how it ended? Miyaad uir lahayd waqtii kasta ila bisha sedexaad ee sanadka 2020, ayaado aan loo eegin xalada uurka ama sida ay ku dhamaatay?	<p>No Maya 1</p> <p>Yes Haa 2</p> <p>Don't know Maagi 3</p>	
418	51	Which statement best describes your current situation? Would you say: Qoorka adhiga xalada aad u tilmaama	<p>Currently pregnant or probably pregnant Hada waxad tahay uir ama waxaan filaa inaad tahay uir 1</p> <p>Currently trying to become pregnant Had waxad isku daaye inaad noqoto uir 2</p> <p>Recently had a baby Goor dhawaa aad heshay cungug 3</p> <p>Not currently pregnant and do not wish to become pregnant Hada malahid uir oo ma dooneysid inaad noqo 4</p> <p>Can no longer have children because you or your partner are infertile Carur ma yeelan kartid maxa yeelay adhiga ama lamaanahaga waa dhalmo la'aan 5</p>	432
Read all answer categories aloud. Select only one. Kor u akhri jawabaha oo mid kali doora				
Programming note: Add in those that said yes to Q511				
432	61	Did you get pregnant before or after the COVID-19 pandemic started? Ma waxaad noqote uir ka hor ama ka dib marki bilaawde cudurka faafa ee corona virus ka	<p>a. Before Ka hor 1</p> <p>b. After Ka dib 0</p> <p>c. Don't know Maagi</p> <p>d. Refuse to answer Waan diidhe</p>	
516	62	When you found out about the pregnancy, did you feel: Marka aad ogagtay inaad tahay uir, ma dareente:	<p>a. Very unhappy Inn badan farxad la'aan 1</p> <p>b. Unhappy Farxad la'aan 2</p> <p>c. Somewhat happy qaar yar farxad ah 3</p> <p>d. Very happy Inn badan oo farxad ah 4</p> <p>e. Neither Happy or unhappy</p> <p>f. Refuse to answer Waan diidhe inaan</p>	
517	63	Did you intend to get pregnant at the time that you did, want to get pregnant but at a different time, or not want to get pregnant at all? Miyaad damacsanayd inaad uir yeelato wakhtiga aad uirka lahayd, aad rabto inaad uir yeelato lakin wakhti kala duwan ama aad rabin inaad uir yeelato gabi ahaanba	<p>a. Yes, at that time Haa, wakhtiga 1</p> <p>b. Yes, but at a different time Haa, lakin wakhti kala duwan 2</p> <p>c. No, not at all Maya, majiro dhaan 3</p> <p>d. f. Refuse to answer Waan diidhe inaan</p>	
FILTER: Skip if q432=1 (pregnant before COVID-19)				
519	65	Have you experienced any of the following challenges accessing pre-natal care during this pregnancy? Miyaad la kulantay mid ka mid ah caqabadaha soo socda ee helitaanka daryeelka dhalamada ka hor inta lagu jiro uurka?	<p>a. The clinics are not open to provide pre-natal care Clinic yada / rugaha caafimadka uma furin inay bixiyaar 0 1</p> <p>b. I cannot afford the cost of pre-natal care Ma awoodi qarashka daryeelka dhalamada ka hor 0 1</p> <p>c. I skip prenatal care because I am worried I will get infected with Coronavirus Waan iska dhaafay daryeelka 0 1</p> <p>d. Other challenges (specify)? Caqabadoyin kale ( sheg) 0 1</p>	
FILTER OUT THOSE WITH NO KIDS (X + X + X + X = 0)				
320	66	IF GIRLS ONLY OR BOYS ONLY: I wanted to ask a few questions about the possible impacts of Coronavirus on the children in your household. I am going to read a series of statements, please tell me if each one is true or false about the kids in your household. If it is true for at least one of your children, then that would count as "true" Hadi gabdha ama wiil yihiin: Waxaan rabay inaan weydiyo su'aalo kusabsan saamaynta suurta galka ah ee corona virus ee carurta qoyskaaga degan labadi isbuuc la soo dhafay. Waxaan aqirin doona qoraal taagan, fadlan waxaad ii sheegita mid kasta oo ku sabsan carurta qoyskaaga inay ruun tahay ama been. Hadi tahay ruun mid ka mid carurta, marka waxaa loo xisaabi "ruun"		
IF BOTH BOYS AND GIRLS: I am going to ask you first about the girls in your household. I am going to read a series of statements about the possible impacts of Coronavirus on the girls in your household. For each statement, please tell me if each one is true or false about the girls in your household. If it is true for at least one girl, that would be "true". (AFTER COMPLETING, REPEAT FOR BOYS: "Now I want you to think about the boys in your household. For each statement, tell me if it is true or false" If it is true for at least one boy, then the answer is "true".) Hadi labadaba wiilal ama gabdha yihiin: Waxaan doonayaa inaan ku weydiyo marka hore gabdha qoyskaaga. Waxaan aqirin doona qoraal taagan oo kusabsan saamaynta suurta galka ah ee corona virus ee gabdha qoyskaaga degan labadi isbuuc la soo dhafay, fadlan waxaad ii sheegita mid kasta oo ku sabsan gabdha qoyskaaga inay ruun tahay ama been. Hadi tahay ruun mid ka mid gabdha, taa waxaa wayo "ruun" [ KA DIB MARKA AAD DHAMMAYSO , KU CELI WIILASHA]: "Hada waxaan rabaa inaad ka fikirtawilasha qoyskaaga jooga. Mid kasta waxaad ii sheegita inay tahay ruun ama been" Hadi tahay ruun hal wiil na haata, marka jawabta waa "ruun"				
			<p>f. My children are spending more time indoors Carurtaaydu waqtii badan ayey ku qaataan guriga 0 1</p> <p>g. My children are spending more time idling about in the community Carurtaaydu waqtii badan ayey ku qaataan dhex wareega bulshada 0 1</p> <p>k. My children have spent more time doing farming/raising livestock Carurtaaydu waxay in badan waqtii ku qaataan duurka / xoolo dhacda ayey iskaashadaan 0 1</p> <p>h. My children have done things to help earn money for the family Carurtaaydu waxay sameeyeen waydiba aay ku caawinayaan qoyska inay lacag ku helaan. 0 1</p> <p>i. My children have skipped immunizations or other health care visits they were supposed to get Carurtaaydu ma helein tallaalaka ama boqashooyin kale oo daryeelka caafimaad oo ay ahayd inay helaan 0 1</p> <p>l. My children's mental health has suffered Caafimadka maskaada ee carurteyda ayaan dhib gaarte 0 1</p> <p>m. I worry that my children's education will be permanently harmed Waxan ka walwalsan yahay waxbarashada carurteyda inaad dhib ugu ii maane. 0 1</p> <p>n. My children are now back in school Carurteyda waxay ku laabteen iskuulka 0 1</p>	
ECONOMIC STATUS PRIOR TO COVID-19				
Now I would like to ask you a few questions about the money that you were earning before Coronavirus and how that may compare to what you are able to earn now. Hada waxaan jeclaan laha inaan ku weydiyo dhawr su'aalood oo ku sabsan lacagta aad heli ka hor corona virus iyo				

sida taasi uu barbardhigi karto lacagta aad hada heli karto						
435	67	In the past month, would you say that you've been making the same, more or less than what you were earning before Coronavirus. <i>Blishi la soo dhafay, ma dhihi lahed waxaad heleysi inn badan, yar ama intuu corona ka hore.</i>	a. Same <i>Mid la mid ah</i> b. More <i>In badan</i> c. Less <i>In yar</i>	1 2 3		
439	68	In the past month, would you say that your partner has been making the same, more or less than before the Coronavirus. <i>Blishi la soo dhafay, ma dhihi leheda lamaanaagu wuxuu helay mid la mid ah, in badan ama in yar intaa corona virus ka hor</i>	a. Same <i>Mid la mid ah</i> b. More <i>In badan</i> c. Less <i>In yar</i> d. Don't Know <i>Maagi</i> e. No partner <i>Ma lahi lamaana</i>	1 2 3 4 5		
441	69	Would you say that your reliance on your partner/husband/wife for basic needs has changed since the beginning of COVID-19? <i>Miyaad dhihi lahed kalsoonida ee lamaanaaga / seysga / naagtaada ee baahida aasaasiga ah ayey wax isbadaleen siduu COVID-19 uu bilowde</i>	Yes, more reliant <i>Haa, isku kalsooni badan</i> Yes, less reliant <i>Haa, isku kalsooni yar</i> No, stayed the same <i>Maya, isma badalin</i>	2 1 0		
520	70	In the past month, would you say that you've been making the same, more or less than what you were earning as compared to the first six months of Coronavirus (March - September 2020). <i>Blishi la soo dhafay, ma dhihi leheda lamaanaagu wuxuu helay mid la mid ah, in badan ama in yar intaa corona virus ka hor</i>	a. Same <i>Mid la mid ah</i> b. More <i>In badan</i> c. Less <i>In yar</i>	1 2 3		
# Q439=5 (no partner) --> SKIP				442		
521	71	In the past month, would you say that your partner has been making the same, more or less as compared to the first six months of Coronavirus (March - September 2020). <i>Blishi la soo dhafay, ma dhihi leheda lamaanaagu wuxuu helay mid la mid ah, in badan ama in yar marka la barbar dhigo lixda bilow oo ugu horeysay intaa corona virus ka (Bishba march - september ka 2020)</i>	a. Same <i>Mid la mid ah</i> b. More <i>In badan</i> c. Less <i>In yar</i> d. Don't Know <i>Maagi</i> e. No partner <i>Ma lahi lamaana</i>	1 2 3 4 5		
DECISION MAKING (EMERGE)						
I'm going to ask you a few questions now about how you make decisions and in general how much control do you have over personal decisions that have a major impact on your life, such as whether you will go out of the house into the community, with whom you will associate with outside of your household, or when and from whom to seek health care for yourself? <i>waxan ku weydiiha su'alo yar oo ku saabsan sidaad u qadato go'aanka iyo intaad hakameyn karta go'aanka shaqsiyad ee ku yeesha saameyn weyn noloshaada sida oo kale intaad ka bixi karto guriga sidaad u dhex qaado bulshada, sida ula dhaqmi dadka ka baxsan qoyskaaga ama marka iyo xage aad ka heli daryelka caafimadka ee naftaada.</i>						
442	72	A. For each of the following decisions, please tell me how much control you currently have over your decision: None, very little, some, a fair amount or full control. <i>Go'aan kasta oo soo socda, iadan ii sheeg xakameyn inta la'eg ayaad hada leedahay ee go'aankaaga: Midna, aad ba u yartahay, qaar, dhex-dhexaad ama xakameyn taam ah.</i>	VERY LITTLE <i>Aad ba u</i> NONE <i>Midna yartahay</i>	A FAIR AMOUNT <i>Su T dhex</i> FULL CONTROL <i>xakameyn taam ah</i>	B. Compared to before Coronavirus started, would you say you have less control, more control or the same	
444	73	How much control do you have to decide when you want to leave the house to go into the community your own? <i>Would you say, none, very little, some, a fair amount or full control</i> <i>Xakameyn intaad la'eg ayaad leedahay marka aad rabto inaad ka baxdo guriga ee aad dhex qaado bulshada? Miyaad dhihi lahayd, midna, aad ba u yartahay, qaar, dhex-dhexaad ama xakameyn taam ah.</i>	1	2 3 4	5	1 2 3
445	74	How much control do you have to decide who you will visit outside of your household. <i>Would you say, none, very little, some, a fair amount or full control</i> <i>Xakameyn intaad la'eg ayaad leedahay marka aad booqaneys qof ka baxsan qoyskiina. Miyaad dhihi lahayd, midna, aad ba u yartahay, qaar, dhex-dhexaad ama xakameyn taam ah.</i>	1	2 3 4	5	1 2 3
446	75	How much control do you have to decide when and where to seeking health care? <i>Would you say none, very little, some, a fair amount or full control</i> <i>Xakameyn intaad la'eg ayaad leedahay marka iyo xage aad ka heli daryelka caafimadka ee naftaada? Miyaad dhihi lahayd, midna, aad ba u yartahay, qaar, dhex-dhexaad ama xakameyn taam ah.</i>	1	2 3 4	5	1 2 3
447	76	How much control do you have to decide to working outside of the house. <i>Would you say none, very little, some, a fair amount or full control</i> <i>Xakameyn intaad la'eg ayaad leedahay inaad ka shaqeyso meel ka baxsan guriigina. Miyaad dhihi lahayd, midna, aad ba u yartahay, qaar, dhex-dhexaad ama xakameyn taam ah.</i>	1	2 3 4	5	1 2 3
448	77	How much control do you have to make large household purchases? <i>Would you say none, very little, some, a fair amount or full control</i> <i>Xakameyn intaad la'eg ayaad leedahay inaad iin badan u soo adhegid qoyskiina? Miyaad dhihi lahayd, midna, aad ba u yartahay, qaar, dhex-dhexaad ama xakameyn taam ah.</i>	1	2 3 4	5	1 2 3
MENTAL HEALTH (PHQ-9)						
450	78	Over the last 2 weeks, how often have you been bothered by any of the following problems. For each one, tell me about how many days. <i>labaad isbuuc ee la soo dhafay, immissa jeer aya kuu foodsante dhibaatooyinka soo socda. Midkasta, esheg immissa maalin.</i>	a. 0 days <i>0 maalin</i> b. 1-7 days <i>1-7 maalin</i> c. 8-12 days <i>8-12 maalin</i> d. 13 or 14 days <i>13 ama 14 maalin</i> e. REFUSE TO ANSWER <i>Waan diidhe inaan</i>	1 2 3 4 5	If a=0 or Refused, don't ask b	
451	79	Feeling down, depressed, or hopeless <i>Waxaad dareemi hoos u dhaac, walbahar ama niya jab</i>	a. 0 days <i>0 maalin</i> b. 1-7 days <i>1-7 maalin</i> c. 8-12 days <i>8-12 maalin</i> d. 13 or 14 days <i>13 ama 14 maalin</i> e. REFUSE TO ANSWER <i>waan diidhe inaan</i>	1 2 3 4 5	Mor 1 Les 2 San 3	
522	80	Feeling nervous, anxious or on edge <i>Waxaad dareemi cabsi, walwaal ama gees ahan</i>	0 days <i>0 maalin</i> 1-7 days <i>1-7 maalin</i> 8-12 days <i>8-12 maalin</i> 13 or 14 days <i>13 ama 14 maalin</i> REFUSE TO ANSWER <i>waan diidhe inaan ka ji</i>	1 2 3 4 5	If a=0 or Refused, don't ask b	
523	81	Not being able to stop or control worrying <i>Awood u ma lahi inaan joojiyo ama xakameeyo walwaka</i>	0 days <i>0 maalin</i> 1-7 days <i>1-7 maalin</i> 8-12 days <i>8-12 maalin</i> 13 or 14 days <i>13 ama 14 maalin</i> REFUSE TO ANSWER <i>waan diidhe inaan ka ji</i>	1 2 3 4 5	If a=0 or Refused, don't ask b	
524	82	Since the start of the Coronavirus (COVID-19) pandemic, have you sought help from family or friends because you felt low, anxious or stressed? <i>Sida uu bilaawde cudurka faafa ee corona virus ka (COVID-19), Ma ka raadstay caawimaad qoyska ama saaxiibadma xalay waxaad darentay hoos u dhac, walwal ama walac?</i>	No <i>Maya</i> Yes <i>Haa</i> Don't know <i>Maagi</i> Refuse to answer <i>waan diidhe inaan ka jawaaba</i>	1 2 3 4		
229	86	Do we have your permission to recontact you in the future? <i>Ma haysaana ogolaashahaaga si aan mustaqbalka dambe kuula soo xiriima</i>	Yes <i>Haa</i> No <i>Maya</i>	1 2		89
134	87	Could you give me a contact we can use to contact you in the future? <i>Ma ii siin kartaa nambaar aan isticmaali karno si aan ku guula soo xiriimo mustaqbalka dambe</i>	Phone Number _____ <i>Nambaarka telefonka</i>			

				(confirm) Xaqiij	
229	88	Could you tell me your name or nickname? Ma ii sheegi karta magacaaga ama magacaaga naanjada ah / magacaagu yaqaano			
	89	As you may recall, [name of adolescent] is also participating in our COVID-19 research and we interviewed them last time as well. May we have your permission to interview them again? Sidaad xusuusto ( magaca qaan gaarka ah) ayaa sidoo kale ka qeyb qaadatay cilmi baaristayna ee COVID-19 oo waxaan la yeelanay wareysi waqtigi u dambe. Maagashahay inan wareysi markale la yeelano?		No <i>Maya</i> Yes <i>Haa</i>	1 2
		Is [ADOLESCENT GIRL] [THAT BOY] at home? [GABADHA QAANGAARKA AH [WIL KAASI ] ma joogan guriga?			
		Can you give me the phone number I can use to talk to [ADOLESCENT GIRL] [THAT BOY]? Ma I sin karta telefon nambarka ee isticmaali karo si aan ula hadlo [ GABADHA QAANGAARKA AH] [WIL KAASI]?			
		If adolescent not available for interview ask: Why is [endline_participant_name] not available for interview? Hadii uu qaan-gaarka la wareysan tahay uu sin joogin weydii sababta oo ( magaca ka qeyb galka aad u joogin si loo la yeesho wareysi		Gone back to school <i>waxuu ku talle ak</i> He/she travelled and can't be reached on phone Other	1 2 77
		BOY] school located? Xage aad ku yeela skulka ( qaan-gaarka gabadha) ( wilkas)		County (Add drop down list of 47 counties) Dowlad gobaleedka ( ku daarListiga 47 ) Outside Kenya <i>Mel ka baxsan kenya</i>	1 2
				Enter contact name <i>Qoor magaca la la xariirayo</i>	1
		What is the name of the school where [ADOLESCENT GIRL] [THAT BOY] attends? <i>Mawdy tahay magaca skulka ee (qaan-gaarka gabadha)</i>		Enter phone number <i>Qoor nambarka telefonka.</i>	2
		Please share with me contacts that I could use to reach [ADOLESCENT GIRL] [THAT BOY] from school. <i>Fadiin waxaad ila wadhaagis nambarka aan isticmaali karo si aan ula xirto ( qaan-gaarka gabadha) ( wilkas) ee skulka.</i>		No <i>Maya</i>	1
		May we have your permission to interview [ADOLESCENT GIRL] [THAT BOY] if the school allows? Ma nasine ogdasha si aan wareysi ula yeelano ( qaan-gaarka gabadha) (wilkas) hadi skulka noo aqdaalo?		Yes <i>Haa</i>	2
		We have reached the end of the interview. Thank you so much for your time and for answering our questions. Do you have any question or comment for me? <i>Waxaan gaamay dhamaadka wareysiga .Aad baad ugu mahadsantahay waqtigaaga iyo ka jawaabista su'aalahaayna. Ma qabta wax su'al ama faalo oo aniga il gaar ah</i>		Yes <i>Haa</i> No <i>Maya</i>	1 2
<p>226i - If yes, program a prompt offer a referral for SGBV counseling- 226i - Hadii haa tahay isku diyaari inaad uu gudbisso la taaliyada SGBV.</p> <p>If yes to four or more 450 and 451, referral for mental health services Hadii haa tahay afaar ama in ka badan 450 iyo 451, uu gudbi adeegyada caafimaadka dhimarka</p>					

NO. FROM RT		KSM/ KLF RT SEQUENCE	QUESTIONS AND FILTERS	SKIP TO
<p>Hello, my name is [NAME] and I am calling from Population Council. We are a health research organization who is working in partnership with the Ministry of Health on the response to Coronavirus. We are contacting you because you participated in our survey on COVID-19 sometime last year. We would like to ask some additional questions about the Corona virus and your experiences during this time. There are no right or wrong answers and the answers you provide will not lead to any direct benefits or penalties for your household. The answers that you give provide us a better understanding of what people in your community have been experiencing so that the government and other partners can better respond. The interview will take about 30-45 minutes. There are no risks or benefits to participating in this survey. Your participation is voluntary and you can stop the interview at any time if you do not wish to continue. After completing the survey we will send you 200 via Mpesa to compensate you for your time, even if you stop in the middle.</p> <p>Hello, jina langu ni [JINA] na ninakupigia simu kutoka Population Council. Sisi ni shirika la utafiti wa afya na tunashirikiana na serikali kuhusu virusi vya Korona. Tunawasiliana nawe kwa sababu ulishiriki katika utafiti wetu wa COVID-19 wakati mwingine mwaka uliopita. Tungependa kukauliza maswali mengine kuhusu virusi vya Korona na uliyoyapitia wakati huu. Hakuna majibu yaliyo sawa na yasiyo sawa na majibu utakayotoa hayatakuwa na marufaa au kutumu ya mola kwa mola nyumbani kwenu. Majibu unayotoa yanatowezesha kuwaona vyema zaidi kile wao walilo katika jumla yenu hupitia ili serikali na washirika wake waweze kutoa msaada unaadai. Mahojiano yatachukua takriban dakika 30-45. Hakuna marufaa au athari zozote kwa kushiriki katika utafiti huu. Kushiriki kwako ni kwa hafi na unaweza kuaitisha mahojiano wakati uwotele ukawa hutaki kumdelela. Baada ya kumaliza utafiti huu tutakutumia Shilingi 200 kupitia Mpesa kama shukrani kwa muda wako hata kama utachuka mahojiano yakewa katikati.</p> <p>Alo, nyingi [NYINGI] kendo agochoni kowaku e migao mar Population Council. Wan rieuruk ma timo norro mar theeth ma tyo kanyaka kod sirkal e kedo kod Korona. Witudore kod nkech ne bebo e norro mar COVID-19 e kinde moro higa mokalo. De waher penjo penjo mkomedore e w Korona kod gik ma isekile e thudori. Onge dudlo mabego kaka masicho kendo dudlo ma shiew ok bi kedo bi ber kaka tum moro amora ne odi. Duoio ma shiew mtyo wang eyo maber gima joma nie ogandau ong eyo mondo okony sirkal kod rieuruge ma otudorego timo gima owirjore. Cherro mar penjo biro kawo madrom dakika 30-45. Onge rach kaka ber mar bebo e norroni. Bedori en kuom dharuuk mari kendo myalo chungo penjo saa asaya ka ok idwar dhi mbele. Ka isetelo norro lo wabro orori siling 200 e Mpesa kuom kawo thudori, kaka ka iweye gie kore.</p> <p>If you have any questions about the survey in the future, please feel free to contact our office. I have the phone number and I can give it to you would like.</p> <p>Ukwa na maswali kuhusu utafiti huu, tafadhali jake huku kuwasiliana na alia yetu. Nika na nambani ya simu na naweza kukupatia kika ungependa. Ka bebo gi penjo moro amora kuom norro ndalo mabiro, yie beed thudori mar kutor gi idika. An gi nambani simu kendo anyalo myi ka dhar.</p> <p>Do you have any questions? No 0 La Yes 1 Nd Yes 1</p> <p>Je, una maswali yoyote? Be in gi penjo moro amora?</p> <p>Do you agree to participate? No 0 La Yes 1 Nd Yes 1</p> <p>Je, unakubali kushiriki? Be iye mar bebo e norro?</p> <p>Literacy Numeracy Survey Consent</p> <p>In a few weeks from today, we will conduct a follow up survey with some adolescents to assess whether Coronavirus has had any impacts on learning for adolescents. The adolescents to participate in this follow up survey will be randomly selected from those we are interviewing for this KAP survey. The interview process will include administration of a literacy and numeracy test which will be administered face to face by an interviewer. The interview process will take about 25 minutes. There are no risks or benefits to participating in the survey. Their participation is voluntary and they can stop the interview at any time if they do not wish to continue. There will be no direct benefits to the study. If your child is selected to participate in this follow up survey, they will be given Ksh.200 to compensate for their time.</p> <p>Wika chache kuanzia leo, tutafanya utafiti wa dhasigaji na kashiki ya vijana ili kutathmini kama Korona imekuwa na athari zozote kuika mafunzi ya vijana.</p> <p>Do you give us permission to interview your child for the follow up survey if they are selected to participate? Bende imyowa thudlo mar myi penjo e norro mar luwo ka oyere mar bebo?</p> <p>Je, unapata kiali dha kuming mbo wao hwa gila ya utafiti wa kufuata lengo dhasigajiwa kushiriki?</p> <p>Bende imyowa thudlo mar myi nyathia penjo e norro mar luwo ka oyere mar bebo?</p> <p>[Automatic fill in indicating that this is Round 3]</p> <p>[Confirm respondent using pre-pull from last round - name, sex, age, location]</p>				
101	1		<p>How old are you?</p> <p>Una umri wa miaka mingapi?</p> <p>In ja nigri ad?</p>	<p>Years</p> <p></p>
101b	1		<p>Are you the head of your household?</p> <p>Je, wewe ndiwe kiongozi wa Nyumba yenu?</p> <p>In e jattlo mar odi?</p>	<p>Yes Ndiyo: Ee 1</p> <p>No La Oyo 0</p>



100	2	Record sex of respondent. <b>Andika jinsia ya Mhaziri</b> Ndik kik chuchuk mar jachiare ka en dichawo kata miyo	Male Female	1 2	
WAJ	2	I want to know a bit about how many men, women, boys and girls live in this household. For each category, kindly tell me how many people live in this household, including yourself. EXPLAIN: 'ive' is someone who sleeps in your house the majority of the nights of the week. EXPLAIN: 'household' is one that shares a kitchen (pot) and has the same head of household. Nataka kuhahamu kidogo kuhusu idadi ya wanume, wanawake, watoto na wasichana wanaoishi katika makao haya. Kwa kila kikundi, tafadhali nambie ni wangepi wanaoishi katika makao haya, ikiukumbishia. ELEZA: 'ishi' ni mtu aweyaka katika makao haya mara nyingi kwa wiki. ELEZA: 'makao' ni yule mliyeshirikiana kwenye jikoni (chungu) kimoja na kiongozi mmoja wa makao. Adwa ng'nyo matini ni gin ji adi ma chwa, mon, yawudi kod nyi ma odak e odhi. Na kidenyi ka kidenyi, ye nyitia ni gin ji adi ma odak e odhi. kowei. LER: 'dak' en ng'ama rindo e odu ng'eny ofano mag juma. LER: 'odu' en ng'ama urwego jikon kod jato achiel mar ot.	MALE FEMALE		
1					
201	3	The last time we interviewed you, you were living in [pre-pull from last location]. Are you still living in that location? If not, where are you living? Wakati wa mwisho tulipokuhoji, ulikuwa ukishi [pre-pull from R1]. Je, bado wishi sehemu hii? Kama sivyo, wishi wapi? E tuhoio mogik mane wasenji penjo ne lwacho ni ne idak [pre-pull from R1]. Bende pod idak kanyo? Ka ooyo, idak kanyo?  Read answer options aloud Soma chague za majibu kwa kauli. <i>Read aloud: Soma maelezo dhidi ya majibu ya watafiti.</i>	a. Have not moved Sijahama Pok adar b. Same county, rural location Kaunti ile ile, kijijini Kaonti achiel, g'weng' c. Same county, urban location Kaunti ile ile, mjini Kaonti achiel, taon d. Other county, urban location Kaunti nyingine, mjini Kaonti machielo, taon e. Other county, rural location Kaunti nyingine, kijijini Kaonti machielo, g'weng' f. Other (specify) Pengine (eleza) Machielo (ler)	1 2 3 4 5 6	107
202	4	Why did you leave [Last location]. Kwa nini ulihama kutoka [line la mahali R1] Ang o ma omoyo ne idak [location R1]  Do NOT read answer categories aloud	a. To get away from Coronavirus Ii kujepusha na Vitusi vya Korona Mondo adhi mabor gi b. Economic reasons (no food, no work, couldn't pay rent, etc.) Sababu za kichumi hakuna c. To take care of my family that live here Ii kutunza familia yangu inayoshi hapa Rito jood d. Better place for my children Mahali pazuri zaidi kwa watoto wange Kama ber mokojo ne e. Other Nyingine Machielo	1 2 3 4 9	
COVID-19 RISK PERCEPTION, STIGMA AND PREVENTION MTAZAMO WA HATARI YA COVID-19, UNYANTAPAA NA KINGA					
107	5	Do you think your chance of getting infected with Corona is low, medium, or high, or do you have no risk at all? Je unafikiri uwezekano wako wa kupata Korona ni wa chini, wastani au juu, au hauna uwezekano wowote? Ipara ni nyatoni mar yado Korona ni piny, diere, koso malo, koso longe nyatruok mar yude?	Low Chini Piny Medium Wastani Diere High Juu Malo No risk Hakuna uwezekano wowote Onge nyatruok Already had Coronavirus Tayari nimepata virusi vya Korona Naseyado Korona Don't know, no response Sijui, hakuna jibu Akia, onge duoko	1 2 3 4 5 88	108a 204 204

				Nr fcs	
			a. I'm young <i>Mimi ni mdogo/mchanga</i> An ng'ama tin	0 1	
			b. God protects me <i>Mungu anankinga</i> Nyasaye rita	0 1	
			c. The hot weather/climate <i>Hali ya hewa yenye joto</i> Liet mar piny	0 1	
			d. There is no more COVID <i>COVID haiko tena</i> Onge COVID kendo	0 1	
			e. I haven't travelled <i>Sijasafiri</i> Pok adhi wuoth	0 1	
			f. I am not a Mzungu or Chinese <i>Mimi si mzungu au Mchina</i> Ok an Jasungu kata Jachi	0 1	
			g. COVID is a feigov't just trying to get money <i>COVID ni uwongor serikali</i> Injaribu tu kupata pesa <i>COVID en miriamba/sirikali temo mana yudo pesa</i>	0 1	
			h. Don't know anyone with Corona <i>Simjui mtu yeyote aliye na Corona</i> Akia ng'alo ang'ala marigi Corona	0 1	
			i. I have been staying at home <i>Nimekuwa nikikaa nyumbani</i> Asebedo ka an dala	0 1	
			l. Have been adhering to government guidelines <i>Nimekuwa nikifuta maagizo ya serikali</i> Asebedo ka arito chike mag sirikali	0 1	
			m. Practice social distancing/staying 1-2 meters apart/not shaking hands/hot interacting with people <i>Nimekuwa nikikaa mbali na watu/nimekuwa nikikaa umbali wa mita 1-2/kutosimiana kwa mikono/kutotangamana na watu</i> Asebedo ka abedo mabor gi ji / ma kindwa mita 1-2 / ok amos ji gi lwedo / ok studra gi ji	0 1	
		Why do you think you are not at high risk? <i>Kwa nini unafikiri uwezekano wako wa kupata Corona hauko juu?</i> <i>Ana'o momiyo iparo ni ok in gi nyathuk ma malo?</i>	n. Have been washing hands with soap and running water/using sanitizer <i>Nimekuwa nikinawa na sabuni na maji yanayotirika/natumia vyezi</i> Asebedo ka alogo gi sabun e pi ma mchafye gi sentiza	0 1	
		Do NOT read answer categories out loud	o. Have been wearing a face mask <i>Nimekuwa nikivaa barakoa</i> Asebedo ka anwako mask	0 1	
		Note: Probe - anything else? <i>Kumbuka: Changua - chochote kingine?</i>	p. I am healthy <i>Nina alya bora</i> An gi ngima maber	0 1	
			q. I have been vaccinated <i>Nimechangwa</i> Ouchungu	0 1	ALL 204
		Record all mentioned	r. I already got Covid 19 <i>Ninapasa Covid 19 tayari</i> Asebedo Corona	0 1	
			s. Other <i>Nyingine</i> Machielo	0 1	
			t. There is no Coronavirus in this county <i>Hakuna virusi vya Corona katika kaunti hii</i> Onge Corona e kaunti ni	0 1	
			u. Don't know/no response <i>Sijui/hakuna jibu</i> Akia/onge duoko	0 1	
108a	7	Why do you think you are at high risk? <i>Kwa nini unafikiri uwezekano wako wa kupata Corona uko juu?</i> <i>Ana'o momiyo iparo ni in gi nyathuk ma malo?</i>	a. Have been in contact with someone who is infected <i>Nimewasiliana na mtu aliyeamboziwa</i>	0 1	NIS
			b. Travelled recently <i>Nitasafiri hivi karibuni</i> Asebeth wuoth machiegni	0 1	
			c. Health care worker <i>Mhudumu wa alya</i> An jathiehi	0 1	
			d. I interact with a lot of people every day <i>Nashirikiana na watu wengi kila siku</i> Atudora gi ji ma	0 1	
		Do NOT read answer categories aloud	e. Ride public transportation a lot <i>Natumia usafiri wa umma mara nyingi</i> Atyo gi yor wuoth	0 1	
			f. Am not able to wash my hands <i>Siwezi kunawa</i> Ok anyal logo	0 1	
			g. Am not able to wear a mask <i>Siwezi kuvaa barakoa</i> Ok anyal resko mask	0 1	
		Probe: Anything else <i>Probe: Chochote kingine</i> Non malut. Gimoro amora machielo	h. Am not able to follow government guidelines <i>Siwezi kufuta kanuni za serikali</i> Ok anyal luw	0 1	
			i. Am elderly <i>Mimi ni mzee</i> Asi	0 1	
			j. Live in a place with crowded living conditions/shared toilets <i>Ninaishi katika nyumba yangu ana msongamano wa watu/tatumia choo kimoja watu wengi</i> Adak kama ji ng enye/waawo choo	0 1	
			k. Handle cash <i>Kushughulikia pesa</i> Amulo pesa	0 1	
			l. Am sick/have a health condition <i>Mimi ni mgonjwa/nina tatizo la kiafya</i> Atuolan gi chandrud	0 1	
			m. Someone in my household is high risk (for any reason) <i>Mtu fulani katika nyumba yangu ana uwezekano mkubwa wa kupata masambukizi (kwa sababu yoyote ile)</i> Ng'alo kuom jodwa nigi nyathuk ma malo mar yudo tuo (nikach wach moro amora)	0 1	
			n. Live in or near a hotspot/place with many confirmed cases <i>Ninaishi katika au karibu na eneo la habari / pahali paipo na watu wengi waliotibitishwa</i> Adak kama kasa machiegni gi kama oreyude ji mang emy gi luo	0 1	
			o. My kids are back in school <i>Watoto wangu wamerudi shuleni</i> Nyithinda osedok skul	0 1	
			p. I have gone back to work <i>Nimerudi kazini</i> Aseduk e tich	0 1	
			q. I have not been vaccinated <i>Siwachangwa</i> Pok chachya	0 1	
			r. Other (specify) <i>Nyingine (baja)</i> Machielo (ter)	0 1	

204	8	Do you know anyone in your family, neighborhood or workplace who has been infected with the Coronavirus? Your answer is confidential and no action will be taken based on your answer. Would you say... Je, unanjanja mtu yeyote katika familia yako, kitongoji chako au pahali pa kazi ambaye ameambuliziwa na virusi vya Korona? Jibu lako ni sahihi na hakuna hatua itakayochukuliwa kwa sababu ya jibu hilo. Je, ungesema: Ikiwa ingi ng'ato ang'ata kuum joodu, jirende kama kama iwe na Korona osemako? Duukoni eni maling'ing' kendo onge okang' ma biro kaw kaluware gi duukoni. Diwachi ni	a. Yes, I know someone who tested positive Ndiyo, namjanja mtu ambaye amepimwa na ako na virusi vya Korona. Ee, ang'eyo ng'ama ropim moyud gi tuo b. Yes, I know someone who is suspected of being positive but hasn't gone for a test Ndio namjanja mtu ambaye anashukiwa kuwa na virusi vya Korona lakini hapenda kupimwa. Ee, ang'eyo ng'ama idichid godo ni tuo to pok odhi e jim c. No, I don't know anyone Hapana, siji mtu yeyote Ooyo, aka ng'ato ang'ata	302
501	9	Who had Coronavirus? Ni nani aliyekuwa na virusi vya Korona? Ng'a mane ngi Korona?	a. Me Mini An b. Someone in my family Mtu fulani katika familia yangu Ng'ato kuum joodwa c. Someone in a friend's family Mtu fulani katika familia ya rafiki yangu Ng'ato kuum joo d. Someone in my neighborhood/community Mtu fulani katika kitongoji changu/jami yangu e. My friend Rafiki yangu Osepeza f. Co worker Mnyakazi mwenza Jitich wadwa g. Someone at my child's school Mtu fulani shuleni mwa mwanangu Ng'ato e skund gi nye h. Someone else Mtu mwingine Ng'amachiyele i. Refuse Katika kujibu Otamore duoko	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1
1, R3		In general, for the people you just listed, how many had a COVID-19 test at that time? Would you say most, some, or a few (if you're not sure, please give a best guess)? Kwa ujumla, kwa watu uliowasodoshia hivi punde, ni wazote wakulwa na kipimo cha COVID-19 wakati huo? Je, select one. Chagua moja. Tier achai	a. Most Wangi Ng'enyi b. Some Wangine Moko c. A few Wlachache Monda d. Don't know/Refuse to answer	0 1 2 3
2, R3		Did anyone you knew well pass away from COVID-19? Je, kum yeyote uliyetambua yeyote aliyefariki kutokana na COVID-19? Bende ng'ato ang'ata mane ing'e maber na oho gi COVID-19?	a. No La Ooyo b. Yes Ndiyo Ee	0 1
3, R3		Did anyone from your household pass away from COVID-19? Je, kum mtu yeyote kutika katika makao yenu aliyefariki kutokana na COVID-19? Bende ng'ato ang'ata kuum joodu na oho gi COVID-19?	a. No La Ooyo b. Yes Ndiyo Ee	0 1
302	10	Now I want you to imagine that people suspected that you were infected with Coronavirus, or that you have tested positive for Coronavirus. How do you think that people in your family and neighborhood would treat you. For each statement tell me if you think it's true or false. Sasa nitaka uwazie kwa watu wanakushuku kuwa umeambuliziwa na virusi vya Korona, au kuwa umethibitishwa kuwa umeambuliziwa. Unafikiri watu katika familia yako na katika upiani wako wangeliundelea? Katika kila kauli nambie ikiwa ni kweli au uongo. Koro adika ni ipatane ni ji chich ni Korona omaki, kaka ni ropim moyud gi Korona. Bapo ni joodu kod jirende de kawi nade. Ne wach ka wach nyisa ka iparo ni en adier koso mirambo.	a. People would stop talking to me Watu wangesha kuzungumza nami Ji de we wuojo b. People would gossip about me Watu wangenisengenyi Ji de kuodha c. People I know would bring me food I need Watu rinawajua wangeniletea chakula rinachotaji Joma ang'eyo de kaina chemo ma adwiro d. People I know would bring me the medicines I need Watu rinawajua wangeniletea madawa rinayohitaji Joma ang'eyo de kaina yedhe ma adwiro e. People in the community would treat my family badly Watu katika jami yetu wangeniduka familia yetu mabaya Joma rie ogardwa de since joodwa masochi f. After I have recovered from Corona virus, people in the community would still avoid me Benda ya kupona virusi vya Korona, watu katika jami yetu bado wangenihaji Joma rie ogardwa po de kuodha kaka ka asichango g. After I have recovered from Coronavirus, I would not be welcome back into my house by family Stakaribishwa tena katika nyumba yangu na familia yangu bado ya kupona kutokana na coronavirus Joodwa ok de riwaka kendo e oda bang' ka asichango h. After I have recovered from Coronavirus, I would not be welcome back at my place of work Stakaribishwa tena kazini baada ya kupona Ok de riwaka kendo kar tich bang' ka asichango i. After I have recovered from Coronavirus I would still not be welcome back to my place of worship Baada ya kupona kutokana na Korona, bado stakaribishwa pahali pangu ya bado Pod ok de riwaka kama akeni kaka bang' ka asichango j. After I have recovered from Coronavirus my child would not be welcomed back to school Baada ya kupona kutokana na Korona, mita wangu hatakuibwa kurudi shuleni Nyathina ok de riwaka e skul kendo bang' ka asichango kuom Korona	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1

502	11	How true are the following sentences describing the people in your community? Je, sentensi zifuatazo zinazoezea watu katika jumuiya yako ni za kweli kiasi gani? Wechegei lero adieri machal nade jama ni gwing'u?  People in my community are taking steps to protect themselves and others from coronavirus (COVID-19). Would you say: 'Very true, somewhat true, not very true, not true at all.' Wata kuhita jani yeta wanchukura hatua za kujikinga na kuingia wengine dhidi ya virusi vya Korona (COVID-19). Je, ungesema ni kweli kabisa, kweli kiasi, si kweli kabisa, si kweli hata kidogo. Jama nie gwing'wa kawo kengele mag geng'ore kendo geng'o jamanoko kik gam kule Korona (COVID-19). Dweach ni: Adieri ahinya, bet adieri, ok adieri ahinya, ok	<p>a. Very true <b>Kweli kabisa</b> Adieri ahinya 1</p> <p>b. Somewhat true <b>Kweli kiasi</b> Bet adieri 2</p> <p>c. Not very true <b>Si kweli sana</b> Ok adieri ahinya 3</p> <p>d. Not true at all <b>Si kweli hata kidogo</b> Ok adieri kata malin 4</p>	
511	20	Which of the following statements best describes you: I used to follow COVID-19 prevention guidelines (i.e. washing hands, social distancing, wearing a mask when around others, avoiding gatherings, etc.) and I still do. I used to follow guidelines but now I don't as much. I didn't used to follow guidelines but now I do, or I never used to follow guidelines that much and I still don't. Ni kauli gani kat ya yalutayo inayokuweza yema zaidi. Nilikuwa nikifuata miongozo ya kuingia dhidi ya COVID-19 (k.m. kunawa, kutangamana na watu, kuwa baraka nikiwa karibu na watu wengine, kupuka mikusanyiko, n.k.) na bado nafuata. Nilikuwa nikifuata miongozo lakini sasa siufuati vili, sikawa nikifuata miongozo lakini sasa nafuata, au sikawa nikifuata miongozo vile na bado	<p>a. I used to follow guidelines and I still do <b>Nilikuwa nikifuata miongozo na bado nafuata</b> 1</p> <p>b. I used to follow guidelines and now I don't as much <b>Nilikuwa nikifuata miongozo na si</b> 2</p> <p>c. I never followed guidelines that much and now I do <b>Sikawa nikifuata miongozo vile n</b> 3</p> <p>d. I never used to follow guidelines that much and I still don't <b>Sikawa nikifuata miongozo vile na bado siufuati</b> 4</p> <p>e. Ne ok ajalawo chike ruuk kendo pod ok aluw <b>Si kweli hata kidogo</b> 5</p>	
213	26	Prior to the "mask mandate" When you were outside of your house, did you wear the facemask covering your nose and your mouth, always, most of the time, sometimes, or rarely? Unipokea je ya nyumba yako, je unawas baraka (maski kufika ndomo) kila wakati, wakati mwingine, au mara chache Kia in cho mar odu, bende iraka mask moum umi gi <b>Probe - anything else? Chunguza - chochote kingine?</b>	<p>a. Always <b>Kila mara</b> Seche te 1</p> <p>b. Most of the time <b>Mara nyingi</b> Seche mang'eny 2</p> <p>c. Sometimes <b>Wakati mwingine</b> Seche mang'eny 3</p> <p>d. Other <b>Nyingine</b> Machelo 0 1</p> <p>e. Rarely <b>Mara chache</b> Dimanik 3</p> <p>f. Never 3</p>	to the responses. Replace other with never.
4_R3		When you are outside of your house, do you try to keep away from other people (at least 1-2 meters) always, most of the time sometimes, or rarely? Unipokea je ya nyumba yako, je unajitibu kuwa mbali na watu wengine (angalia mita 1-2) kila mara, mara nyingi, wakati mwingine, au mara chache? Kia in cho mar odu, bende iraka mask moum umi gi	<p>a. Always <b>Kila mara</b> Seche te 1</p> <p>b. Most of the time <b>Mara nyingi</b> Seche mang'eny 2</p> <p>c. Sometimes <b>Wakati mwingine</b> Seche mang'eny 3</p> <p>d. Rarely <b>Mara chache</b> Dimanik 3</p>	to the responses. Replace other with never.
5_R3		Please tell me if you think each of the following statements is true, false, or you're not sure. Unipokea je ya nyumba yako, je unajitibu kuwa mbali na watu wengine (angalia mita 1-2) kila mara, mara nyingi, wakati mwingine, au mara chache? Kia in cho mar odu, bende iraka mask moum umi gi	<p>a. You cannot become infected with COVID-19 if you've been vaccinated <b>Huwezi kuambuki</b> 1 0</p> <p>b. Being vaccinated makes it less likely you would be hospitalized with or die from COVID-19 <b>Bado unaweza</b> 1 0</p> <p>c. You can still become infected with COVID-19 if you've had COVID before <b>Bado unaweza</b> 1 0</p> <p>d. Almost everyone in my neighborhood has had COVID-19 already <b>Karibu kila mtu katika n</b> 1 0</p> <p>e. If there was a new more deadly COVID-19 variant people would be willing to go back into 1 0</p>	
WAJ 2	29	Have you ever been tested for Coronavirus (Please note - this is not the temperature test)? Je, ushawahi kupimwa dhidi ya Korona (Tafadhali kumbuka - hi si kupimwa joto)? Bende osepini ne kule Korona (jye ipar - ma ok en pin mar liet del)?	<p>a. No <b>La</b> Ooyo 0</p> <p>b. Yes <b>Ndoyo</b> Ee 1</p>	
VACCINATION KUCHANWA CHENJO				
6_R3		Have you had at least one dose of a COVID-19 vaccine? Je, umipata angalau dozi moja ya chanzo ya COVID-19? Bende kopya kwa kila adieri mar oduyo mar COVID-19?	<p>No <b>La</b> Ooyo</p> <p>Yes <b>Ndoyo</b> Ee</p>	9_R3
7_R3		If a vaccine to prevent COVID-19 were offered to you today for free, and you were eligible, would you choose to get vaccinated? Bende chanzo ya kuzua COVID-19 ingetaweka kwenye leo bila chaguo, na ukasahiti, ungetachagua kuata chango? Read each answer option aloud <b>Soma kila chaguo la jibu kwa</b> Select all that apply <b>Chagua yote yanayotumika</b>	<p>1 Yes, definitely <b>Ndoyo, bila shaka</b> Ee, mionge kiawa</p> <p>2 Yes, probably <b>Ndoyo, pengine</b> Ee, samoro</p> <p>3 No, probably not <b>La, pengine siyo</b> Ooyo, ok apar</p> <p>4 No, definitely not <b>La, bila shaka</b> Ooyo mionge kiawa</p> <p>[Note: we prefer not to have a don't know option here]</p>	12_R3 12_R3

8_R3	<p>Which of the following, if any, are the reasons that you would choose or only would probably choose to get a COVID-19 vaccine?</p> <p><i>Je ni ziko kati ya afasiwazi. Niwa zipo, ni sababu ambazo kungachagui ku pangam unapangwa ku kupata chanzo ya</i></p> <p>Read each answer option aloud. <b>Soma kila chaguo la jibu kwa</b></p> <p>Select all that apply. <b>Chagua yote yanayotumika</b></p>	<p>a. of a COVID-19 vaccine. <b>Nina wasiwasi</b></p> <p>b. I don't like vaccines. <b>Sipendi chanzo. Ok, shere chanzo</b></p> <p>c. I'm concerned about possible side effects of a vaccine. <b>Ninawaza na mwelekezoni</b></p> <p>d. I don't like the idea of getting a vaccine. <b>Ninawaza na mwelekezoni</b></p> <p>e. I don't like the idea of getting a vaccine. <b>Ninawaza na mwelekezoni</b></p> <p>f. I don't like the idea of getting a vaccine. <b>Ninawaza na mwelekezoni</b></p> <p>g. I don't like the idea of getting a vaccine. <b>Ninawaza na mwelekezoni</b></p> <p>h. I don't like the idea of getting a vaccine. <b>Ninawaza na mwelekezoni</b></p> <p>i. I don't like the idea of getting a vaccine. <b>Ninawaza na mwelekezoni</b></p> <p>j. I don't like the idea of getting a vaccine. <b>Ninawaza na mwelekezoni</b></p> <p>k. I don't like the idea of getting a vaccine. <b>Ninawaza na mwelekezoni</b></p> <p>l. I don't like the idea of getting a vaccine. <b>Ninawaza na mwelekezoni</b></p> <p>m. I don't like the idea of getting a vaccine. <b>Ninawaza na mwelekezoni</b></p> <p>n. I don't like the idea of getting a vaccine. <b>Ninawaza na mwelekezoni</b></p> <p>o. Other (specify) <b>Ningine (ijaza) Mchale (ite)</b></p>	No	Yes
9_R3	<p>How many doses of the vaccine have you had?</p> <p><i>Je, unapata dozi ngapi za chanzo?</i></p> <p>select one <b>Chagua moja</b></p>	<p>1 dose <b>Dozi 1</b></p> <p>2 doses <b>Dozi 2</b></p> <p>3 doses <b>Dozi 3</b></p>	1	2
10_R3	<p>Where did you receive your vaccination from?</p> <p><i>Je, ulipata chanzo yako kutoka wapi?</i></p> <p>Select all that apply. <b>Chagua yote yanayotumika</b></p>	<p>a. Government hospital <b>Hospitali ya serikali</b></p> <p>b. Private hospital <b>Hospitali ya kibinafsi</b></p> <p>c. Private clinic <b>Zahanati ya kibinafsi</b></p> <p>d. Health camp <b>Kambi ya afya</b></p> <p>e. Workplace/office <b>Pishali pa kazirafiki</b></p> <p>f. At home by health workers <b>Nyumbani na wahudumu wa afya</b></p> <p>g. In my neighbourhood <b>Mbari kwetu</b></p> <p>h. Other (specify) <b>Ningine (ijaza) Mchale (ite)</b></p>	No	Yes
11_R3	<p>[Ask if 9_R3=1]</p> <p>You said you have taken the first dose of COVID-19 vaccine. What is the main reason you have not gone for the second dose of the vaccine?</p> <p><i>Je, ulipata dozi ya kwanza ya chanzo ya COVID-19. Je, ni sababu gani hasi ambayo imechukua kuenda kupata</i></p> <p>Read out and select all that apply. <b>Soma na uchague yote yanayotumika</b></p>	<p>a. I have appointment for second dose of the vaccine. <b>Nimepangiwa miadi ya kupata dozi</b></p> <p>b. I cannot get an appointment for second dose. <b>Siwazi kupata miadi ya dozi ya pili</b></p> <p>c. I am concerned about possible side effects of a second dose. <b>Nina wasiwasi kuhusu m</b></p> <p>d. The first dose is enough to protect me from COVID-19. <b>Dozi ya kwanza imetoshi kuni</b></p> <p>e. My partner/family don't want me to get the second dose. <b>Mwenzangu/familia vanyu ha</b></p> <p>f. I'm waiting for a different type of vaccine to be available. <b>Ninawaza na mwelekezoni</b></p> <p>g. I didn't like the first dose of vaccine/I had a previous bad reaction to/experience with a vacc</p> <p>h. I plan to wait and see if it is safe and may get my second dose later. <b>Napanga kusubiri</b></p> <p>i. I am concerned about the cost of another dose of the vaccine. <b>Nina wasiwasi kuhusu g</b></p> <p>j. The type of vaccine only required one dose (like J&amp;J). <b>Aina ya chanzo ilihitaji dozi moja</b></p> <p>k. Other (specify) <b>Ningine (ijaza) Mchale (ite)</b></p>	No	Yes
12_R3	<p>[This question and next are for respondents who have not been vaccinated but express willingness (yes definitely or yes probably)]</p> <p>[Ask if 7_R3=1 or 2]</p> <p>Would you be willing to take any type of vaccine offered to you?</p> <p><i>Je, unapenda kuchukua aina yoyote ya chanzo inayotolewa kwako?</i></p> <p>Read out and select all that apply. <b>Soma na uchague yote yanayotumika</b></p>	<p>0 No <b>La</b></p> <p>1 Yes <b>Ndiyo</b></p>	14_R3	
13_R3	<p>Which of the following vaccines would you NOT be willing to take?</p> <p><i>Ni chanzo gani kati ya afasiwazi ambayo HAUNGKUWA ngapi kupata?</i></p> <p>Read out and select all that apply. <b>Soma na uchague yote yanayotumika</b></p>	<p>0 Astra Zeneca</p> <p>1 Moderna</p> <p>2 Johnson and Johnson</p> <p>3 Pfizer Vaccine</p> <p>4 Sinopharm</p> <p>5 Sputnik</p> <p>6 Unsure/don't know <b>Sina uhakikishaji</b></p>		

14_R3		<p>[For ALL respondents]</p> <p>Do you have any children ages 12-17? Je, ukio na watoto wotele wakiwa na umri wa miaka 12-17? Ee ni gi nyathi muna amara marie kindi higni 12-17?</p>	<p>0 No La Ooyo</p> <p>1 Yes Ndiyo Ee</p>	16_R3	
15_R3		<p>If a vaccine to prevent COVID-19 were offered to your children age 12-17 today for free, and they were eligible, would you choose to get them vaccinated? Kwa chanzo ya kuzuza COVID-19 ingetolewa leo kwa watoto wakiwa umri wa miaka 12-17 bila malipo, na wataziti, je...</p> <p>Read each answer option aloud <b>Soma kila chaguo la jibu kwa...</b></p> <p>Select all that apply <b>Chagua yote yanayotumika</b></p>	<p>0 Yes, definitely Ndiyo, bila shaka Ee, maongo kwawa</p> <p>1 Yes, probably Ndiyo, pengine Ee, samoro</p> <p>2 No, probably not La, pengine siyo Ooyo, ok apar</p> <p>3 No, definitely not La, bila shaka Ooyo maongo kwawa</p> <p>4 They (or some) have already gotten a COVID vaccine Wapo (au wengine) tayari wamepata chanzo ya COVID Giseyudo (kata moko oseyudo)</p> <p>[Note: we prefer not to have a don't know option here]</p>	Swahili wording has changed	
16_R3		<p>[For ALL respondents]</p> <p>Do you have any children under age 12? Je, ukio na watoto wotele wakiwa chini ya miaka 12? Bende ni gi nyathi muna amara marie kwa higni 12?</p>	<p>0 No La Ooyo</p> <p>1 Yes Ndiyo Ee</p>	18_R3	
17_R3		<p>If a vaccine to prevent COVID-19 were offered to your children under age 12 today for free, and they were eligible, would you choose to get them vaccinated? Kwa chanzo ya kuzuza COVID-19 ingetolewa leo kwa watoto wakiwa chini ya miaka 12 bila malipo, na wataziti, je...</p> <p>Read each answer option aloud <b>Soma kila chaguo la jibu kwa...</b></p> <p>Select all that apply <b>Chagua yote yanayotumika</b></p>	<p>0 Yes, definitely Ndiyo, bila shaka Ee, maongo kwawa</p> <p>1 Yes, probably Ndiyo, pengine Ee, samoro</p> <p>2 No, probably not La, pengine siyo Ooyo, ok apar</p> <p>3 No, definitely not La, bila shaka Ooyo maongo kwawa</p> <p>4 They (or some) have already gotten a COVID vaccine Wapo (au wengine) tayari wamepata chanzo ya COVID Giseyudo (kata moko oseyudo)</p> <p>[Note: we prefer not to have a don't know option here]</p>		
18_R3		<p>[For ALL respondents]</p> <p>How important do you think it is that the Government ensure everyone can get vaccinated as soon as possible? Je, unahisi kama umuhimu gani kwa Serikali kuhakikisha kuwa kila mku anaweza kupata chanzo hatakiwa kwake? Je, gani niki kende muna maelezi makuu? Siku una ni ngi ni...</p>	<p>0 Not at all important Si muhimu hata kidogo Onge tende kata matini</p> <p>1 Somewhat important Muhimu kwa kiasi fulani Bet niki tende</p> <p>2 Very important Muhimu sana Ngi tende alinye</p>		
FOOD SECURITY/ASSISTANCE					
216	30	<p>In the past seven days have you/your household eaten less or skipped meals because you did not have enough money or food? Katika muda wa wiki moja iliyoita, je wewe/italo katika makao yenu umekua/mmekula kiasi kidogo au umekosa/mmekosa kula kwa sababu kukunahamkwa na pesa za kutisha au chukula cha kutisha? E ndalo abiryo makalo be osechui/osechuno jodi munda ochien matini kati yari kach nitech nionge pesa mromomo nyewe chemo?</p>	<p>No La Ooyo</p> <p>Yes Ndiyo Ee</p>	220	
318	31	<p>How frequently are you/your household skipping meals or eating less. Would you say every day, a couple times a week or once a week? Je, wewe/italo katika makao yenu umekosa/mmekosa mlo au kula kidogo mara nyingi kiasi gani? Je, ungesema ni kila siku, mara kadhaa kwa wiki au mara moja kwa wiki? Iliyo kach kata ichemo matini marom nade, Diwach ni pile pile, dimandak e juma koso dimandak e juma?</p>	<p>a. Every day Kila siku Pile pile</p> <p>b. A couple times a week Mara kadhaa kwa wiki Dimandak e juma</p> <p>c. Once a week Mara moja kwa wiki Dichiel e juma</p>		
217	32	<p>Was eating less/skipping meals related to the situation with Coronavirus? Je, kula kidogo/kukosa mlo kuhusian na janga la virusi vya Korona? Be chemo matini/nyo kach notidore gi wach mar Korona?</p>	<p>No La Ooyo</p> <p>Yes Ndiyo Ee</p>		
220	33	<p>In the past seven days have you received any cash, vouchers, food, soap/sanitizer or other goods because of Corona virus? Your response will not increase or decrease your chances of getting any of these items, so please answer as honestly as you can. Would you say, Katika muda wa wiki moja iliyoita je umepokea pesa tasimu, voucha, chukula, sabuni/sanitizer (kandiza) au bidhaa nyingine kwa sababu ya virusi vya Korona? Jibu lako halitazongeza au kupunguza uwezekano wako wa kupata chochote kati ya vilu hivyo, kwa hivyo sishitaji jibu kwa uaminifu unayoweza. Je, waweza kusema, Kuum ndalo abiryo makalo, bende iseyudo pesa, voucha, chemo, sabuni/sanitizer kama gimo amara machielo nitech Korona? Duokoni ok bi mendo kata duoko chien nyatoni mar yudo muna amara kuom gige, koro yie iduok ma ratiro kaka nyalo, Diwach ni...</p>	<p>a. No assistance received Ysidume usaidizi ulitapata</p> <p>b. Yes, received assistance due to Coronavirus Ndiyo, nilipata usaidizi kwa ajili ya Korona Ee, nayudo kony nitech Korona</p> <p>c. Yes, received assistance due to another reason Ndiyo, nilipata usaidizi kwa sababu nyingine Ee, nayudo kony nitech wach machielo</p> <p>d. Yes, received assistance but do not know the reason for it Ndiyo, nilipata usaidizi lakini sijui sababu Ee, nayudo kony, to ok ang'e ginoimyo</p>	<p>0</p> <p>1</p> <p>2</p> <p>3</p>	
Read all options out loud					

221	34	Where did you get the assistance from? Ulipata usaidizi kutoka wapi? Niyudo kony kowuok kure?	a. Government; Serikali Sirkali b. NGO; Shirika la kiserikali Riwuruk ma ok mar sirkali (NGO) c. Church/mosque; Kanisa/maskiti Kanisa/Maskiti d. Good samaritan/Philanthropist Corporate Sponsorship; Maamaria mwema/uchamini wa shirika Jasamaria mang'woni/Jang'wono/Kawo Ting' gi Riwuruk e. Family/relatives; Jami/jamaa yangu Joo/wede f. Other: Nyirigine Machielo	0 1 0 1 0 1 0 1 0 1 0 1	
222	35	What have you received? Umepokea nini? Niyudo ang o?  Ask all answer categories aloud Uliiza kategorija zote za majibu kwa sauti <i>Please list all the answer categories aloud</i>	a. Cash/Money Pesa/pesa tasimu Pesa b. Food Chakula Chemo c. Water Maji Pii d. Soap/hand sanitizer Sabuni/vieuzi (sanitiza) Sabuni/sanitiza e. Medicine Dawa Yath f. Other Nyirigine Machielo		
223	36	Does the assistance you receive currently cover your most important needs? Je usaidizi uliopokea hivi karibuni zinakusaidia kukimu mahitaji yako ya muhimu zaidi? Bende kony ma lyudo sani chopo dwareni madongo?	No La Oyo Yes Ndiyo Ee		225
224	37	What needs do you have that are not being met by the assistance you receive? Ni mahitaji gani uliyonayo ambayo hayawazi kukimwa na usaidizi uliopokea? Gin dware mige ma in godo ma ok chop gi kony ma lyudo?	a. Food Chakula Chemo b. Cash Pesa Pesa c. Shelter nyumbainmakazi Kar dak d. Water Maji Pii e. Soap/hand sanitizer Sabuni/vieuzi (sanitiza) Sabuni/sanitiza f. Medical care/medicine Uunzaji wa kiafya Arta mar thieth g. Other Lingine Machielo		
225	36	What is the one biggest need that you have at this time that is not being addressed? Ni hitaji lipo kubwa ulilo rato kwa sasa ambalo halipashughulikiwa? En dware mane maduong' ma in godo sani ma ok ngi?	a. Food Chakula Chemo b. Cash Pesa Pesa c. Shelter nyumbainmakazi Kar dak d. Water Maji Pii e. Soap/hand sanitizer Sabuni/vieuzi (sanitiza) Sabuni/sanitiza f. Medical care/medicine Uunzaji wa kiafya/dawa Arta mar thieth g. Sanitary Towels Taalo za hedhi Taalo mag'ria h. Other Nyirigine Machielo		
WAJ	37	Have you visited a health facility in the past three months? Ushawahi kutembea kituo cha afya katika muda wa mreezi mitatu iliyopita? Bende iedhi kar thieth ei diche adak mokalo?	No La Oyo Yes Ndiyo Ee		226
WAJ	38	I'm going to ask you some questions about your experience at the health facility. For each one tell me if it was true or false. Nenda kukuizua mizamo wako uliopokea kwenye kituo cha afya. Kwa kila moja niantie kama ni kweli au uongo. Adhi penji penji moko kum kaka ne ineno kar thieth. Ne thono ka inoro nyika ka ne en adier kata mirambo.	a. I was satisfied with my visit to the health facility Niliridhika na matembizi yangu katika kituo cha afya Ne amor gi imbena kar thieth b. I received the medical attention that I was seeking Nilipata huduma ya afya Naliyokuwa nikafuta Nayudo thieth mane ananyo c. There was a hand washing station with soap and water at the health facility Kulikuwa na sehemu ya kuhawa yenye maji and sabuni katika kituo cha afya Ne nite kar logo mangi sabuni gi pi kar thieth d. Health care providers were wearing masks covering their nose and mouth Wahudumu wa afya walivisa barakoa iliyoziba pia na midomo yao Jotheth ne onwako mask mane outno umgi gi dhigi e. The service/commodity that I went for was not available huduma/bidhaa niliyotaka haikuwepo Konyigima ne adhi manyo ne onge f. I was not able to receive services because of the health workers strike Sikuwaza kupata h	### ### 0 1 0 1 0 1 0 1 0 1	



EFFECTS OF COVID-19 MITIGATION MEASURES				
226	39	<p>I want to ask a few more questions about how the Coronavirus pandemic, and the responses of the government and others to try prevent the spread of Coronavirus, may have affected you. Your responses will not have an effect on anything you may receive, so please answer as honestly as possible. In the past two weeks, have you experienced any of the following as compared to before the Coronavirus started? <b>Nataka kukuliza mawili zaidi machache kuhusu vile mkupuko wa Virusi vya Korona, na jina serikali na wadau wengine wamehughulikia kujibu kuzua kuesha kwa virusi vya Korona, iweza kuwa imekuathiri. Majibu yako hayakuwa na athari yoyote kuhusu chochote ambacho huenda ukapokea, kwa hivyo tafadhali jibu kwa uaminifu iwezekanavyo. Je, katika muda wa wiki mbili zililopita umepata mamba yoyote yaliutoaji kwa kutingamisha na kabisa ya kuenza kwa virusi vya Korona?</b></p> <p><b>Adwa perji perji mko maruk kuum kaka muochi mar Korona, kod ya ma sirikali kod pemko temo geng'ogo landruk mar Korona, dipo ni osemu. Duokoni ok bi loko gimoro amora ma nyalo yuto, koro yie kluok ma ritoo kaka nyalo. Kuom jumbe anyo mokoato, benie iwekate magie kipimo gi ndalo mokoato ne chakruok Korona?</b></p> <p><b>READ ALL ANSWERS ALOUD SOMA MAJIBU YOTE KWA SAUTI</b></p>	<p>NC/ES</p> <p>a. See my family less <b>Nimewaona watu wa familia yangu mara chache zaidi</b> <b>Neno joda c</b> 0 1</p> <p>b. See my friends less <b>Nimewaona marafiki zangu mara chache zaidi</b> <b>Neno osiepe di m</b> 0 1</p> <p>c. Avoid public transport <b>Naeputa usafiri wa umma</b> <b>Weyo yor wuoth mar oganda</b> 0 1</p> <p>d. Complete loss of job/income <b>Nimepoteza kabisa kazi/ajira</b> <b>Wito yor yuto chutho</b> 0 1</p> <p>e. Partial loss of job/income <b>Nimepoteza kazi/ajira kwa kiasi fulani</b> <b>Wito bath yor yuto</b> 0 1</p> <p>f. Increased expenses for the household <b>Matumizi ya nyumbani yameongezeka</b> <b>Medruo</b> 0 1</p> <p>g. More time spent cooking for the household <b>Natumia muda mwingi zaidi kupikia familia</b> <b>Kawo thudo mang'eny mar tado ne joo</b> 0 1</p> <p>h. More time spent cleaning the house <b>Natumia muda mwingi zaidi kuafisha nyumba</b> <b>Kawo thudo mang'eny mar kelo ot malar</b> 0 1</p> <p>i. More time spent taking care of children <b>Natumia muda mwingi zaidi kuwatunza watoto</b> <b>Kawo thudo mang'eny mar rito nyithindo</b> 0 1</p> <p>j. More time spent taking care of livestock/farming <b>Natumia muda mwingi kuchunga mitugokulima</b> <b>Kawo thudo mang'eny mar rito chiayepur</b> 0 1</p> <p>k. More time fetching water <b>Natumia muda mwingi kuteka maji</b> <b>Kawo thudo mang'eny ma</b> 0 1</p> <p>l. More tensions in the household <b>Uhasama zaidi nyumbani</b> <b>Medruok mar chury marach</b> 0 1</p> <p>m. More arguing in the household <b>Magombano zaidi nyumbani</b> <b>Medruok mar lwemruok</b> 0 1</p> <p>n. Increase of crime in your neighborhood? <b>Kuongezeka kwa uhalifu katika kilongoi cheni</b> 0 1</p> <p>o. Experienced more violence outside the house? <b>Kushuhudia ukatili zaidi rija ya nyumba?</b> <b>Romo gi ang'engelmasira mang'eny oko mar ut?</b> 0 1</p> <p>p. More fear that your partner will harm you <b>Woga zaidi kuwa mwenzi wako atakuumiza</b> <b>Medruok mar fuoro ni nyawadu biro hini</b> 0 1</p> <p>q. Experienced more violence inside the household? <b>Kushuhudia ukatili zaidi nyumbani?</b> <b>Romo gi ang'engelmasira mang'eny ei ot?</b> 0 1</p> <p>r. Not accessing health care/services/medicines that you would have otherwise needed <b>Kutoweza kupata utunzaji wa kiafya/hudumamadawa ambayo ungehitaji</b> <b>We yudo siriafory mar theeth kaka yedhe ma idearo</b> 0 1</p> <p>s. Increase in food prices <b>Kuongeza kwa bei ya chakula</b> <b>Medruokmar nengo chiamo</b> 0 1</p> <p>t. Increase in the cost of cooking fuel <b>Kuongezeka kwa bei ya rija ya kupikia</b> <b>Medruok mar nengo yor tado</b> 0 1</p> <p>u. Less time spent praying <b>Nachukua muda mchache kuomba/kusali/kuabudu</b> <b>Kawo thud</b> 0 1</p> <p>v. Other <b>Nyingine</b> <b>Machiolo</b> 0 1</p>	<p>Ask 414- If option r,s,t,y = yes (if atleast one is yes)</p> <p>(code to give referral)</p> <p>If NO (at option m), SKIP WAJ 9</p>
414	40	<p>How has the increase in household work had an impact in your ability to generate income in the past two weeks? <b>Ni sababu gani kuu iliyokufanya ukakosa kwenda kupata huduma za alya?</b> <b>En wach mane madung' mane omioyo lewo ne kony mar theeth?</b></p> <p><b>Ere kaka medruok mar ije ni osedachio nyaloni mar yuto e jumbe anyo mokoato. Diwach ni:</b></p>	<p>a. It has had no impact <b>Hakujakuwa na athari yoyote</b> <b>Pok ochacho</b> 1</p> <p>b. It's causing you to earn a bit less money <b>Inakufanya upate pesa kidogo</b> <b>Omioyo bet iloio pi</b> 2</p> <p>c. It's causing you to earn a lot less money <b>Inakufanya upate pesa kidogo sana</b> <b>Omioyo iloio</b> 3</p> <p>d. It has caused to you completely stop earning money <b>Imesababisha uache kabisa kupata i</b> 4</p> <p>e. It has led to an increase in the money I earn <b>Kumentanya riweze kupata pesa nyingi za</b> 5</p>	
319	40	<p>What is the main reason that you skipped health services, in the last two weeks? <b>Ni sababu gani kuu iliyokufanya ukakosa kwenda kupata huduma za alya?</b> <b>En wach mane madung' mane omioyo lewo ne kony mar theeth?</b></p> <p><b>Do not read answer categories aloud. Probe "anyone else"? Usisome majibu kwa sauti. Chunguza "mtu yeyote mwingine?"</b></p>	<p>NCS</p> <p>a. The clinics are closed because of Coronavirus <b>Kliniki zimefungwa kwa sababu ya virusi vya Korona</b> <b>Otor kliniki rikedi Korona</b> 0 1</p> <p>b. People will think I have Corona if I go to the clinic <b>Nikienda kwenye kliniki watu watafikiri nina virusi vya Korona</b> <b>Ji biro paro ni an gi Korona ka adhi e kliniki</b> 0 1</p> <p>c. I am scared that I will get infected with Coronavirus if I go to the clinic <b>Ninaogopa kuwa nisambukizwa virusi vya Korona nikienda kwenye kliniki</b> <b>Aluor ni Korona nyalo maka ka adhi e kliniki</b> 0 1</p> <p>d. I cannot afford the cost of health care services right now <b>Siwazi kupata pesa za kupitia huduma za kiafya katika kliniki kwa sasa</b> <b>Ok anyal chulo nengo mar theeth gie sani</b> 0 1</p> <p>e. The health facilities do not have the medication I need <b>Vituo vya alya havina madawa ninayohitaji</b> <b>Kuonde theeth onge gi yedhe ma adawo</b> 0 1</p> <p>f. The health facilities are only seeing a small number of patients each day <b>Vituo vya alya vyawahudumia wagonjwa wachache tu kila siku</b> <b>Kuonde theeth neno mana jotoo matn pile ka pile</b> 0 1</p> <p>g. The health care workers strike <b>Mogomo wa wahudumu wa alya</b> <b>Gomo mar jotheth</b> 0 1</p> <p>h. Other (specify) <b>nyingine (baja)</b> <b>Machiolo (ler)</b> 0 1</p>	

227	41	Which health care services/medicines have you given up? Ni huduma gani ya kiafya/madawa ambayo umesacha? Gin ania/konyi/yedhe mage mag theth ma iseweyo?	<p>a. Check/medicine for malaria Kuchunguzwa/kupata madawa ya malaria Pimo/yadh malaria 0 1</p> <p>b. Check/medicine for stomach/digestive problems Kuchunguzwa/ kupata dawa kwa ajili ya tumbo/matako ya chakula kusagika tumboni Pimo/yadh chandruk mar ichi/chiemo e ichi 0 1</p> <p>c. Check/medicine for diabetes/blood pressure Kuchunguzwa/kupata madawa ya ugonjwa wa kisukari/mongo wa damu Pimo/yadh diabetes/ing'we remo 0 1</p> <p>d. Care for any acute illness; Utunzaji wa ugonjwa wowote wa ghafl 0 1</p> <p>e. Refills of any other regular medications you may take; Kuongezwa kwa madawa ya kawaida unayoweza kutumia Medo yath moro amora ma (ja biyogo; 0 1</p> <p>f. Immunizations/nutrition services for children; Chanjo/huduma ya ishe ya watoto Chenjo/weche chiemo mag nyithindo 0 1</p> <p>g. Check/medicine for pre-natal care (only women) Kuchunguzwa/kupata dawa kwa ajili ya uja uzito (kwa wanawake pekee) Pimo/yadh rit mar ndato matoleima bang' nyuol (mimo kande) 0 1</p> <p>h. Family Planning/Child spacing methods (only women) Mpango wa uzazi (kwa wanawake pekee) Yote mag komo nyuol (mimo kande) 0 1</p> <p>i. Other Nyingine Machiolo 0 1</p>	NI YES
Read all answer categories aloud Soma majibu yote kwa sauti				
CHILD MARRIAGE				
WAJ 9	42	Has anyone in your household gotten married since the start of Coronavirus? Je kama mtu yeyote katika makao yako amotelewa/meseti tangu Korona (arise)? Dawidhi ni mtu ang'aa a nda amotelewa/meseti tangu Korona (arise)? Refers to where participant currently resides	<p>a. No La Ooyo 0</p> <p>b. Yes Ndiyo Ee 1</p>	415
19_R3		How many people in your household got married since start of Coronavirus? Je, ni wote wengine katika...	Insert Number	
Programming: If Yes, ask how many and loop 43-46 accordingly				
WAJ 10	43	Who got married? Ni nani aliyelewa/aliyeoa? Ng'o mane okendi/okendo?  Do not read answer categories aloud. Probe "anyone else"? Unaisome majibu kwa sauti. Chunguza "mtu yeyote mwingine?"	<p>a. Son Mwana wa kume Wuoda 1</p> <p>b. Daughter Binti Nyara 2</p> <p>c. Self Mimi An 3</p> <p>d. Other female (specify) Machana mwingine (fafanua) Nyako machiolo (ier) 4</p> <p>e. Other male (specify) Mvulana mwingine (fafanua) Wuoi machiolo (ier) 5</p>	
WAJ 11	44	About how old is the person who got married? Mtu ambaye alielewa ana umri wa miaka mingapi hivi? Ng'ama ne okendi/okendo ne en kar jahigni adi?	AGE IN YEARS UMRI KWA MIKA	
513	45	In what month and year did they get married? Alielewa/alioa mwezi na mwaka gani? Ne gikendore dawa mane e higa mane?	Month (drop down) Year (2020/2021/2022)	
WAJ 12	46	I'm going to read some statements about that marriage. For each one tell me if it is true or false. Nianza kusoma mambo mengine kuhusu ndoa hi. Kwa kila moja nambie kama ni kweli au uongo. Adhi some weche ndoa kuzim kendo. Ne moro ka moro nyisa ka en adier kata mrambo.	<p>a. The marriage was planned to happen before Coronavirus Ndoa ilipangwa kutaniya kabla ya Korona Kuchan kend ka pok Korona ochakore 0 1</p> <p>b. The marriage happened because the person was out of school before Coronavirus started Ndoa ilifanyika kwa sababu huyo mtu aliwacha shule kabla ya korona Kend notimore nitech jagono ne owe skul ka pok Korona ochakore 0 1</p> <p>c. The marriage happened because schools were closed for Coronavirus Ndoa ilifanyika kwa sababu shule zifungwa kwa ajili ya Korona Kend notimore nitech notor skunde ne wach Korona 0 1</p> <p>d. The marriage happened because our family needed money Ndoa ilifanyika kwa sababu familia yetu ilihitaji pesa Kend notimore nitech joodwa ne dwa pesa 0 1</p> <p>e. The marriage happened to cope with changes in that person's life, or their families' lives, that were caused by the Coronavirus pandemic Ndoa ilifanyika ili kukabiliana na mabadiliko katika maisha ya mtu huyo, au maisha ya familia yake, iliyotewa na janga la Korona Kend notimore moro okony lakisage mane olmore e ngima jagono, kaba e ngima joodgi, mane olmore nitech muoch mar Korona 0 1</p> <p>f. There was another reason why the marriage happened (specify) Kulikuwa na sababu nyingine iliyofanya ndoa ilianike (fafanua) Nise gimachiolo mane omioyo kend olmore (ier) 0 1</p>	F T

RELATIONSHIP/PREGNANCY/FP					
415	47	Which statement best describes your current situation? Jei Ni kauli gani kati ya zifuatazo inayopoteza vizuri zaidi hali yako kwa sasa? Ene wach ma lero maber mdoyo chalni ma sani?  Read all answer categories aloud. Choose only one	a. Have a husband/partner and currently living with them b. Have a husband/partner and NOT currently living with them c. Do not have a husband/partner d. Partner deceased	Nina mume/mwenzi na ninaishi ni 1 Nina mume/mwenzi ambaye 2 Sina mume/mwenzi 0 Nyawadwa ne osatho	417  F1
416	48	When was the last time you saw this husband/partner? Ni lini mara ya mwisho ulipomwona mume/mwenzi huyu? Nineno jacinini/yawaduni karani o mlogi?	a. Within the past 2 weeks b. Between 2-4 weeks ago c. More than 1 month ago	Katika muda wa wiki 2 zilizopita 1 Kati ya wiki 2-4 zilizopita 2 Mdogo dwe 1 makalo 3	
417	49	Are you currently satisfied in your relationship with your main partner? Would you say... Je kwa sasa umeridhika katika uhusiano na mwenzi wako? Je, waweza kusema: Bende iwingi ka tudruk ma in godo gi osepini mithoro tudongo mdogo mori gi sani? Diwash ni:  Read answer categories aloud and select one. Soma majibu kwa sauti na uchague jibu moja	a. Very satisfied b. Somewhat satisfied c. Not satisfied or unsatisfied d. Somewhat unsatisfied e. Very unsatisfied	Nimeridhika sana 1 Nimeridhika kwa kiasi fulani 2 Sivezi kusema nimeridhika au la 3 Sijaridhika kwa kiasi fulani 4 Sijaridhika hata kidogo 5	
F1		IF MALE -> SKIP			450
Now I would like to ask a few questions about pregnancy and if and how Coronavirus may have affected you or your partner's use of family planning. I know these questions may be a bit personal, but please be as honest as you can Sasa ningependa kukauliza maswali kadhaa kuhusiana na uga-uzito na kama au jinsi gani kuwepo kwa virusi vya Korona huenda kumebathiri ukumizi wako au wa mwenzi wako wa mpango wa uzazi. Najua maswali haya yanaweza kuwa nyeti sasa, lakini nitakuomba ujibu kwa usemiwa wa kawaida. Tono dhari perjo perjo mambi kuoni ichi kendo ka dipo ni kendo kaka Korona osemuika kaka tiyo kaka osepini tiyo gi yote koto nyusi. Angiyo ni perjo gi nyalo bado majaye, to ye bed jaratiro kaka injalo					
514	50	Have you been pregnant any time since March 2020, regardless of the state of the pregnancy or how it ended? Je, umewazi kuwa nja mtoke wakati wote kutoka mwezi wa tatu 2020, bila kuzingatia hali ya mimba au jinsi ilivyokamilika? Bende isibede gi ichi e shudo moro amora chakre dwe mar adak 2020, ka ok ingiyo chali mar jino kaka kaka mlogi?	No Yes Don't know	La Ovo Akia Sina Akia	1 2 3
418	51	Which statement best describes your current situation? Would you say... Ni kauli gani inayopoteza vyema zaidi hali yako kwa sasa? Je, waweza kusema: En wach mane ma lero maber mdoyo chalni masani? Diwash ni:  Read all answer categories aloud. Select only one. Soma majibu yote kwa sauti. Chague jibu moja tu. Som kidienje duto mag duoko matek. Yier achiel kende.	Currently pregnant or probably pregnant Currently living to become pregnant Recently had a baby Not currently pregnant and do not wish to become pregnant Can no longer have children because you or your partner are infertile	Kwa sasa nina mimba au yaweza kuwa nina mimba 1 Kwa sasa ninaiaibu kushika mimba 2 Ninoyul machigini 3 Kwa sasa sina mimba na sindoi 4 Sivezi tena kupata watoto kwa sababu mimi au mwenzi wangu ni tasa 5	516 450 450
419	52	If you found out today that you were pregnant, you would feel... Ungehajie ungefundika kuwa una mimba. Ka de ilweny kawuoni ni in gi ichi, diwini ka:  Read answer categories aloud Soma majibu kwa sauti	Very unhappy Somewhat unhappy Somewhat happy Very happy	Ninohezunika sana 1 Ningehuzunika kwa kiasi fulani 2 Ningefurahi kwa kiasi fulani 3 Ningefurahi sana 4	
425	53	Are you or your partner currently doing something to avoid or delay pregnancy? Je, kwa sasa wewe au mwenzi wako mnaifanya lolote kupuka au kuchelewesha kushika mimba? Bende timo kaka nyawadu timo gimoro mar geng'o kaka choro maki ichi?	No Yes	La Oyo Ndio Ee	0 1
426	54	What method are you or your partner currently using? Kwa sasa wewe au mwenzi wako mnaifanya njia gani ya kupanga uzazi? Iyo kaka nyawadu iyo gi jo mane gie sani?	a. Female sterilization b. Male sterilization c. IUD d. Injectables e. Implants f. Oral contraceptive pills g. Male condom h. Female condom i. Emergency contraception j. Standard days method k. Lactational Amenorrhea Method/ Breastfeeding l. Withdrawal m. Abstinence n. Other (specify)	Kufungwa kizazi kwa mwanamke 1 Kufungwa uzazi kwa mwanamume 1 IUD (Koli) 1 Sindano 1 Chembe za kupachika mwilini 1 Tembe za kumeza 1 Kondomu za kume 1 Kondomu za kike 1 Tembe za kumeza za wakati wa dharura (E-pill) 1 Njia ya kuhesabu siku 1 Njia ya kuzuia kuanza kwa hedhi kwa kur 1 Njia ya kutoa uume kabla ya kumwaga shahawa 1 Kujizula 1 Siji 1 Nyingine (fafanua) 1	NK YES 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1

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517	63	Did you intend to get pregnant at the time that you did, want to get pregnant but at a different time, or not want to get pregnant at all? Wakati uliposhika mimba je ulikuwa unataka kushika mimba wakati huo, utataka kushika mimba lakini wakati mwingine tofauti, au hukutaka kushika mimba hata kidogo? Bende ne igeo maliko ich e kinde mane imake, ne idwa mako ich to e kinde mogogore, koso ne ok idwa mako ich kata matini?	a. Yes, at that time Ndiyo, wakati huo Ee, e kidero b. Yes, but at a different time Ndiyo, lakini wakati tofauti Ee, to e kinde mocoore c. No, not at all La skutaka hata kidogo Ooyo, ne ok adwar	1 2 3
518	64	Did any of the following apply to you at the time you became pregnant? Kati ya kaulia ulitazoa ni kaulia pi iliyoe kwele kukuhusu wakati uliposhika mimba. Bende moro amora kum gige notimoreni e kinde mane imake ich? <b>READ ALL ANSWER OPTIONS. SOMA MAJIBU YOTE</b> <b>SOM YIERO MAG DUOKO TE</b>	a. Couldn't access family planning because of COVID Singeweza kupata nja ya kupanga uzazi kwa sababu ya COVID Ne ok inyal yudo yore komo nyusi nkech COVID b. Couldn't access emergency contraception because of COVID Singeweza kupata tembe za kuzura mimba za dhurura kwa sababu ya COVID Ne ok inyal yudo yor geng'o ich mapyo nkech COVID c. Couldn't access condoms because of COVID Singeweza kupata kondomu kwa sababu ya COVID Ne ok inyal yudo rabo yunga nkech COVID d. Needed the money/gifts from a sexual relationship Nihitaji pesa/ (zawadi kutoka kwa uhusiano wa kingono Ne idwa pesa/mich mane owuok e osep mar ringruok e. Needed the money I would have spent on FP or condoms for food or other basic needs Nihitaji pesa ambazo ningetumia kwa mpango wa uzazi au kondomu kununus chakula au mahitaji mengine Ne idwa pesa ma de iyogo e weche komo nyusi kata rabo yunga mondo inyawo chemo kata gik mamko madwarore f. Spending more time with my husband/friend/partner because of COVID Nitumia muda mwingi pamoja na rafiki yangu wa kiume/mwenzi wangu kwa sababu ya COVID Rako thudo mang'eny gi jao/osepihiyawadu nkech COVID g. Other (specify) Nwindine (fafanua) Machiolo (ier)	NI YES 0 1 0 1 0 1 0 1 0 1 0 1
519	65	Have you experienced any of the following challenges accessing pre-natal care during this pregnancy? Je, umewahi kukumbwa na nyote kati ya changamoto zilizotazoa kupata huduma ya kabla ya kuzaa wakati wa upa- uzozi? Bende isabeddo gi moro amora kum agetegi mag yudo riti mteleo ne nyusi e kinde ini?	a. The clinics are not open to provide pre-natal care Kiniki hacikufunguliwa kutoka huduma ya b. I cannot afford the cost of pre-natal care Siwezi kumuia gharima ya huduma ya kabla ya ku c. I skip prenatal care because I am worried I will get infected with Coronavirus Naeputa hudu d. Other challenges (specify) Chanasomoto zinaine (fafanua) Aotele miamoko (ier)	0 1 0 1 0 1 0 1
MENTAL HEALTH (PHQ-2 and GAD-2)				
450	78	Over the last 2 weeks, how often have you been bothered by any of the following problems. For each one, tell me about how many days. Katika kipindi cha wki mbili zilizotazoa, ni mara ngapi umesumbuliwa na tatizo kote kati ya haya. Kwa kila moja, niambe ni kama siku ngapi havi? Kum jumbe ariyo mokalo, nyadidi ma moro amora kum gige osechandi? Ne moro ka moro, nyisa ni madinom ndalo asi.  Little interest or pleasure in doing things, you normally enjoy Kukosa tamaa au shauku ya kufanya mambo ambayo unapenda kufanya Bido gi gombo kata mor matini mar timo gik mai ja mor timo  [DO NOT READ OPTIONS]	a. 0 days Siku 0 Ndalo 0 b. 1-7 days Siku 1-7 Ndalo 1-7 c. 8-12 days Siku 8-12 Ndalo 8-12 d. 13 or 14 days Siku 13 au 14 Ndalo 13 kata 14 e. REFUSE TO ANSWER KATAA KUJIBU TAMORE 5	1 2 3 4 5  Would you say that is more, less or about the same as compared to before the Coronavirus began? Je ungesema kuwa ni zaidi au ni kiasi kiasi kidogo au sawa kwa kulinganisha na kabla ya kuanzia kwa virusi vya Korona? I a=0 or Refused, don't ask More 1 Less 2 Same 3
451	79	Feeling down, depressed, or hopeless Kuvijika moyo, kuhuzunika au kukosa tamaa Bido gi churyi mod, mokuyo, kata ma onge geno  [DO NOT READ OPTIONS]	a. 0 days Siku 0 Ndalo 0 b. 1-7 days Siku 1-7 Ndalo 1-7 c. 8-12 days Siku 8-12 Ndalo 8-12 d. 13 or 14 days Siku 13 au 14 Ndalo 13 kata 14 e. REFUSE TO ANSWER KATAA KUJIBU TAMORE 5	1 2 3 4 5 More 1 Less 2 Same 3
522	80	Feeling nervous, anxious or on edge Kuwa na uwoga, wasiwasi	0 days Siku 0 Ndalo 0 1-7 days Siku 1-7 Ndalo 1-7 8-12 days Siku 8-12 Ndalo 8-12 13 or 14 days Siku 13 au 14 Ndalo 13 kata 14 REFUSE TO ANSWER KATAA KUJIBU TAMORE DI 5	1 2 3 4 5 a=0 or Refused, don't ask More 1 Less 2 Same 3
523	81	Not being able to stop or control worrying Kutoweza kuwacha au kuthibiti wasiwasi Bido ma ok nyal weyo kata qayo parruok	0 days Siku 0 Ndalo 0 1-7 days Siku 1-7 Ndalo 1-7 8-12 days Siku 8-12 Ndalo 8-12 13 or 14 days Siku 13 au 14 Ndalo 13 kata 14 REFUSE TO ANSWER KATAA KUJIBU TAMORE DI 5	1 2 3 4 5 a=0 or Refused, don't ask More 1 Less 2 Same 3
524	82	Since the start of the Coronavirus (COVID-19) pandemic, have you sought help from family or friends because you felt low, anxious or stressed? Tangu janga la Korona (COVID-19) lazoze, umewahi kuafika msaada kutoka kwa familia au marafiki kwa sababu ulihisi kuvunjika moyo, kuwa na wasiwasi au kufahamika? Nyaka ne Korona (COVID-19) muji, bende isemanyo kony kum jodu kata osep nkech ne ibedo gi churyi mod kata parruok?	No La Ooyo Yes Ndiyo Ee Don't know Sijai Alia Refuse to answer Kataa kujibu Tamore duoko	0 1 # #

PARTNER VIOLENCE & SEXUAL EXPLOITATION (EMERGE)				
IF MALE → SKIP				461
IF NO PARTNER → SKIP				229
459	83	<p>Now I would like to ask you about your difficulties that may be occurring in your relationship. Some couples are fighting more because of the stresses related to the COVID-19 pandemic. Is this the case for you to share with us a bit about your relationship? <b>Sasa nataka kukuliza kuhusu matatizo yaliyoitokea katika uhusiano wako. Wenzetu tutani wameitokea wakigigana zaidi kwa sababu ya mkazo wa khatua inayohusiana na janga la Covid-19. Ningependa kukuliza ubatizaji mamba kutani kuhusu uhusiano wako.</b></p> <p>Koro dahir pengi kuam chandruko ma nyolo beko ni wote e dahir. Juvu moko, dhiru mnyang yotech parupuk mchudora gi muchu mar COVID-19. Dahir kwayi mondo nyivwae matin kuam dahir.</p>	<p>B. Does this occur more often or less often since the COVID-19 pandemic? B. Je, hi inatokika mara nyingi zaidi au mara chache zaidi tangu janga la COVID-19 ilikae? B. Ma timore di mnyang koso matin mabayo nyaka na COVID-19 mnyag?</p> <p>MORE OFTEN MAR</p> <p>L E S S C</p> <p>SA ME SA C</p>	
460	84	<p>In the past one month, has your male partner slapped you, hit you, kicked you, thrown things at you, or done anything else to physically hurt you? <b>Katika muda wa mwezi mmoja ulopita je mwenzako wa kume amekupiga kofi, amekugunga, amekupiga lake, amekunusha viti, au amefanya jambo lingine lolote ili akumaze kimitwi?</b></p> <p>E dwe achiel moko, bende jaidinyawadu ma wuo osechuni imo hera ka na de ak idah?</p>	<p>A. In the past one month? A. Katika muda wa mwezi mmoja ulopita? A. E dwe achiel moko?</p> <p>(if no, skip b) YES NDYO EE</p>	<p>0 1 2 3</p>
461	85	<p>In times of crisis, or just in cases when people are in need, they are asked sometimes to do sexual things for money or other resources. Sometimes people also enter into or stay in relationships because they anticipate that they will get money or other things they need like money, rent, clothes, etc. During the past one month, have you had sex in exchange for food, gifts, or money or stayed in a relationship because you thought you would get those things from your partner? <b>Wakati wa dharura, au wakati tu ambapo watu wana mahitaji, wakati mwingine wanawomba wafanye ngono ili wapate pesa au viti vingine. Wakati mwingine watu huingia katika mahusiano au hukaa katika mahusiano kwa sababu wanataji kupata pesa au viti vingine wanavyohitaji kama, kodi ya nyumba, nguo na kadhalika. Katika muda wa mwezi mmoja ulopita je unafanya ngono ili kupata chukula, zawadi nyingine, au pesa au ukakaa katika uhusiano na mtu kwa sababu udhani kuwa utapata viti hivyo kutoka kwa mwenzako?</b></p> <p>E kinde mag chandruko, kaka mana e kinde ma ji nigi dware, seche moko kiongo mondo giti timbe hera mondo giw pesa kaka gi mamoko. Seche moko bende</p>	<p>A. In the past one month? A. Katika muda wa mwezi mmoja ulopita?</p> <p>(if no, skip b) YES NDYO OOTO</p>	<p>B. Does this occur more often or less often since the COVID-19 pandemic? B. Je hi inatokika mara nyingi zaidi au mara chache zaidi tangu janga la COVID-19 ilikae?</p> <p>MORE OFTEN MAR</p> <p>L E S S C</p> <p>SA ME SA C</p>
CONCLUSION OF INTERVIEW				
229	86	<p>Do we have your permission to recontact you in the future? <b>Je tukio na dhiri yako kuwasiliana nawe tena siku zisizo?</b></p> <p>Bende imiyoa thulo mar tudruko kodi kendo ndalo mabiro?</p>	<p>Yes NDYO EE</p> <p>No LA OYO</p>	<p>1</p> <p>2</p>
134	87	<p>Could you give me a contact we can use to contact you in the future? <b>Je, unaweza kumpa nambari ambayo tunaweza kutuma kuwasiliana nawe siku zisizo?</b></p> <p>Bende inalo miya yor tudruko ma wanyato tudorego kodi ndalo mabiro?</p>	<p>Phone Number _____</p> <p>(confirm)</p>	
229	88	<p>Could you tell me your name or nickname? <b>Pia waweza kunimba jina lako halisi au la utani?</b></p> <p>Bende inalo nyisa nyingi ma adiri kaka mar angere?</p>		
89		<p>As you may recall, [name of adolescent] is also participating in our COVID-19 research and we interviewed them last time as well. May we have your permission to interview them again? <b>Kama unavyoweza kukumbuka, [jina la kijana] pia anashiriki kwenye utafiti wetu wa COVID-19 na kufuniki wakati ulopita pia. Je, tunaweza kupata kuhusu yako tena tena?</b></p> <p>Kaka inalo paro, [jina la kawira] bende nite e nono mar COVID-19 kendo en bende ne wamiye penjo e thulo moko. Bende imiyoa thulo mar miye penjo kendo?</p>	<p>No LA OYO</p> <p>Yes NDYO EE</p>	<p>1</p> <p>2</p>
90		<p>Is [ADOLESCENT GIRL] [THAT BOY] available for the interview? - Je, [JULIANA MSICHANA] MVULANA HUVO? yako nyumba? Bende [RAINIERA MA NYAKO] [WUCHI NO] e dahir?</p>	<p>Yes, available</p> <p>Not available</p>	<p>1</p> <p>2</p> <p>Ask why not available</p>
90 a		<p>If adolescent not available for interview ask: Why is [Spendine, participant_name] not available for interview? If/ka kijana hapatikani kwa mahojiano utia: Mbona [Spendine, participant_name] hapatikani kwa mahojiano? Ki twera de yuthe ne chezo mar penjo, penjo. Ango, momyo [Spendine, participant_name] ok yuthe ne penjo?</p>	<p>Gone back to school <b>Amendui shuleni</b> Otoki skul</p> <p>He/she travelled and can't be reached on phone <b>Aliafiri na hawati kufika kwa simu</b> Odi wuthi kendo ok nyal yude e simu</p> <p>Other <b>Ndavya: Itachiselo</b></p>	
91		<p>Can you give me the phone number I can use to talk to [ADOLESCENT GIRL] [THAT BOY]? Pia unaweza kunisadha na nambari ya simu inayoweza kutumia kuwasiliana na [JULIANA MSICHANA] MVULANA HUVO? Bende inalo miya namba sime ma anyalo wuoyo</p>		

96	<p>May we have your permission to interview [ADOLESCENT GIRL] [THAT BOY] if the school allows?</p> <p>Jei tunaweza kupata ruhusa yako ya kumbi? [KIJANA MSICHANA] M/ULANA HUYO ikiwa shule inaruhusu?</p> <p>Be wanyito guto thuo maiti mar penjo</p>	<p>No La Ooyo</p> <p>Yes Ndiyo Ee</p>	
IF SITE = KISUMU SKIP TO END OF INTERVIEW NOTE			
97	<p>Like I explained to you earlier in a few weeks from today, we will conduct a literacy and numeracy test which will be administered face to face by an interviewer. We would like to know where you currently live.</p>	<p>County 1</p> <p>sub-county 2</p>	
97a	<p>Land marks Write in details how to get to the Household. Capture major roads, well known shops and how people refer to the respondent in the neighbourhood.</p>		
	<p>We have reached the end of the interview. Thank you so much for your time and for answering our questions. Do you have any question or comment for me? Tumelikia mwenito wa mahojiano. Ahsante sana kwa muda wako na kujibu maswali yetu. Je, una swali lolote au maoni yoyote kwangu?</p> <p>Vishoppo e giko mar chevo mar penjo. Erokamano maduong' kuom thudoni kendo kuom duoko perjowa. Bende in gi penjo kata wach moro amora ma dimys?</p>	<p>No La Ooyo</p> <p>Yes Ndiyo Ee</p>	<p>1</p> <p>2</p>
<p>A REGISTERED NAME AND NUMBER FOR REIMBURSEMENT</p> <p>226 - If yes, program a prompt offer a referral for SGBV counseling.</p> <p>If yes to four or more 450 and 451, referral for mental health services</p>			



STROBE Statement—Checklist of items that should be included in reports of *cohort studies*

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-5
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up (b) For matched studies, give matching criteria and number of exposed and unexposed	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) If applicable, explain how loss to follow-up was addressed (e) Describe any sensitivity analyses	6
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	7
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) Summarise follow-up time (eg, average and total amount)	7
Outcome data	15*	Report numbers of outcome events or summary measures over time	7-8

Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	7-8
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7-8
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	8
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	8-10
Generalisability	21	Discuss the generalisability (external validity) of the study results	9-10
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	10

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at <http://www.strobe-statement.org>.

# BMJ Open

## Exploring COVID-19 vaccine hesitancy and uptake in Nairobi's urban informal settlements: an unsupervised machine learning analysis of a longitudinal prospective cohort study from 2021-2022

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# Exploring COVID-19 vaccine hesitancy and uptake in Nairobi's urban informal settlements: an unsupervised machine learning analysis of a longitudinal prospective cohort study from 2021-2022

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## Abstract

**Objectives:** To illustrate the utility of unsupervised machine learning compared to traditional methods of analysis by identifying archetypes within the population that may be more or less likely to get the COVID vaccine.

**Design:** A longitudinal prospective cohort study (n = 2,009 households) with recurring phone surveys from 2020 to 2022 to assess COVID-19 knowledge, attitudes, and practices. Vaccine questions were added in 2021 (n = 1,117) and 2022 (n = 1,121) rounds.

**Setting:** Five informal settlements in Nairobi, Kenya.

**Participants:** Individuals from 2,009 households included.

**Outcome measures and analysis:** Respondents were asked about COVID-19 vaccine acceptance (February 2021) and vaccine uptake (March 2022). Three distinct clusters were estimated using K-Means clustering and analysed against vaccine acceptance and vaccine uptake outcomes using likelihood ratio tests.

**Results:** Despite higher educational attainment and fewer concerns regarding the pandemic, young adults (Cluster 3) were less likely to intend to get the vaccine compared with Cluster 1 (41.5% vs 55.3%, respectively;  $p < 0.01$ ). Despite believing certain COVID-19 myths, older adults with larger households and more fears regarding economic impacts of the pandemic (Cluster 1) more likely to ultimately to get vaccinated than Cluster 3 (78% vs 55.3%;  $p < 0.01$ ), potentially due to employment requirements. Middle-aged women who are married or divorced and reported higher risk of gender-based violence in the home (Cluster 2) were more likely than young adults (Cluster 3) to report wanting to get the vaccine (50.5% vs 41.5%;  $p = 0.014$ ) but not more likely to have gotten it (69.3% vs 66.4%;  $p = 0.41$ ), indicating potential gaps in access and broader need for social support for this group.

**Conclusions:** Findings suggest this methodology can be a useful tool to characterize populations, with potential utility for improved targeted policy, programs and behavioural messaging to promote uptake of healthy behaviours and ensure equitable distribution of prevention measures.

## Strengths and limitations of this study

- A strength of modern statistical methods, such as K-Means clustering, is the ability to facilitate data-driven analysis, objectively revealing sub-groups without the researchers preconceived assumptions potentially biasing the analysis.
- A strength of this study is its longitudinal prospective design, following respondents from two months after the pandemic was declared through to vaccine availability.

- Some limitations to K-Means clustering include possible changes to the clustering of the data when run multiple times due to the use of random starting points and challenges in interpreting the data when distinct sub-groups are not present.
- Limitations in the study design include potential selection bias favouring respondents who had mobile phones as well as social desirability bias, whereby respondents may have answered questions to be socially acceptable to the interviewer.
- Relatedly, the study has high attrition due to the repeat rounds of collection.

## Introduction

The World Health Organization (WHO) officially declared COVID-19, a disease caused by the novel coronavirus SARS-CoV-2, a pandemic on March 11, 2020 (1). The first case of COVID-19 in Kenya was reported shortly after on March 13, 2020. To curb transmission, the Kenyan Government swiftly instated lockdown policies including restrictions on travel and large gatherings, and business and school closures. Experts were concerned that due to limited resources for distancing and hand washing, that populations in urban informal settlements would be at high risk of transmission (2). Many studies regarding COVID-19 and other outbreaks, such as Ebola, have cited loss of income, food insecurity, gender-based violence, mental health, and lack of access to healthcare needs as major downstream impacts of disease mitigation policies (3–5). In the years since the pandemic began, restrictions have eased and with the rollout of COVID-19 vaccines to the general public in early 2021, the focus has shifted to increasing vaccination coverage. While vaccination is critically important, during initial phases of the rollout, 82% of globally available doses went to high and upper middle-income countries, with only 0.2% delivered to low- and middle-income countries, highlighting continued vaccine inequity and injustice (6–10). As of July 2023, 65.9% of individuals globally have taken both doses of the COVID-19 vaccine (11).

The government of Kenya launched a phased rollout of COVID-19 vaccination from March 2021, starting with essential workers such as healthcare providers, then the elderly and those with comorbidities. In June 2022, the Kenyan Ministry of Health expanded their reach and aimed to vaccinate 27 million eligible adults and 5.8 million teenagers by the end of the year (12). Certain jobs require vaccination such as civil servants, teachers, and some private employers (13–16). Ongoing campaigns aim to increase vaccination coverage, assuage concerns about vaccine safety, and promote uptake to protect Kenyans from severe outcomes and death as well as to protect against new and emerging variants. Vaccination is one of the most effective



interventions to control the ongoing pandemic but vaccine acceptance rates around the world vary (17–19).

Vaccine hesitancy is a major ongoing global concern as it is likely there will continue to be new vaccines or boosters required as the pandemic evolves. A study across 23 countries worldwide (including Kenya) found that soon after the vaccines were available (June 2021) over three-quarters (75.2%) of respondents reported vaccine acceptance, meaning they would get the vaccine. Reasons for vaccine hesitancy related to lack of trust in COVID-19 vaccine safety and science, and scepticism about its efficacy (19). Other factors included misperceptions regarding individual level risk of contracting COVID-19, the severity of infections(19–24) and fear of side effects (25). Some people surveyed reported a general lack of trust in scientific institutions or health authorities which can also increase vaccine hesitancy (19).

Looking closer at COVID-19 vaccine hesitancy in Kenya, an early study in four Kenyan counties found hesitancy ranged from 10.2 - 44.6%, with Nairobi County having the highest proportion that reported they intended to get the vaccine, particularly among those who had received training from the Ministry of Health (26). A 2022 study from six Kenyan health facilities found that while 81% reported it was important to get the vaccine, 40.5% also reported concerns, mainly regarding side effects (6). This study also found that hesitancy was higher in government and faith-based health institutions compared to private ones (6). Another study conducted in February 2022 found that more than 45% of individuals eligible for vaccination in Kenya had not taken a single dose (19,27,28).

To increase vaccine uptake, it is important to address hesitancy by identifying sources of information, perceived trustworthiness of sources, and how messaging can be adapted to drive positive behaviour change. Studies have shown that individuals who report receiving COVID-19 information from social media, primarily Facebook, have the highest rates of vaccine hesitancy (6,26). An Africa CDC report found that among those surveyed in Kenya, 65% reported having seen or heard at least some misinformation about COVID-19 from social media (29). Overall, the potential for social media to contribute to misinformation is concerning, as the information shared is not scientifically filtered or reviewed. Other sources commonly reported for COVID-19 information include TV, SMS from government agencies, and health providers. An African CDC report found that in Kenya, 78% of those surveyed say that TV is a trusted source of information (29). In Nairobi, a study revealed that government health messages through television, radio and SMS were among the most common sources of information for residents in urban informal settlements at the initial onset of the COVID-19 pandemic (30). In particular, it is important to understand how young adults receive and interpret

information regarding COVID-19, as some studies suggest this age group may be extremely hesitant because of perceived low risk of severe outcomes, mistrust in authority, and fear regarding side effects especially around infertility and pregnancy outcomes (31–33). A global study found young people were most likely to search for COVID-19 and other health information from social media, raising concerns about exposure to misinformation (34).

This study analyses data from a sample of individuals residing in urban informal settlements in Nairobi, surveyed in 2021 and 2022, before and after the distribution of the first COVID-19 vaccine. An exploratory analysis was implemented to understand how the characteristics of respondents could point to vaccine acceptance/hesitancy (prior to availability) and uptake (after the vaccine was available). We explored the utility of K-Means clustering to characterize participants based on demographics, knowledge, perceptions, risks, and other factors, to determine if certain archetypes or sub-groups are present in the cohort; and if so, how likely they are to want to take the COVID-19 vaccine and ultimately get it. We selected K-Means analysis because it is a data-driven approach, meaning that the patterns are derived from the data itself, a less biased method to characterize ‘types’ of participants. K-Means have been used in previous studies to group together participants in a dataset to predict health prevention and treatment strategies for each group (35). We compared this statistical approach to a more basic one, to highlight the utility of K-Means clustering to understand unmeasured characteristics of the groups. Ultimately, K-Means clustering identified three sub-groups in the dataset with implications for COVID-19 vaccination policy and messaging.

## Methods

### *Sample and survey design*

The Population Council, in collaboration with the Kenya Ministry of Health, conducted a longitudinal prospective cohort study across five informal settlements (Kibera, Mathare, Kariobangi, Huruma, and Dandora) in Nairobi, Kenya to understand knowledge, attitudes and practices around COVID-19. Participants were sampled from two previous longitudinal cohorts, Adolescent Girls Initiative-Kenya (AGI-K) (n=2,565) and *Nisikilize Tujengane* (NISITU): Engaging men and boys in girl centred programming (n=4,519). For AGI-K and NISITU surveys, household listings were generated and eligible households contained at least one adolescent member were sampled. For AGI-K and NISITU sample size calculations were conducted and samples selected accordingly.

For the COVID-19 survey, 3,465 households were randomly sampled from the AGI-K and NISITU cohorts and stratified by informal settlement, so they are somewhat representative but had to have at least one adolescent household member (e.g., a

household with only one adult member would not have been eligible for inclusion). For the COVID-19 surveys, we were aiming for a sample size of 2,000, or 400 per informal settlement (30). Of the random sample from AGI-K and NISITU (n=3,465), 24% of the numbers were no longer in use, but refusals were quite low at about 1%. The resulting cohort for this COVID-19 study includes 2,009 adult household members interviewed on March 30<sup>th</sup> and 31<sup>st</sup> 2020 just after the pandemic was declared. Repeated mobile phone surveys were completed in April (N = 1,768), May (N = 1,750), June (N=1,525) of 2020, February 2021 (N=1,117), and March 2022 (N= 1,121). Attrition was high given the frequent repeat nature of the survey and possibility of mobile phone numbers being discontinued, but given the unknowns early in the pandemic, the possibility of attrition was weighed against gathering critically needed information.

Survey questions include demographics, knowledge and awareness of COVID-19 transmission and symptoms, perceived risk, socioeconomic effects of the pandemic, health and mental health indicators, gender-based violence and uptake of various protective behaviours such as masking, isolating if sick, testing, and vaccination (see questionnaires in **Supplementary Files 1 and 2**). All interviews were conducted by phone by a team of 77 Kenyan surveyors to adhere to national physical distancing policies to prevent the spread of COVID-19. Respondents gave informed consent over the phone before commencing the survey. The same approach was used for all surveys at each time point. Only the questionnaire changed, with questions added or adapted between rounds.

### *Measures of variables*

Relevant variables were selected based on how likely they are to influence behaviour and vulnerability to the effects of COVID-19 and missing values were imputed using the mice R package. The included demographic and behavioural variables were age, gender, educational attainment, marital status, slum, perceived risk, knowledge of symptoms, what myths they believe, disease prevention measures taken, symptoms experienced, social and economic impacts, household size, government assistance received and fears around COVID-19. These variables were used to construct subgroups using unsupervised machine learning, a variable description and summary statistics are included as a supplementary table (**Supplementary Table 1**).

### *Data analysis*

The data were analysed using R version 4.1.2. To identify potentially relevant data-dependent subgroups, K-Means clustering was applied. This is an unsupervised, data-driven machine learning method of exploratory analysis often used to determine the number of 'clusters' that naturally exist within a high-dimensional space formed by a set of possible covariates. K-Means clustering was run, and three clusters were identified,

even with repeated attempts, suggesting distinct sub-groups. Silhouette plots (**Supplementary Figure 1**) were visualized to find the appropriate number of clusters, and cluster means of each variable were calculated and tabulated (**Supplementary Table 2**) to display the characteristic breakdown of each cluster.

To assess the value of the K-Means algorithm against more traditional methods, we ran likelihood ratio tests. The likelihood ratio test compared the fit of a model containing demographic covariates of interest alone versus a model with the addition of a cluster indicator. We conducted this analysis twice, once for the outcome of vaccine hesitancy (in 2021, prior to vaccine availability) and again for the outcome of vaccine uptake (in 2022, once the vaccine was widely available). For each of these outcomes of interest, p-values were calculated for each model containing a demographic covariate of interest when nested ( $H_0$ : outcome  $\sim$  intercept + covariate) and complex ( $H_1$ : outcome  $\sim$  intercept + covariate + cluster indicator), with significant p-values indicating that the model with the cluster indicator (complex model) is a better fit for the data. Overall, significant p-values for the likelihood ratio tests for each demographic covariate highlight that the cluster variable adds additional, unmeasured information about the sub-groups in the dataset versus the demographic covariate alone. Separate models were fit for age, education, marital status, household size, likely to know positive COVID-19 status, knowledge of COVID-19 symptoms, household gender-based violence risk, economic impacts (food insecurity and income loss) and respondent concerns around loss of income due to COVID-19.

After creating the clusters, we used the newly defined cluster variable to compare vaccine hesitancy and vaccine uptake across the three groups using regression forest analysis, an approach which uses non-parametric statistical estimation based on random forests, to estimate the conditional mean of the outcomes of interest. The best fit tree was found, and the results were visualized as forest plots using ggplot in R. P-values were calculated for three-way and pairwise comparisons of the clusters for vaccine acceptance and vaccine uptake using Wald tests.

#### *Patient and public involvement*

None.

#### **Results**

Participants had an average age of 36.5 years (standard deviation 11.3) with 59% of participants between ages 30-40, 28.7% of participants aged 18-29, and 12.4% of participants aged 50+, over half were female (62.8%), and over half were married (58.5%) (**Table 1**). In 2021, before the vaccine was widely available, most of the respondents (71.5%) said they would be willing to get a vaccine, and about this same

percentage had received the vaccine in 2022 once it was available (71.1%). However, this means over a quarter (29%) still had not received the vaccine at the time of the most recent survey.

Variable	Frequency (%)
Age (mean (SD))	36.5 (11.3)
Age in categories	
Age 18-29	576 (28.7)
Age 30-49	1,184 (59.0)
Age 50+	248 (12.4)
Female gender	1,258 (62.8)
Education	
Primary or less	866 (43.2)
Secondary	878 (43.9)
Higher	257 (12.8)
Marital status	
Married	1,170 (58.5)
Single	502 (25.1)
Divorced/separated	328 (16.4)
Vaccine acceptance (2021) <sup>a</sup>	799 (72.1)
Vaccine uptake (2022) <sup>b</sup>	797 (71.1)

<sup>a</sup>Question added in round 5 (N=1,108). <sup>b</sup>Question added in round 6 (N=1,121).

**Table 1. Cohort Demographics for Round 1 (N = 2,009) respondents from five informal settlements in Nairobi, Kenya April 2020**



Based on the results of the K-Means clustering, each of the three clusters that emerged define slightly different ‘types’ of people. Cluster 1 contained older, married individuals who knew less about common COVID-19 symptoms, were more likely to have believed common myths around COVID-19 and lived in the largest households. Members of this cluster also had the most concern about potential economic harms (fear of food shortages and loss of income) and had a higher perceived risk of COVID-19 early in the pandemic. Cluster 2 primarily consisted of less educated, married or divorced, middle-aged women who were the most economically impacted (eat less, loss of income, lack electricity, lack social support) at the beginning of the pandemic. These individuals were also the most likely of the three groups to report a perceived risk for gender-based violence from increased tensions at home due to the pandemic. Cluster 3 was the youngest group with higher educational attainment, who had a higher average knowledge of COVID-19 symptoms and expressed fewer fears around the economic impacts of lockdowns early in the pandemic. The mean values of each demographic variable per cluster is presented in **Supplementary Table 2**, and Clusters are described in **Supplementary Table 3**. The silhouette plots presented in **Supplementary Figure 1** highlight the three clusters selected that best capture the variation in the dataset.

We then ran the likelihood ratio tests to compare each variable to see if the fit was better with the variable alone (nested model) or with the addition of the cluster indicator (complex model). All of the likelihood ratio tests except for age were significant, revealing that when included in the model, the clusters defined using the K-Means algorithm are a better fit for the data than individual characteristics alone (**Table 2** presents for outcome of vaccine hesitancy in survey round 5 and **Table 3** for the outcome of vaccine uptake in round 6).

Outcome: vaccine acceptance (“How likely are you to take the COVID-19 vaccine if it were offered today?”)	
Covariate	Likelihood Ratio Test P-Value
Education	<0.0001
Marital Status	<0.0001
Age	0.111
Household Size	<0.0001
Concerned the pandemic will impact income	<0.0001

Likely to test if symptomatic, know if positive for COVID-19	<0.0001
Know at least 3 symptoms of COVID-19	<0.0001
Household Gender-Based Violence Risk	<0.0001
Eat less due to COVID-19	<0.0001
Loss of income experienced due to COVID-19	<0.0001

Table 2. Likelihood ratio test for vaccine hesitancy (Nairobi survey round 5; Feb 2021, prior to vaccine rollout in Kenya), where H0: outcome ~ intercept + covariate and H1: outcome ~ intercept + covariate + cluster indicator

Outcome: vaccine uptake ("Have you had at least one dose of the COVID-19 vaccine?")	
Covariate	Likelihood Ratio Test P-Value
Education	<0.0001
Marital status	<0.0001
Age	0.966
Household size	<0.0001
Concerned the pandemic will impact income	<0.0001
Likely to test if symptomatic, know if positive for COVID-19	<0.0001
Know at least 3 symptoms of COVID-19	<0.0001
Household gender-based violence risk	<0.0001
Eat less due to COVID-19	<0.0001
Loss of income experienced due to COVID-19	<0.0001

Table 3. Likelihood ratio test for vaccine uptake (Nairobi survey round 6, March 2022), where H0: outcome ~ intercept + covariate and H1: outcome ~ intercept + covariate + cluster indicator



After completing the likelihood ratio tests and concluding that the clusters offer more information than demographic variables alone, we used regression forest analysis to explore the association between cluster identification and the two vaccine related outcomes. For vaccine acceptance (2021), Cluster 3 was significantly less likely to say they would get the vaccine if it became available compared to Cluster 1 (41.5% vs 55.3%; p-value <0.01) and compared to Cluster 2 (41.5% vs 50.5%; p=0.014) (**Figure 1**). Once the vaccine became available and participants were asked about vaccine uptake in 2022, Cluster 1 was significantly more likely to have gotten at least one dose of the vaccine compared to Cluster 2 (78.0% vs 69.3%; p-value <0.01), and more likely than Cluster 3 (78.0% vs 66.4%, p-value <0.01) (**Figure 2**). Of the 29% (n=324) in round 6 who have not gotten the vaccine, about half are hesitant (48%) and about half say they are very likely to still get the vaccine (not shown).

## Discussion

Our findings suggest that survey respondents from across Nairobi informal settlements fall into three clusters or archetypes each with distinct characteristics that can provide insight into COVID-19 vaccine uptake. Kenya, and our sample specifically, achieved high vaccination coverage (almost three-quarters of respondents). This estimate is in line with a global study that suggested a maximum share of 70% of the total population could be vaccinated, without application of coercive policies or restrictions (36). Our exploratory analyses suggest the cluster indicator adds value to basic models describing characteristics associated with vaccine uptake, capturing unmeasured characteristics of participants that are associated with the outcome. The clusters may be useful to identify archetypes of individuals in informal settlements and suggest avenues to explore for communication with sub-groups that have different vulnerabilities and risks. Our results suggest some variation between the three groups of respondents in vaccine uptake, information that can be used to better target or improve messaging to increase awareness and adoption of healthy behaviour (37–42).

It is concerning to find that primarily younger, more highly educated individuals, with highest knowledge of COVID-19 transmission in Cluster 3 are least likely to have gotten the vaccine. They reported being less concerned with COVID-19 infection and the economic impacts, potentially indicating less urgency due to a lack of perceived risk, as initially risks to the elderly were highlighted. A recent study confirms this link, and that lack of perceived risk and low perceived disease severity were leading factors for not getting vaccinated (42). Relatedly, those in Cluster 3 were less likely to know someone who had tested positive for COVID-19 (17% vs 25% in Cluster 2 and 27% in Cluster 1)

reinforcing their lower perceived risk (**Supplementary Table 2**). It's also likely younger people might be exposed to different information through their higher use of social media. Public health messages tailored to youth (43) could highlight vaccine safety, as our participants' main concerns were about side effects or wanting to wait and see if it's safe. Studies in other settings show young people may be concerned about myths regarding vaccine side effects that affect fertility (44). Lastly, it would also be useful to ensure access to vaccines for young people, potentially expanding current outreach to include mobile clinics or other options instead of requiring a visit to a health facility. Nairobi is already employing strategies for vaccine outreach including providing vaccines at social gatherings such as churches or social functions, this may increase uptake.

Respondents from Cluster 1, mostly men, defined by large households and with less educational attainment, were found to have more economic anxieties due to the pandemic and less knowledge about COVID-19 symptoms but also were most likely to have gotten the vaccine. They were also the most likely to believe common myths around COVID-19 but have the highest perceived risk of infection. This may be because this cluster of individuals reported being more likely to need to travel for work (a factor in considering themselves at high risk of infection) (45). They also may hold jobs that require vaccination. Keeping employment by getting vaccinated may have been worth the risk, as this cluster also expressed economic concerns related to the pandemic and potentially were responsible for bringing in income to their large households. This is supported by a recent study that found older adults particularly with chronic illnesses had the highest vaccination rates, and that this group was responsive to messages to increase vaccination (46).

Individuals in Cluster 2, older women who were married or divorced, seem to carry the highest risk of economic hardship and gender-based violence due to the pandemic (37–41), so further investigation to not only vaccinate but also support this group is critical. Cluster 2 was comprised of older women, with higher risks of food insecurity and gender-based violence due to the pandemic (37–41). This group had a lower rate of vaccine uptake in relation to their willingness or interest in getting the vaccine expressed in February 2021. This could point to issues around accessibility of the vaccine, especially for women who may have more familial responsibilities and fewer financial and transportation resources. Government assistance and social support interventions may provide a solution, as well as outreach through churches and other venues, to reach women who are unable to travel to facilities and face other challenges in food and economic insecurity and potential violence risks.

By defining archetypes or groups in the population, we can better inform and target policy to improve the efficacy of public health and social support interventions. These clusters can also be used to inform future modelling and predictive analysis of the data by providing insight into what characteristics and behaviours define sub-groups of interest, particularly in a situation with a novel disease such as COVID-19 where a lot is unknown and where no prior information is available to inform messaging or policy. These are major strengths to this statistical approach as it is an efficient way to let the data guide the analysis without potential bias related to the analysts' preconceived beliefs about the population. Some limitations of this approach include possible changes to the clustering of the data when run multiple times due to the use of a random starting point and challenges in interpreting the data when clearly defined sub-groups are not present. Another limitation to note was the issue of social desirability bias that possibly arose during the phone interviews. Respondents may have felt compelled to provide socially acceptable responses rather than responses that reflect their true attitudes and beliefs, which may clarify some of the inconsistencies observed in vaccine acceptance and uptake. It is also important to note that the cohort of respondents are not truly representative of the underlying population but rather a subset that have a mobile phone and an adolescent household member that participated in recent survey rounds through AGI-K and NISITU. We conducted a small analysis (not shown) that found no significant differences by age or gender in attrition, but that over rounds wealthier participants were slightly less likely to respond, and that participants in Dandora and Kibera slums were slightly more likely to. It is also important to note that vaccine acceptance was recorded before the vaccine was available to the general public, and that there is a gap between the vaccine acceptance and uptake measures during which time perceptions may have shifted.

Overall, respondents in our sample of residents of five informal settlements in Nairobi had higher vaccination rates reported than Nairobi as a whole (nearly 75% compared to the 52% reported for the city (47)) as of March 2022. Of the unvaccinated participants, about half reported interest in receiving the vaccine. This suggests that with additional access and messaging almost all individuals can be vaccinated. We also found that most respondents had received more than one dose, although about one in ten had only received the first dose, suggesting additional outreach is needed to make sure everyone is fully vaccinated. As vaccine immunity wanes and new variants emerge, continued messaging and vaccination will be critical, but also uptake of other non-pharmaceutical interventions to prevent transmission (48,49). Studies to understand how to improve governance to increase vaccination and to determine optimal levels of vaccination, are important to inform policy (50–52). K-Means clustering may be a useful statistical tool when survey data are available to rapidly understand variation in the population and to highlight different potential approaches to messaging and outreach.

This paper summarizes our methodology and results to provide a starting point for more investigation into targeted vaccination strategies.

## Conclusion

Machine learning techniques, such as K-Means clustering, are useful investigate the factors that may predict behaviours related to disease prevention and mitigation. By letting the data guide the analysis and identifying naturally occurring sub-groups, we identified characteristics associated with vaccine hesitancy and vaccine uptake, useful for informing policies and messages to target different vulnerable groups within a population. Our results highlight that the highest risk individuals (Cluster 1) are most likely to get vaccinated, but that younger, more educated respondents (Cluster 3) may require additional messaging and persuasion. One group identified (Cluster 2) faced many different challenges and barriers, not only to vaccination but in economic security, food security, and risk of violence. This group may require not only more ways to access the vaccine, but also may require additional access to social support systems. Based on the results of this study, K-Means clustering may be a useful tool to explore to better identify and target vulnerable groups in public health policy at a national and global level. Though this study primarily focused on vaccine acceptance and uptake, these methods can be applied to a wide range of public health behaviours in future use.

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**Data availability statement:** Cleaned and deidentified dataset including questionnaire are publicly available on the Harvard Dataverse. Questionnaires and reports are publicly available, with the full deidentified data set available upon request. The Dataverse for this project can be found here:  
<https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi%3A10.7910%2FDVN%2FVO7SUO&version=&q=&fileTypeGroupFacet=&fileAccess=&fileSortField=date>

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## References

1. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. *Acta Biomedica*. 2020.
2. Corburn J, Vlahov D, Mberu B, Riley L, Caiaffa WT, Rashid SF, et al. Slum Health: Arresting COVID-19 and Improving Well-Being in Urban Informal Settlements. *Journal of Urban Health*. 2020;
3. Mukumbang FC, Ambe AN, Adebisi BO. Unspoken inequality: How COVID-19 has exacerbated existing vulnerabilities of asylum-seekers, refugees, and undocumented migrants in South Africa. *Int J Equity Health*. 2020;
4. Stanturf JA, Goodrick SL, Warren ML, Charnley S, Stegall CM. Social vulnerability and Ebola virus disease in rural Liberia. *PLoS One*. 2015;
5. Ahmed SAKS, Ajisola M, Azeem K, Bakibinga P, Chen YF, Choudhury NN, et al. Impact of the societal response to COVID-19 on access to healthcare for non-COVID-19 health issues in slum communities of Bangladesh, Kenya, Nigeria and Pakistan: results of pre-COVID and COVID-19 lockdown stakeholder engagements. *BMJ Glob Health*. 2020;
6. Shah H. COVID-19 recovery: science isn't enough to save us. *Gale Onefile Health and Medicine*. 2021 Mar 25;591(7851).
7. Rouw A, Wexler A, Kates J, Michaud J. Tracking Global COVID-19 Vaccine Equity. Kaiser Family Foundation. 2021 Jul 21;
8. Lazarus J v, Abdool Karim SS, van Selm L, Doran J, Batista C, ben Amor Y, et al. COVID-19 vaccine wastage in the midst of vaccine inequity: causes, types and practical steps . *BMJ Glob Health*. 2022;7(4).
9. Harman S, Erfani P, Goronga T, Hickel J, Morse M, Richardson ET. Global vaccine equity demands reparative justice — not charity . *BMJ Glob Health*. 2021 Jun 21;6(6).
10. Khosla R, Gurskin S. Equity without human rights: a false COVID-19 narrative? . *BMJ Glob Health*. 2021 Jul 15;6(7).
11. World Health Organization. WHO Coronavirus (COVID-19) Dashboard.
12. Kenya Ministry of Health. <https://www.kenyanews.go.ke/health-ministry-calls-on-kenyans-to-go-for-covid-19-jab/>. Health Ministry Calls On Kenyans To Go For Covid-19 Jab.
13. Adepoju P. Kenya Mandates COVID-19 Vaccines for Civil Servants as Africa's Vaccine Rollout Gathers Speed. *Health Policy Watch Independent Global Health Reporting*. 2021 Aug 13;



14. Wasike A. Kenyan teachers given 7 days to get COVID vaccine or face punishment. Andalou Agency. 2021 Aug 17;

15. Fick M. Kenya's Covid-19 vaccine mandate draws praise and criticism. Reuters. 2021 Nov 23;

16. Kenya: Vaccine Requirements Violate Rights. Human Rights Watch. 2021 Dec 13;

17. Ackah BBB, Woo M, Stallwood L, Fazal ZA, Okpani A, Ukah UV, et al. COVID-19 vaccine hesitancy in Africa: a scoping review. Vol. 7, Global Health Research and Policy. BioMed Central Ltd; 2022.

18. Sallam M, Al-Sanafi M, Sallam M. A Global Map of COVID-19 Vaccine Acceptance Rates per Country: An Updated Concise Narrative Review. Vol. 15, Journal of Multidisciplinary Healthcare. Dove Medical Press Ltd; 2022. p. 21–45.

19. Lazarus J V., Wyka K, White TM, Picchio CA, Rabin K, Ratzan SC, et al. Revisiting COVID-19 vaccine hesitancy around the world using data from 23 countries in 2021. Nat Commun. 2022 Jul 1;13(3801).

20. Ackah M, Ameyaw L, Gazali Salifu M, Afi Asubonteng DP, Osei Yeboah C, Narkotey Annor E, et al. COVID-19 vaccine acceptance among health care workers in Africa: A systematic review and meta-analysis. PLoS One. 2022 May 18;17(5).

21. Detoc M, Bruel S, Frappe P, Tardy B, Botelho-Nevers E, Gagneux-Brunon A. Intention to participate in a COVID-19 vaccine clinical trial and to get vaccinated against COVID-19 in France during the pandemic. Vaccine. 2020 Oct 21;38(45).

22. Orangi S, Pinchoff J, Mwanga D, Abuya D, Hamaluba M, Warimwe G, et al. Assessing the Level and Determinants of COVID-19 Vaccine Confidence in Kenya. Vaccines (Basel). 2021 Aug 23;9(8).

23. Awang Bono S, Faria de Moura Villela E, Sin Siau C, Sun Chen W, Pengpid S, Hasan MT, et al. Factors Affecting COVID-19 Vaccine Acceptance: An International Survey among Low- and Middle-Income Countries. Vaccines (Basel). 2021 May 17;9(5).

24. Caserotti M, Girardi P, Rubaltelli E, Tasso A, Lotto L, Gavaruzzi T. Associations of COVID-19 risk perception with vaccine hesitancy over time for Italian residents. Science Direct. 2021 Mar;272.

25. Ackah BBB, Woo M, Stallwood L, Fazal ZA, Okpani A, Ukah UV, et al. COVID-19 vaccine hesitancy in Africa: a scoping review. Glob Health Res Policy. 2021 Sep 3;7(21).

26. Osur J, Muinga E, Kuria S, Hussein S, Mugambi Ileri E. COVID-19 vaccine hesitancy: Vaccination intention and attitudes of community health volunteers in Kenya. Plos Global Public Health. 2022 Mar 16;

27. Nasimiyu C, Ngere I, Dawa J, Amoth P, Oluga O, Ngunu C, et al. Near-Complete SARS-CoV-2 Seroprevalence among Rural and Urban Kenyans despite Significant Vaccine Hesitancy and Refusal. Vaccines (Basel). 2023 Jan 1;11(1).

28. Lazarus J V., Wyka K, White TM, Picchio CA, Gostin LO, Larson HJ, et al. A survey of COVID-19 vaccine acceptance across 23 countries in 2022. Nat Med. 2023 Jan 9;29:377–375.

29. COVID 19 Vaccine Perceptions: A 15 country study. 2021 Mar.

30. Austrian K, Pinchoff J, Tidwell JB, White C, Abuya T, Kangwana B, et al. COVID-19 Related Knowledge, Attitudes, Practices and Needs of Households in Informal Settlements in Nairobi, Kenya. SSRN. 2020 Apr 14;

31. Hudson A, Montelpare WJ. Predictors of Vaccine Hesitancy: Implications for COVID-19 Public Health Messaging. *Int J Environ Res Public Health*. 2021 Jul 29;
32. Abbasi J. Widespread Misinformation About Infertility Continues to Create COVID-19 Vaccine Hesitancy. *JAMA Medical News & Perspectives*. 2022 Feb 22;
33. Ainslie D, Ogwuru C, Sinclair R. Coronavirus and vaccine hesitancy, Great Britain: 9 August 2021. 2021 Aug.
34. Blandi L, Sabbatucci M, Dallagiacoma G, Alberti F, Bertuccio P, Odone A. Digital Information Approach through Social Media among Gen Z and Millennials: The Global Scenario during the COVID-19 Pandemic. *Vaccines (Basel)*. 2022 Nov 1;10(11).
35. Ahlqvist E, Storm P, Käräjämäki A, Martinell M, Dorkhan M, Carlsson A, et al. Novel subgroups of adult-onset diabetes and their association with outcomes: a data-driven cluster analysis of six variables. *Lancet Diabetes Endocrinol*. 2018;
36. Coccia M. Improving preparedness for next pandemics: Max level of COVID-19 vaccinations without social impositions to design effective health policy and avoid flawed democracies. *Environ Res*. 2022 Oct 1;213.
37. Wenham C, Smith J, Morgan R. COVID-19: the gendered impacts of the outbreak. *The Lancet*. 2020.
38. John N, Casey SE, Carino G, McGovern T. Lessons Never Learned: Crisis and gender-based violence. *Dev World Bioeth*. 2020;
39. Gould C. Gender-Based Violence During Lockdown - Looking for Answers [analysis]. Market Watch [Internet]. Available from: <https://www.marketwatch.com/press-release/gender-based-violence-during-lockdown---looking-for-answers-analysis-2020-05-12>
40. Azcona G, Bhatt A, Ndugwa Robert. COVID-19 exposes the harsh realities of gender inequality in slums. [Internet]. Available from: <https://data.unwomen.org/features/covid-19-exposes-harsh-realities-gender-inequality-slums>
41. Pinchoff J, Austrian K, Rajshekhar N, Abuya T, Kangwana B, Ochako R, et al. Gendered economic, social and health effects of the COVID-19 pandemic and mitigation policies in Kenya: Evidence from a prospective cohort survey in Nairobi informal settlements. *BMJ Open*. 2021 Mar 3;11(3).
42. Davis TP, Yimam AK, Kalam MA, Tolossa AD, Kanwagi R, Bauler S, et al. Behavioural Determinants of COVID-19-Vaccine Acceptance in Rural Areas of Six Lower-and Middle-Income Countries. *Vaccines (Basel)*. 2022 Feb 1;10(2).
43. Limaye RJ, Balgobin K, Michel A, Schulz G, Erchick DJ. What message appeal and messenger are most persuasive for COVID-19 vaccine uptake: Results from a 5-country survey in India, Indonesia, Kenya, Nigeria, and Ukraine. *PLoS One*. 2022 Sep 1;17(9 September).
44. Diaz P, Reddy P, Ramasahayam R, Kuchakulla M, Ramasamy R. COVID-19 vaccine hesitancy linked to increased internet search queries for side effects on fertility potential in the initial rollout phase following Emergency Use Authorization. *Andrologia*. 2021 Oct 1;53(9).
45. Pinchoff J, Kraus-Perrotta C, Austrian K, Tidwell JB, Abuya T, Mwanga D, et al. Mobility Patterns During COVID-19 Travel Restrictions in Nairobi Urban Informal Settlements: Who Is Leaving Home and Why. *Journal of Urban Health*. 2021 Apr 1;98(2):211–21.



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46. Yego J, Korom R, Eriksson E, Njavika S, Sane O, Kanorio P, et al. A Comparison of Strategies to Improve Uptake of COVID-19 Vaccine among High-Risk Adults in Nairobi, Kenya in 2022. *Vaccines* (Basel). 2023 Feb 1;11(2).

47. Report of the OAG, as at 31 March, 2022, of Covid-19 Vaccine Roll Out for Nairobi City.

48. Coccia M. Sources, diffusion and prediction in COVID-19 pandemic: lessons learned to face next health emergency. *AIMS Public Health*. 2023;10(1):145–68.

49. Dobрева Z, Gimma A, Rohan H, Djoudalbaye B, Tshangela A, Jarvis CI, et al. Characterising social contacts under COVID-19 control measures in Africa. *BMC Med*. 2022 Dec 1;20(1).

50. Coccia M. COVID-19 Vaccination is not a Sufficient Public Policy to face Crisis Management of next Pandemic Threats. *Public Organization Review*. 2022;

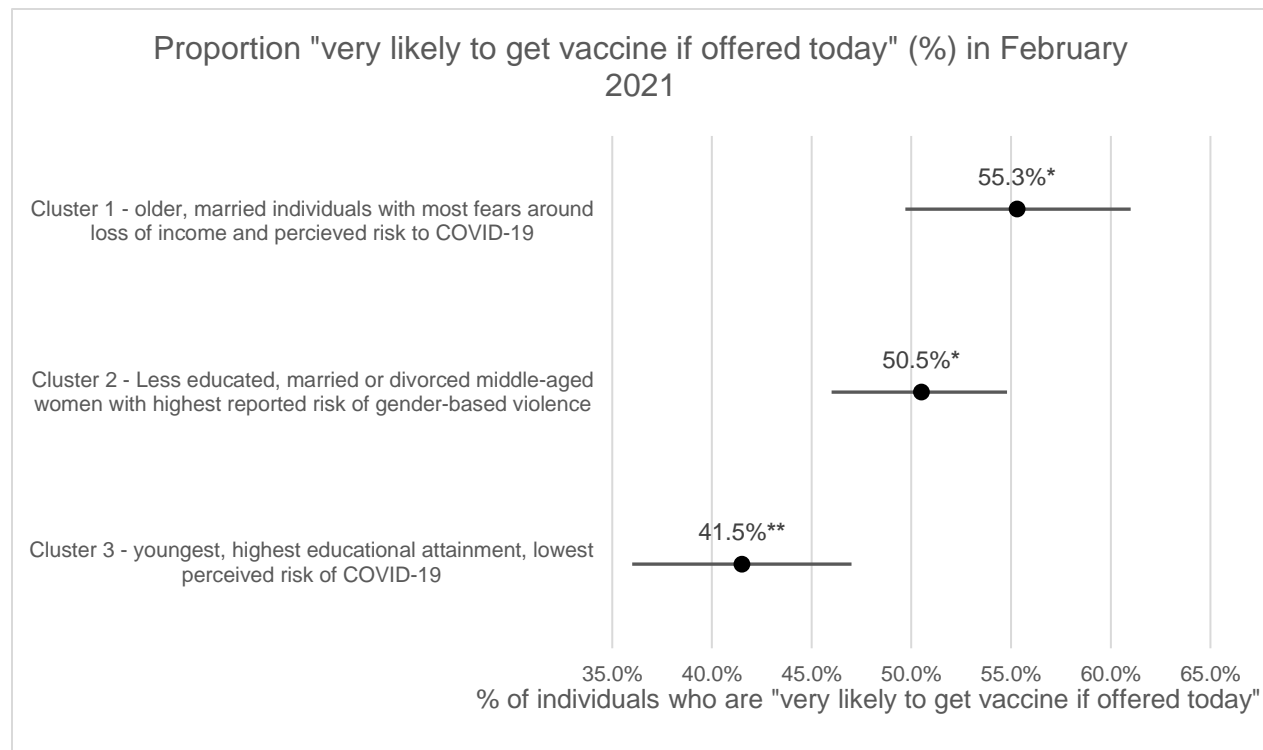
51. Coccia M. Optimal levels of vaccination to reduce COVID-19 infected individuals and deaths: A global analysis. *Environ Res*. 2022 Mar 1;204.

52. Benati I, Coccia M. Global analysis of timely COVID-19 vaccinations: improving governance to reinforce response policies for pandemic crises. *International Journal of Health Governance*. 2022 May 31;27(3).

**FIGURE TITLES**

**Figure 1. Regression forest analysis plot of vaccine acceptance by cluster, Nairobi, Kenya February 2021 (N=1,117)**

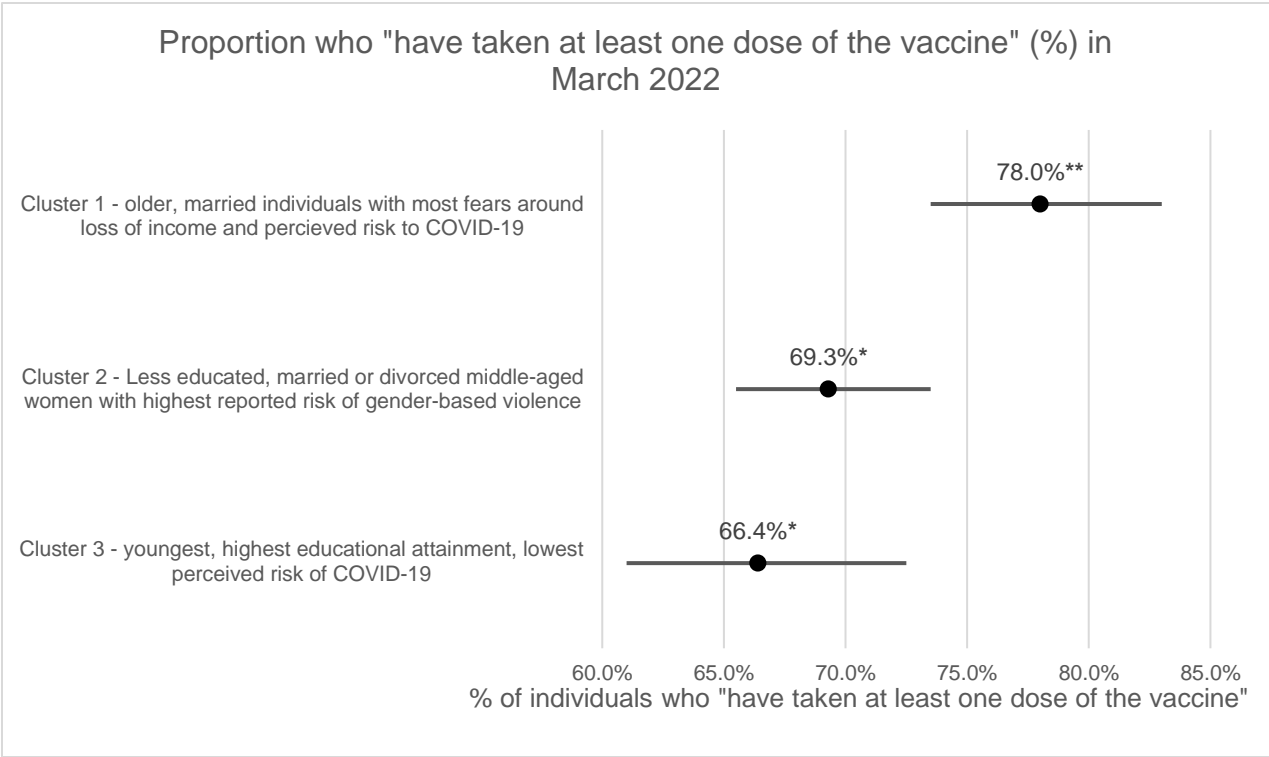
**Figure 2. Regression forest analysis plot of vaccine uptake by cluster, Nairobi, Kenya March 2022 (N=1,121)**



**\*\*Cluster 3 is significantly lower than Cluster 1 and Cluster 2 ( $p < 0.01$  and  $p = 0.014$  respectively)**

**\*Cluster 1 and 2 are significantly different than Cluster 3, but not each other**

**Figure 1: Regression forest analysis plot of vaccine acceptance by cluster, Nairobi, Kenya February 2021 (N=1,117)**

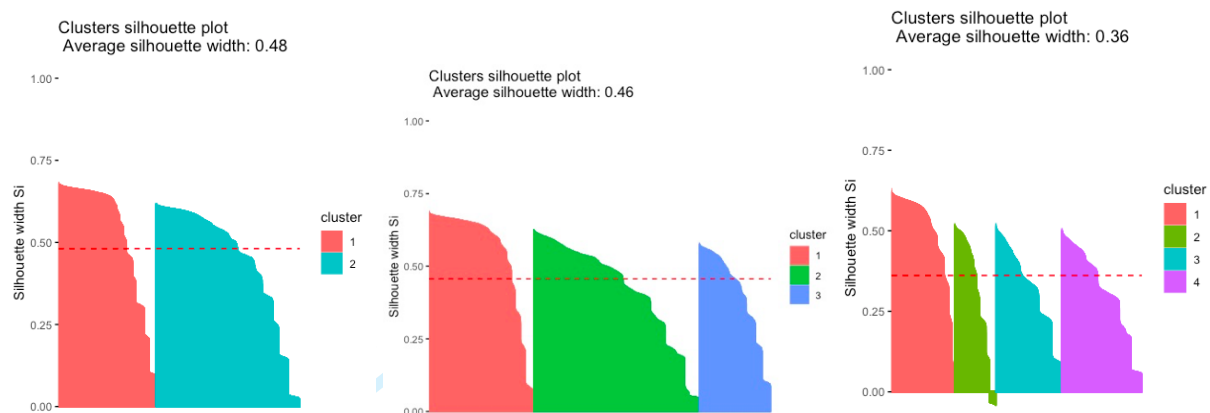


**\*\*Cluster 1 is significantly higher than Cluster 2 and Cluster 3 ( $p < 0.01$  for both)**

**\*Cluster 2 and 3 are significantly different than Cluster 1, but not each other**

**Figure 2: Regression forest analysis plot of vaccine uptake by cluster, Nairobi, Kenya March 2022 (N=1,121).**

## Supplementary Figure 1: Silhouette plot used to determine the best fit of clusters for K-Means algorithm



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			<p>duruufo nololeed oo dadku badan yahay / Musqulaha la wadaago</p> <p>j. Handle cash Waxaan qabte lacag caadan ah 0 1</p> <p>k. Am sick/have a health condition Waan xanuunsanahay / Waxaan qaba xaalad caafimaad 0 1</p> <p>l. Someone in my household is high risk (for any reason) Qof ka mid qoyskeyga ayaa halis ku sugan (sababi ahadaba) 0 1</p> <p>m. Live in or near a hotspot/place with many confirmed cases Waxaan ku noolahay/ u dhowahay meelaha qatarita ah / mise meelaha ugu badan maralada la xaqiijiyaay 0 1</p> <p>n. My kids are back in school Carurteyda waxay ku labtan skuulka 0 1</p> <p>o. I have gone back to work Waxaan ku labte shaqo 0 1</p> <p>p. Other (specify) Kuwa ( sheg) 0 1</p>	
204	8	<p>Do you know anyone in your family, neighborhood or workplace who has been infected with the Coronavirus? Your answer is confidential and no action will be taken based on your answer. Would you say: Adhiga maginayso qof (qoyskiisa, darsiga ama mesha shaqada) uu ku dacey corona virus? Jawaabtaada waa sir ah oo ficlaha kuma salaysnaan doona jawaabtaada. Miyaad dihi lahed:</p> <p>Read answer options aloud Kor u akhri jawabaha</p>	<p>a. Yes, I know someone who tested positive Haa, waxan garanaya qof laga helay cudurka corona virus 1</p> <p>b. Yes, I know someone who is suspected of being positive but hasn't gone for a test Haa, waxan garanaya qof looga shakiisan yahay corona virus lahin aan iska caabinin 2</p> <p>c. No, I don't know anyone Maysa, Cofna garan maayo 3</p>	302
501	9	<p>Who had Coronavirus? Yaa qaaba corona virus?</p>	<p>a. Me Aniga 0 1</p> <p>b. Someone in my family Qof la miid qarabadeyda 0 1</p> <p>c. Someone in a friend's family Qof ka miid ah qarabada saxibadey 0 1</p> <p>d. Someone in my neighborhood/community Qof ka miid ah daarsikeyga / bulshadeyda 0 1</p> <p>e. My friend Saxibkey 0 1</p> <p>f. Co worker Qof aan isla shaqayno 0 1</p> <p>g. Someone at my child's school Qof kujira skuulka curugeyga 0 1</p> <p>h. Someone else Qof kale 0 1</p> <p>i. Refuse Wan diidhe inaan ka jawabo 0 1</p>	
302	10	<p>Now I want you to imagine that people suspected that you were infected with Coronavirus, or that you have tested positive for Coronavirus. How do you think that people in your family and neighborhood would treat you. For each statement tell me if you think it's true or false. Hada waxaan rabaa inaad qiyaasid inn dadku say kaga shakiisan yahii innu kugu dhacay corona virus ama laga helay corona virus. Sideed u malaynayso in dada qoyskaaga ama darsigaaga ay kuula dhaqmayaan. Qoraal kasta ii sheg hadii aad u malaynayso inay run tahay ama been.</p>	<p>a. People would stop talking to me Dadka waxay iska reeban inay ila hadlan 0 1</p> <p>b. People would gossip about me Dadku way ilga shekaynan 0 1</p> <p>c. People I know would bring me food I need Dad aan garanayo ayaa ii keena cuntada aan uu bahanay 0 1</p> <p>d. People I know would bring me the medicines I need Dad aan garanayo ayaa ii keena dawada aan uu bahanay 0 1</p> <p>e. People in the community would treat my family badly Dadka bulshada dhexdhexda ayaa si xun ulaa dhaqma qarabadheyda 0 1</p> <p>f. After I have recovered from Corona virus, people in the community would still avoid me Kadib marka aan corona virus ka bogsodday, dadka bulshada dhexdhexda ayaa weli iiga fogaanay 0 1</p> <p>g. After I have recovered from Coronavirus, I would not be welcome back into my house by family 0 1</p> <p>h. After I have recovered from Coronavirus, I would not be welcome back at my place of work Kadib marka aan ka bogsodday corona virus weli liima o'goda inaan taago mesha shaqada 0 1</p> <p>i. After I have recovered from Coronavirus I would still not be welcome back to my place of worship Kadib marka aan ka bogsodday corona virus weli liima o'goda inaan ku dhukado masjidka 0 1</p> <p>j. After I have recovered from Coronavirus my child would not be welcomed back to school Kadib marka aan ka bogsodday corona virus curugeyga weli liima o'goda inn u ku labto skuulka 0 1</p>	
502	11	<p>How true are the following sentences describing the people in your community? Side ay run u yihiin qoralka soo socda ee sharxaya dadka ka tirsan bulshadada?</p> <p>People in my community are taking steps to protect themselves and others from coronavirus (COVID-19). Would you say: Very true, somewhat true, not very true, not true at all. Dadkanool bulshadeyda aya qaadaya talaabooyin ay iskaga ilaalinayaan niftooda iyo kuwa kale corona virus ka (COVID-19). Miyaad dihi lahayd: Ruun ma ahan dhamaan, Waxay run , Aad run ma ahan , Ruun ma ahan dhamaan</p>	<p>a. Very true Aad ba run utahay 1</p> <p>b. Somewhat true Waxay run 2</p> <p>c. Not very true Aad run ma ahan 3</p> <p>d. Not true at all Ruun ma ahan dhamaan 4</p>	
503	12	<p>People in my community are angry about the social distancing measures put in place due to coronavirus (COVID-19). Would you say very true, somewhat true, not very true or not true at all. Dadka ku nool bulshadeyda waxay ka xanaqan wax ku sabasan tilmamaha ee kala fogashada ee corona virus ka awoode ( COVID-19). Miyaad dihi lahayd: Ruun ma ahan dhamaan, Waxay run , Aad run ma ahan , Ruun ma ahan dhamaan</p>	<p>a. Very true Aad ba run utahay 1</p> <p>b. Somewhat true Waxay run 2</p> <p>c. Not very true Aad run ma ahan 3</p> <p>d. Not true at all Ruun ma ahan dhamaan 4</p>	
504	13	<p>People in my community work together to prevent and fight the coronavirus (COVID-19). Would you say: Very true, somewhat true, not very true, not true at all. Dadka ku nool bulshadeyda waa isla shaqayn si ay ugu hortaga oo ula dagaalaa corona virus ka ( COVID-19). Miyaad dihi lahayd: Ruun ma ahan dhamaan, Waxay run , Aad run ma ahan , Ruun ma ahan dhamaan.</p>	<p>a. Very true Aad ba run utahay 1</p> <p>b. Somewhat true Waxay run 2</p> <p>c. Not very true Aad run ma ahan 3</p> <p>d. Not true at all Ruun ma ahan dhamaan 4</p>	
505	14	<p>Would you say that the current government guidance/regulation on COVID-19 are very easy to follow, somewhat easy to follow, somewhat difficult to follow or very difficult to follow? Miyaad dihi lahayd tilmamaha / sharciya dowlada ee COVID-19 Aad ba u fudud yihiin inn la raaco, waxay ay fudud yihiin inn la raaco, waxay ay adag yihiin inn la raaco, Aad ba u adag yihiin inn la raaco.</p>	<p>a. Very easy to follow Aad ba u fudud yihiin inn la raaco 1</p> <p>b. Somewhat easy to follow waxay ay fudud yihiin inn la raaco 2</p> <p>c. Somewhat difficult to follow waxay ay adag yihiin inn la raaco 3</p> <p>d. Very difficult to follow Aad ba u adag yihiin inn la raaco. 4</p>	
506	15	<p>Now I want to ask you a few questions about a Coronavirus vaccine. As you may know, several vaccines that protect you from Coronavirus have been developed and approved, although they are not yet in Kenya. When the vaccine becomes available here, how likely is it that you would get the vaccine. Would you say very likely, somewhat likely, very unlikely. Hada waxaan raba inaan ku weydio su'aalo yar oo ku saabsan tallaalka corona virus ka. Sideed ogahay waxa soo isare oo la oggolaaday dhowr tallal oo ka dhacaya corona virus ka, Lakin weli so ma gaarin Kenya. Sidee u badan tahay inaad heli karto tallaalka. Miyaad dihi lahayd aad ba u badan tahay, waxay ay badan tahay, waxay ma badno, aad uma badno</p>	<p>a. Very likely aad ba u badan tahay 1</p> <p>b. Somewhat likely waxay ay badan tahay 2</p> <p>c. Somewhat unlikely waxay ma badno 3</p> <p>d. Very unlikely aad uma badno 4</p> <p>e. Don't know Maagi 5</p>	
507	16	<p>If the Coronavirus vaccine would be available for free, how likely is it that you would get it. Would you say very likely, somewhat likely, somewhat unlikely or very unlikely? Hadii talaalka corona virus ka uu bilaash ahan lahay, sidee u badan tahay inaad heli karto. Miyaad dihi lahayd aad ba u badan tahay, waxay ay badan tahay, waxay ma badno, aad uma badno</p>	<p>a. Very likely aad ba u badan tahay 1</p> <p>b. Somewhat likely waxay ay badan tahay 2</p> <p>c. Somewhat unlikely waxay ma badno 3</p> <p>d. Very unlikely aad uma badno 4</p> <p>e. Don't know Maagi 5</p>	
508	17	<p>Which are some of the reasons that may keep you from getting the vaccine Maxay yihiin sababaha qaarkood ee ka rebaya inaan qaadatid tallaalka.</p> <p>Read all answer options aloud Kor u akhri dhamaan jawabaha</p>	<p>a. I do not trust the vaccine Ma aaminsani tallaalka 0 1</p> <p>b. I worry about the side effects Waxan ka walwalsanahay dhibaatooyinka ka ii maadhi doona 0 1</p> <p>c. I will not be able to afford it Ma awoodi inaan iibasado 0 1</p> <p>d. I am not worried that I will get infected with Coronavirus Kama walwalsanay inn ugu dhici corona vir 0 1</p> <p>e. I do not think the vaccine will be effective Uma maleynayo in tallaalka waxay yeelan doono 0 1</p> <p>f. I am too busy to get vaccinated Aad ba uga mashquuli inaan qaato tallaalka 0 1</p> <p>g. I am afraid that I will get infected with Coronavirus if I get vaccinated Waan baqay inn corona virus 0 1</p> <p>h. It will be hard for me to access the place where I can get vaccinated Waa igu adagtahay inaan h 0 1</p> <p>i. Other (specify) Kuwa kale (sheg) 0 1</p> <p>j. I am scared of needles / jabs Waan ka baqaa ciribadaha / baritanka 0 1</p> <p>k. For religious and cultural reasons Sabab dinta iyo dhaganka awoode 0 1</p>	
509	18	<p>If the vaccine was available for free here in Kenya, how likely is it that you would take your kids to get the vaccine that protects them from getting Coronavirus. Would you say very likely, somewhat likely, somewhat unlikely, or very unlikely? Hadii talaalka uu bilaash ahan lahay halan Kenya, sidee u badan tahay inaad qaniqatid naa'id ii a'u u halan tallaalka ee ka dhacaya corona virus ka. Miyaad</p>	<p>a. Very likely aad ba u badan tahay 1</p> <p>b. Somewhat likely waxay ay badan tahay 2</p>	

		<p>adhaa lahayd hadda u badan tahay, wayyar ay badan tahay, wayyar ma badno, aad uma badno</p>	<p>c. Somewhat unlikely wayyar ma badno</p> <p>d. Very unlikely aad uma badno</p> <p>e. Don't know Maagi</p> <p>f. I do not have any children Malahi wax carur ah</p>	<p>3</p> <p>4</p> <p>5</p>		
510	19	<p>If the vaccine were not available for free, how much would you be willing to pay in total? Remember that you will need two shots about one month apart - Hadi tallaalka an lagu heli karin blaash, immisa guud ahan diyaar utahay inaad bixiso? Xasunow waxad u bahantahay labo cirobadood hal bil guudahad.</p> <p>Note: If not willing to pay mark zero Ogow: Hadi ay rabin inay bixiyaan waxa u qoray eber</p>	<p>KES <input type="text"/></p> <p>Don't know Maagi</p> <p>slidehe inaan ka jawabo</p> <p>88999</p> <p>88888</p>	<p>[Range: 0-20000]</p>		
511	20	<p>Which of the following statements best describes you: I used to follow COVID-19 prevention guidelines (i.e. washing hands, social distancing, wearing a mask when around others, avoiding gatherings, etc.) and I still do, I used to follow guidelines but now I don't as much, I didn't used to follow guidelines but now I do, or I never used to follow guidelines that much and I still don't. Qoraalada soo socda kuwe adhiga aad ku tilmaama. Waxaan raace jiray sharciyada ee ka hortaga COVID-19 ( Tusaale ahan: gacma dhaqashada, kala foogashada, xirashada afka iyo sanka marka aan la jooga dadka kale, inaan taagin meelaha layskugu imaana, iyo kuwa kale) welina waan sameysa, waan raace jiray sharciyada lakin hada inta badan ma raaci, Ma raace jirin sharciyada lakin hada waan raaca ama weligey ma raacin sharciyada inta badan oo hadana ma raaca</p>	<p>I used to follow guidelines and I still do Waxaan raace jiray sharciyada welina waan sameysa</p> <p>I used to follow guidelines and now I don't as much waan raace jiray sharciyada lakin hada inta bac</p> <p>I never followed guidelines that much and now I do Ma raace jirin sharciyada lakin hada waan raaca</p> <p>I never used to follow guidelines that much and I still don't weligey ma raacin sharciyada inta badan oo I</p> <p>Don't know Maagi</p>	<p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p>		
211	21	<p>Do most public areas in the area where you live - markets, public toilets, etc. - have hand washing stations available with water and soap? Ma qaban inta badan gobaha dadweynaha ee ku yaal meesha aad ku nooshahay -Suqyada, Makhaayadaha, Dukamada, Musqulaha dadweynaha iyo kuwa kale meel gacma dhaq oo leh biyo iyo sabuun.</p>	<p>a. No Maya</p> <p>b. Yes Haa</p> <p>c. Don't know Maagi</p>	<p>0</p> <p>1</p> <p>2</p>		
304	22	<p>Do you have a designated place in your house to wash hands? Majirta gurigayga meel gooni ah oo lagu dhaqdo gacmaha</p>	<p>No Maya</p> <p>Yes Haa</p>	<p>1</p> <p>2</p>	212	
305	23	<p>Do you currently have water available at the handwashing place in your home? Hada ma qabta biyo meesha lagu dhaqdo gacmaha gurigaaga</p>	<p>No Maya</p> <p>Yes Haa</p>	<p>1</p> <p>2</p>		
306	24	<p>Do you currently have soap available at the handwashing place in your home? Hada majirta sabuun meesha lagu dhaqdo gacmaha gurigaaga</p>	<p>No Maya</p> <p>Yes Haa</p>	<p>1</p> <p>2</p>		
212	25	<p>In the past one week, have you worn a face mask? Isuubuci la soo dhaafay, ma xiratay maaska</p>	<p>a. No Maya</p> <p>b. Yes Haa</p>	<p>0</p> <p>1</p>	215	
213	26	<p>When you are outside of your house, did you wear the facemask covering your nose and your mouth, always, sometimes, or rarely? Marka aad joogta bananka guunkaaga, Mayaad ku xirta maaska la sanka iyo afka, markasta, waqti qaar, ama mar mar?</p>	<p>a. Always markasta</p> <p>b. Most of the time Inta badan</p> <p>c. Sometimes waqti qaar,</p> <p>d. Rarely mar mar</p>	<p>1</p> <p>2</p> <p>3</p> <p>3</p>	512	
215	27	<p>What keeps you from wearing a face mask all the time? Maxaa ka celinayo inaad xirato maaska waqti kasta?</p> <p>Do not read answer aloud Ha u ahkhiin jawabaha kor</p> <p>Probe - anything else? Weydii: Maxa kale</p>	<p>a. I don't have one because I cannot afford it Mid ma lihi maxaa yeelay ma awoodi</p> <p>b. I don't have one because I don't know how to get one/can't find one Mid ma lihi maxaa yee</p> <p>c. I don't think they work Ma u maleynayo inaad wax taaro</p> <p>d. They are uncomfortable Waxa wayo raaxo la'aan</p> <p>e. I'm not allowed to wear one Maynsan ogolayn inuu mid xirto</p> <p>g. I don't leave the house Ka ma baxo gurigaa</p> <p>h. It interferes with religious practice/dress Waxaay faara gaalini dhaqanka diinta / Libiska</p> <p>f. Other Kuwa kale</p>	<p>0</p> <p>1</p> <p>0</p> <p>1</p> <p>0</p> <p>1</p> <p>0</p> <p>1</p> <p>0</p> <p>1</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	
512	28	<p>Compared to the first few months of Coronavirus, would you say that you wear a mask covering your nose and mouth more, less, or about the same?Marka la barbar dhigo bilaha ugu horraya ee corona virus ka, Ma dhihi lahayd waxaad xiraneysay maaska inn badan, inn yar ama mid la mid ah</p>	<p>a. More inn badan</p> <p>b. Less inn yar</p> <p>c. About the same Mid la mid ah</p>	<p>1</p> <p>2</p> <p>3</p>		
WAJ 2	29	<p>Have you been tested for Coronavirus (Please note - this is not the temperature test)? Ma lagaa baray corona virus? (Fadlan ogow - tan ma ahan baritanka heerkuuka</p>	<p>No Maya</p> <p>Yes Haa</p>	<p>0</p> <p>1</p>		
FOOD SECURITY/ASSISTANCE						
216	30	<p>In the past seven days have you/your household eaten less or skipped meals because you did not have enough money or food? Todobaadka la soo dhaafay miyaad adhiga / qoyskaaga cuntin cuuno yar ama maba cuunin sababto ah ma haysid lacag kugu filaan ama cuuno</p>	<p>No Maya</p> <p>Yes Haa</p>	<p>0</p> <p>1</p>	220	
318	31	<p>How frequently are you skipping meals or eating less. Would you say every day, a couple times a week or once a week? Sidhe si joogto ah aad cuuno uu cuunin ama uu cunto cuuno yar. Miyaad dhihi lahad maalin kasta, marka qaar isbuuci ama hal mar isbuuci?</p>	<p>a. Every day Maalin kasta</p> <p>b. A couple times a week Marka qaar isbuuci,</p> <p>c. Once a week Hal mar isbuuci</p>	<p>1</p> <p>2</p> <p>3</p>		
217	32	<p>Was eating less/skipping meals related to the situation with Coronavirus? Waxaan cunay cuuno yar / maba helin cuuno ee xaaladaha la xirta corona virus</p>	<p>No Maya</p> <p>Yes Haa</p>	<p>0</p> <p>1</p>		
220	33	<p>In the past seven days have you received any cash, vouchers, food, soap/sanitizer or other goods because of Corona virus. Your response will not increase or decrease your chances of getting any of these items, so please answer as honestly as you can. Would you say, Todobaadka la soo dhaafay ma heshay wax lacag caadan ah, fojarada, saabuun/ waxa lagu naadifado gacmaha ama alaabada kale corona virus dertis, jawabahaagu ma kordhinayo ama ma yareeyso fursadahaaga aad ku heli karto wayabahaan.Miyaad dhihi lahayd.</p> <p>Read all options out loud</p>	<p>a. No assistance received Majiro wax caawimaad aan heli</p> <p>b. Yes, received assistance due to Coronavirus Haa, waxaan heli caawimaad corona virus dertis</p> <p>c. Yes, received assistance due to another reason Haa, waxaan heli caawimaad sabab kale dertis</p> <p>d. Yes, received assistance but do not know the reason for it Haa, waxaan heli caawimaad laakin magaraano sababta</p>	<p>0</p> <p>1</p> <p>2</p> <p>3</p>	225	
221	34	<p>Where did you get the assistance from? Xagee ka heshay caawimada</p> <p>Read all answer categories aloud kor uu aqri jawabaha</p>	<p>a. Government; Dowlada</p> <p>b. NGO; Hayada</p> <p>c. Church/mosque; qanizada / Masajidka</p> <p>d. Good samaritan/Philanthropist/ Corporate Sponsorship; Deeq-bixiye wanagsan/ Kafaalasho shirkadeed</p> <p>e. Family/relatives; Qoyska / qarabada</p> <p>f. Other: Kuwa kale</p>	<p>0</p> <p>1</p> <p>0</p> <p>1</p> <p>0</p> <p>1</p> <p>0</p> <p>1</p>		
222	35	<p>What have you received? Maxaad heshay</p> <p>Ask all answer categories aloud weydii su'alaha dhamaan kor</p>	<p>a. Cash/Money Lacag caadan ah</p> <p>b. Food Cuuno</p> <p>c. Water Biyo</p> <p>d. Soap/hand sanitizer Saabuun/ wayabaha gacmaha lagu naadifado</p> <p>e. Medicine Daawo</p> <p>f. Other Kuwa kale</p>	<p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>9</p>		



225	36	What is the one biggest need that you have at this time that is not being addressed? Waa maxay baxshida ugu weyn ee ku haysato hada oo aan wax laga qabanin	a. Food Cuuno 1 b. Cash Lacag caadana ah 2 c. Shelter Hoya 3 d. Water Biyo 4 e. Soap/hand sanitizer Sabuun/waxyabaha gacmaha lagu dhaqda 5 f. Medical care/medicine Daryeel caafimaad / dawada 6 g. Sanitary Towels Shukumaan nafaqada 7 h. Other Kuwa kale 77	
WAJ 3	7	37 Have you visited a health facility in the past three months? Ma booqday xarunta caafimaadka sedaxda bilood ee la soo dhaafay	No Maya 0 Yes Haa 1	226
WAJ 4	8	38 I'm going to ask you some questions about your experience at the health facility. For each one tell me if it was true or false. Waxaan ku weydin doonaa su'aalo qaar oo ku saabsan khibradaada ee xarunta caafimaadka. Mid kasta waxaad ii sheegita inay tahay ruun ama been	FALSE TRUE a. I was satisfied with my visit to the health facility Waan ku qancay booqashada xarunta caafimaadka 0 1 b. I received the medical attention that I was seeking Waxaan helay daryeel caafimaad oo aan raadinayay 0 1 c. There was a hand washing station with soap and water at the health facility Meesha gacmaha lagu dhaqda ayaa ku tala xarunta caafimaadka 0 1 d. Health care providers were wearing masks Bixiyaasha daryeelka caafimaadka waxay ximaayen maaska 0 1 e. The service/commodity that I went for was not available Adeega / badeecada aan u tegay lama helin 0 1 f. I was not able to receive services because of the health workers strike Ma awoodin inaan helo 0 1	
EFFECTS OF COVID-19 MITIGATION MEASURES				
226	39	I want to ask a few more questions about how the Coronavirus pandemic, and the responses of the government and others to try prevent the spread of Coronavirus, may have affected you. Your responses will not have an effect on anything you may receive, so please answer as honestly as possible. In the past two weeks, have you experienced any of the following as compared to before the Coronavirus started? Waxaan rabaa inaan kuweydiiyo su'aalo kale oo dheeri ah oo ku saabsan sida cudurka ee masibada corona virus iyo ka hortaga aay dowlada iyo kuwa kale uu daadhiyay si uu kuugu faafin corona virus. Jawabahaagu ma ku leh saameen wax aad heli lahad, marka fadlan igu Jawaab sida ugu macluusaan adhigo daacad ah. Labada isbuuc ee la soo dhaafay, miyaad la kulantay mid ka mid ah waxyabahan soo socda marka la barbar dhigo ka hor intaan corona virus bilaabin?	NO YES a. See my family less Waxaan arka qoyskeyga in yar 0 1 b. See my friends less Waxaan arka asxaabtayda in yar 0 1 c. Avoid public transport Waxaan iskallaa gaadidka dadweynaha 0 1 d. Complete loss of job/income Gebi ahan waxaan waaye shaqa / daqalaha 0 1 e. Partial loss of job/income Waxaan waaye qeyb ka mid shaqada/daqalaha 0 1 f. Increased expenses for the household Waxaa korday qarashka qoyska 0 1 g. More time spent cooking for the household Waxaan ku qaata waqti dheeri ah ee karinta 0 1 h. More time spent cleaning the house Waxaan ku qaata waqti dheeri ah ee naadafinta guriga 0 1 i. More time spent taking care of children Waxaan ku qaata waqti dheeri ah ee daryeelka carurta 0 1 j. More time spent taking care of livestock/farming Waxaan ku qaata waqti dheeri ah ee daryeelka xoolaha/ miyiga 0 1 k. More time fetching water Waxaan ku qaata waqti badan biyo dhamiis 0 1 l. More tensions in the household Waxaa jira xiisadaa badan qoyska 0 1 m. More arguing in the household Dood badan reerka 0 1 n. Increase of crime in your neighborhood Waxaa korday dembika ee dariska 0 1 o. Experienced more violence outside the house? Khibrad dheeraad ah kala kulmeysa banaanka guriga 0 1 p. More fear that your partner will harm you Waxaan ka cabsi qaba in lammaanaagu waxyelo uu geysto 0 1 q. Experienced more violence inside the household? Khibrad dheeraad ah aan kala kulma guriga dhexiisa 0 1 r. Not accessing health care/services/medicines that you would have otherwise needed Ma heli karo daryeel caafimaad/ adeego / dawo oo aan u bahanay 0 1 s. Increase in food prices waxaa korday qiimaha cunada 0 1 t. Increase in the cost of cooking fuel Waxaa korday qiimaha shidaalka dhabka 0 1 u. Less time spent praying Waxaan waqti yar ku qaata tuukashada 0 1 v. Other Kuwa kale 0 1	code to give refe IF NO, SKIP WAJ 9
READ ALL ANSWERS ALOUD Kor u akhri dhamaan su'alaha				
319	40	What is the main reason that you skipped health services? Maxay tahay sababta ugu weyn ee aad uu taagi weyde adeegyada caafimaadka?  Do not read answer categories aloud. Probe "anyone else"? Ha u akhriin jawabaha kor	NO YES a. The clinics are closed because of Coronavirus Clinic yada waa taxire corona virus daartis 0 1 b. People will think I have Corona if I go to the clinic Hadii aan taago clinic ga dadka waxay uu maleynayaan inn aan qaabo corona 0 1 c. I am scared that I will get infected with Coronavirus if I go to the clinic Hadii aan taago clinic ga waxan ka baqaa inaan igu daaco corona virus 0 1 d. I cannot afford the cost of health care services right now Ma awoodi qarashka adeegyada caafimaadka hada 0 1 e. I did not want to leave the house because of the curfew Ma aanan dooneynin inaan ka baxo guriga bandow daartis 0 1 f. The health facilities do not have the medication I need Xarunta caafimaadka ma hayaan daawada aan uu bahanay 0 1 g. The health facilities are only seeing a small number of patients each day Xarunta caafimaadka waxa kali arxayan tiro yar ee bukaanada maaliinti 0 1 h. The health care workers strike Shaqalaha daryeelka caafimaadka waxay sameyn shaqo jojin 0 1 i. Other (specify) Kuwa kale (sheg) 0 1	
227	41	Which health care/services/medicines have you given up? Miyaad iska dhaafay daryeelka caafimaadka /adeegyada /daawoyin?  Read all answer categories aloud Kor u akhri jawabaha	NO YES a. Check/medicine for malaria Baarintanka / dawo kaneecada 0 1 b. Check/medicine for stomach/digestive problems Baarintanka / daawada caloosha / dhibaataada dheef shidka 0 1 c. Check/medicine for diabetes/blood pressure Baarintanka / daawada sokorowga / dhiig kar 0 1 d. Care for any acute illness; Daryeelka cudur kasta oo deg deg ah 0 1 e. Refills of any other regular medications you may take; Dawooyinka kale ee caadiga ah ee aad qaadan karto 0 1 f. Immunizations/nutrition services for children; Talaalka /adeegyada nafaqada ee carurta 0 1 g. Check/medicine for pre-natal care (only women) Baarintanka / dawo loogu tala galay daryeelka dhalmada kahor [dumarka kaliya] 0 1 h. Family Planning/Child spacing methods (only women) Habka kala-dereynta ilmaha [ dumarka kaliya] 0 1 i. Other Kuwa kale (sheg) 0 1	
CHILD MARRIAGE				
WAJ 9	9	42 Has anyone in your household gotten married since the start of Coronavirus? Miyuu jiraa qof kamid qoyskaaga oo guursaday sidhuu uu bilowde corona virus  Programming: If Yes, ask how many and loop 43-46 accordingly	a. No Maya 0 b. Yes Haa 1	415
WAJ 10	10	43 Who got married? Yaa guursaday?  Do not read answer categories aloud. Probe "anyone else"? Ha u akhriin jawabaha kor. Weydi- maxa kale	a. Son Will 1 b. Daughter Gabar 2 c. Self Nafteeda 3 d. Other female (specify) Naag kale [sheg] 4 e. Other male (specify) Nin kale [sheg] 5	
WAJ 11	11	44 About how old is the person who got married? Immiisa jr weye qofka guursaday ?	AGE IN YEARS <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> DON'T KNOW Maagi 88	

Now I would like to ask you a few questions about the money that you were earning before Coronavirus and how that may compare to what you are able to earn now. **Hada waxaan jeclaan laha inaan ku weydiyo dhawr su'aalood oo ku sabsan lacagta aad heli ka hor corona virus iyo**

sida taasi uu barbardhigi karto lacagta aad hada heli karto				
435	67	In the past month, would you say that you've been making the same, more or less than what you were earning before Coronavirus. <i>Blishi la soo dhafay, ma dhihi lahed waxaad heleysi inn badan, yar ama intuu corona ka hore.</i>	a. Same <i>Mid la mid ah</i> b. More <i>In badan</i> c. Less <i>In yar</i>	1 2 3
439	68	In the past month, would you say that your partner has been making the same, more or less than before the Coronavirus. <i>Blishi la soo dhafay, ma dhihi lahed lamaanaagu wuxuu helay mid la mid ah, in badan ama in yar intaa corona virus ka hor</i>	a. Same <i>Mid la mid ah</i> b. More <i>In badan</i> c. Less <i>In yar</i> d. Don't Know <i>Maagi</i> e. No partner <i>Ma lahi lamaana</i>	1 2 3 4 5
441	69	Would you say that your reliance on your partner/husband/wife for basic needs has changed since the beginning of COVID-19? <i>Miyad dhihi lahed kalsoonida ee lamaanaaga / seygaaga / naagtaada ee baahida aasaasiga ah ayey wax isbadaleen siduu COVID-19 uu bilowde</i>	Yes, more reliant <i>Haa, isku kalsooni badan</i> Yes, less reliant <i>Haa, isku kalsooni yar</i> No, stayed the same <i>Maya, isma badalin</i>	2 1 0
520	70	In the past month, would you say that you've been making the same, more or less than what you were earning as compared to the first six months of Coronavirus (March - September 2020). <i>Blishi la soo dhafay, ma dhihi lahed lamaanaagu wuxuu helay mid la mid ah, in badan ama in yar intaa corona virus ka hor</i>	a. Same <i>Mid la mid ah</i> b. More <i>In badan</i> c. Less <i>In yar</i>	1 2 3
# Q439=5 (no partner) --> SKIP				442
521	71	In the past month, would you say that your partner has been making the same, more or less as compared to the first six months of Coronavirus (March - September 2020). <i>Blishi la soo dhafay, ma dhihi lahed lamaanaagu wuxuu helay mid la mid ah, in badan ama in yar marka la barbar dhigo lixda bilow oo ugu horeysay intaa corona virus ka (Bisha march - september ka 2020)</i>	a. Same <i>Mid la mid ah</i> b. More <i>In badan</i> c. Less <i>In yar</i> d. Don't Know <i>Maagi</i> e. No partner <i>Ma lahi lamaana</i>	1 2 3 4 5
DECISION MAKING (EMERGE)				
I'm going to ask you a few questions now about how you make decisions and in general how much control do you have over personal decisions that have a major impact on your life, such as whether you will go out of the house into the community, with whom you will associate with outside of your household, or when and from whom to seek health care for yourself? <i>waxan ku weydiiha su'alo yar oo ku saabsan sidaad u qadato go'aanka iyo intaad hakameyn karta go'aanka shaqsiyad ee ku yeesha saameyn weyn noloshaada sida oo kale intaad ka bixi karto garga sidaad u dhex qaado bulshada, sida ula dhaqmi dadka ka baxsan qoyskaaga ama marka iyo xage aad ka heli daryelka caafimadka ee naftaada.</i>				
442	72	A. For each of the following decisions, please tell me how much control you currently have over your decision: None, very little, some, a fair amount or full control. <i>Go'aan kasta oo soo socda, iadan ii sheeg xakameyn inta la'eg ayaa hada leedahay ee go'aanka: Midna, aad ba u yartahay, qaar, dhex-dhexaad ama xakameyn taam ah.</i>	VERY LITTLE <i>Aad ba u</i> NONE <i>Midna yartahay</i>	A FAIR AMOUNT <i>SA T DHEE</i> 2 3 4
444	73	How much control do you have to decide when you want to leave the house to go into the community your own? <i>Would you say, none, very little, some, a fair amount or full control? Xakameyn intaad la'eg ayaa leedahay marka aad rabto inaad ka baxdo guriga ee aad dhex qaado bulshada? Miyad dhihi lahayd, midna, aad ba u yartahay, qaar, dhex-dhexaad ama xakameyn taam ah.</i>	1	5
445	74	How much control do you have to decide who you will visit outside of your household. <i>Would you say, none, very little, some, a fair amount or full control? Xakameyn intaad la'eg ayaa leedahay marka aad booqaneys qof ka baxsan qoyskii. Miyad dhihi lahayd, midna, aad ba u yartahay, qaar, dhex-dhexaad ama xakameyn taam ah.</i>	1	5
446	75	How much control do you have to decide when and where to seeking health care? <i>Would you say none, very little, some, a fair amount or full control? Xakameyn intaad la'eg ayaa leedahay marka iyo xage aad ka heli daryelka caafimadka ee naftaada? Miyad dhihi lahayd, midna, aad ba u yartahay, qaar, dhex-dhexaad ama xakameyn taam ah.</i>	1	5
447	76	How much control do you have to decide to working outside of the house. <i>Would you say none, very little, some, a fair amount or full control? Xakameyn intaad la'eg ayaa leedahay inaad ka shaqeyso meel ka baxsan guriinka. Miyad dhihi lahayd, midna, aad ba u yartahay, qaar, dhex-dhexaad ama xakameyn taam ah.</i>	1	5
448	77	How much control do you have to make large household purchases? <i>Would you say none, very little, some, a fair amount or full control? Xakameyn intaad la'eg ayaa leedahay inaad qoyskii. Miyad dhihi lahayd, midna, aad ba u yartahay, qaar, dhex-dhexaad ama xakameyn taam ah.</i>	1	5
MENTAL HEALTH (PHQ-9)				
450	78	Over the last 2 weeks, how often have you been bothered by any of the following problems. For each one, tell me about how many days. <i>labaad isbuuc ee la soo dhafay, immissa jeer aya kuu fidsante dhibaatooyinka soo socda. Midkasta, esheg immissa maalin.</i>	a. 0 days <i>0 maalin</i> b. 1-7 days <i>1-7 maalin</i> c. 8-12 days <i>8-12 maalin</i> d. 13 or 14 days <i>13 ama 14 maalin</i> e. REFUSE TO ANSWER <i>Waan diidhe inaan</i>	1 2 3 4 5
451	79	Little interest or pleasure in doing things, you normally enjoy <i>Dan yar mise waxad jeclaatay inaad sameysa wax yaaba, sidhe caadiga ah ku farxad galiyo</i>	a. 0 days <i>0 maalin</i> b. 1-7 days <i>1-7 maalin</i> c. 8-12 days <i>8-12 maalin</i> d. 13 or 14 days <i>13 ama 14 maalin</i> e. REFUSE TO ANSWER <i>Waan diidhe inaan</i>	1 2 3 4 5
522	80	Feeling nervous, anxious or on edge <i>Waxaad dareemi cabsi, walwaal ama gees ahan</i>	a. 0 days <i>0 maalin</i> b. 1-7 days <i>1-7 maalin</i> c. 8-12 days <i>8-12 maalin</i> d. 13 or 14 days <i>13 ama 14 maalin</i> e. REFUSE TO ANSWER <i>Waan diidhe inaan ka j</i>	1 2 3 4 5
523	81	Not being able to stop or control worrying <i>Awood u ma lahi inaan joojiyo ama xakameeyo walwaka</i>	a. 0 days <i>0 maalin</i> b. 1-7 days <i>1-7 maalin</i> c. 8-12 days <i>8-12 maalin</i> d. 13 or 14 days <i>13 ama 14 maalin</i> e. REFUSE TO ANSWER <i>Waan diidhe inaan ka j</i>	1 2 3 4 5
524	82	Since the start of the Coronavirus (COVID-19) pandemic, have you sought help from family or friends because you felt low, anxious or stressed? <i>Sida uu bilaawde cudurka faafa ee corona virus ka (COVID-19), Ma ka raadstay caawimaad qoyska ama saaxiibadimaha yeelay waxaad darentay hoos u dhac, walwal ama walaaq?</i>	No <i>Maya</i> Yes <i>Haa</i> Don't know <i>Maagi</i> Refuse to answer <i>Waan diidhe inaan ka jawaaba</i>	1 2 3 4
229	86	Do we have your permission to recontact you in the future? <i>Ma haysaana ogolaashahaaga si an mustaqbalka dambe kuula soo xiriima</i>	Yes <i>Haa</i> No <i>Maya</i>	1 2
134	87	Could you give me a contact we can use to contact you in the future? <i>Ma ii siin kartaa nambaar aan isticmaali karno si aan ku guula soo xiriimo mustaqbalka dambe</i>	Phone Number _____ <i>Nambaarka telefonka _____</i>	89

				(confirm) Xaqiji		
229	88	Could you tell me your name or nickname? Ma ii sheegi karta magacaaga ama magacaaga naanjada ah / magacaa laguu yaqaano				
	89	As you may recall, [name of adolescent] is also participating in our COVID-19 research and we interviewed them last time as well. May we have your permission to interview them again? Sidaad xusuusto ( magacaa qaan gaarka ah) ayaa sidoo kale ka qeyb qaadatay cilmi baaristayna ee COVID-19 oo waxaan la yeelanay wareysi waqtigi u dambe. Maogashahay inan wareysi markale la yeelano?		No Maya Yes Haa		1 2
		Is [ADOLESCENT GIRL] [THAT BOY] at home? [GABADHA QAANGAARKA AH [WIIL KAASI ] ma joogan guriga?				
		Can you give me the phone number I can use to talk to [ADOLESCENT GIRL] [THAT BOY]? Ma I sin karta telefon nambarka ee isticmaali karo si aan ula hadlo [ GABADHA QANGAARKA AH] [WIIL KAASI]?				
		If adolescent not available for interview ask: Why is [endline_participant_name] not available for interview? Hadii uu qaan-gaarka la wareysan tahay uu sin joogin weydii sababta oo ( magacaa ka qeyb galaa aad u joogin si loo la yeesho wareysi		Gone back to school -waxuu ku tabbe ak He/she travelled and cant be reached on phone Other		1 2 77
		BOY] school located? Xage aad ku yeela skulka ( qaan-gaarka gabadha) ( wiilka)		County (Add drop down list of 47 counties) Dowlad gobaleedka ( ku daarListiga 47 ) Outside Kenya Mel ka baxsan kenya		1 2
				Enter contact name Qoor magaca la la xariirayo		1
		What is the name of the school where [ADOLESCENT GIRL] [THAT BOY] attends? Maxay tahay magaca skulka ee (qaan-gaarka gabadha)		Enter phone number Qoor numbarka telefonka.		2
		Please share with me contacts that I could use to reach [ADOLESCENT GIRL] [THAT BOY] from school. Fadlan waxaad ila wadhaqin nambarka aan isticmaali karo si aan ula xiriro ( qaan-gaarka gabadha) ( wiilka) ee skulka.		No Maya		1
		May we have your permission to interview [ADOLESCENT GIRL] [THAT BOY] if the school allows? Ma nasine ogdasha si aan wareysi ula yeelano ( qaan-gaarka gabadha) (wiilka) hadi skulkaa noo aqdaalo?		Yes Haa		2
		We have reached the end of the interview. Thank you so much for your time and for answering our questions. Do you have any question or comment for me? Waxaan gaamay dhamaadka wareysiga .Aad baad ugu mahadsantahay waqtigaaga iyo ka jawaabista su'aalahaayna. Ma qabta wax su'al ama faalo oo aniga il gaar ah		Yes Haa No Maya		1 2
226i - If yes, program a prompt offer a referral for SGBV counseling- 226i - Hadii haa tahay isku diyaari inaad uu gudbisso la taaliyada SGBV. If yes to four or more 450 and 451, referral for mental health services Hadii haa tahay afaar ama in ka badan 450 iyo 451, uu gudbi adeegyada caafimaadka dhimirka						

COVID-19 ADULT SURVEY - NAIROBI/WAJIR/KILIFUKISUMU - ROUND 2			
NO. FROM RT	KSM/ KLF RT SEQUENCE	QUESTIONS AND FILTERS	SKIP TO
		<p>Hello, my name is [NAME] and I am calling from Population Council. We are a health research organization who is working in partnership with the Ministry of Health on the response to Coronavirus. We are contacting you because you participated in our survey on COVID-19 sometime last year. We would like to ask some additional questions about the Corona virus and your experiences during this time. There are no right or wrong answers and the answers you provide will not lead to any direct benefits or penalties for your household. The answers that you give provide us a better understanding of what people in your community have been experiencing so that the government and other partners can better respond. The interview will take about 30-45 minutes. There are no risks or benefits to participating in this survey. Your participation is voluntary and you can stop the interview at any time if you do not wish to continue. After completing the survey we will send you 200 via Mpesa to compensate you for your time, even if you stop in the middle.</p> <p>Hello, jina langu ni [JINA] na ninakupigia simu kutoka Population Council. Sisi ni shirika la utafiti wa afya na tunashirikiana na serikali kuhusu virusi vya Korona. Tunawasiliana nawe kwa sababu ulishiriki katika utafiti wetu wa COVID-19 wakati mwingine mwaka uliopita. Tungependa kukauliza maswali mengine kuhusu virusi vya Korona na uliyoyapitia wakati huu. Hakuna majibu yaliyo sawa na yasiyo sawa na majibu utakayotoa hayatakuwa na marufaa au kutumu ya mola kwa mola nyumbani kwetu. Majibu unayotoa yanawezesha kuwaona vyema zaidi kile wato walio katika jumla yenu hupitia ili serikali na washirika wake waweze kutoa msaada unaadai. Mahojiano yatachukua takriban dakika 30-45. Hakuna marufaa au athari zozote kwa kushiriki katika utafiti huu. Kushiriki kwako ni kwa hafi na unaweza kuaitisha mahojiano wakati uwotele ukawa hutaki kumdelela. Baada ya kumaliza utafiti huu tutakutumia Shilingi 200 kupitia Mpesa kama shukurani kwa muda wako hata kama utachuka mahojiano yakewa katikati.</p> <p>Alo, nyingi [NYINGI] kendo agochoni kowaku e migao mar Population Council. Wan riuaku ma timo norro mar thieth ma tyo kanyaka kod sirkal e kedo kod Korona. Wafudoro kod nkech ne bebo e norro mar COVID-19 e kinde moro higa mokalo. De waher penjo penjo mkomedore e w Korona kod gik ma isekile e fluodon. Onge duoko mabogo kaka masicho kendo dudio ma shiwio ok bi kedo bi ber kaka tum moro amora ne odi. Duoko ma shiwio mtyo wang eyo maber gima joma nie ogandau ong eyo mondo okony sirkal kod riuwuge ma otudorego timo gima owirjore. Cherro mar penjo biro kawo madiron dakika 30-45. Onge rach kaka ber mar bebo e norron. Bedori en kuom dharuuk mari kendo myalo chungu penjo saa asaya ka ok idwar dhi mbele. Ka isetelo norro lo wabro orori siling 200 e Mpesa kuom kawo fluodon, kaka ka iweyo gie kore.</p> <p>If you have any questions about the survey in the future, please feel free to contact our office. I have the phone number and I can give it to you would like.</p> <p>Ukwa na maswali kuhusu utafiti huu, tafadhali jake huku kuwasiliana na alia yetu. Nika na nambani ya simu na naweza kukupatia kika ungependa. Ka bebo gi penjo moro amora kuom norro ndalo mabiro, yie beed fluodi mar kutor gi dika. An gi namba simu kendo anyalo myi ka dhar.</p> <p>Do you have any questions?</p> <p>Je, una maswali yoyote?</p> <p>Be in gi penjo moro amora?</p> <p>Do you agree to participate?</p> <p>Je, unakubali kushiriki?</p> <p>Be iye mar bebo e norro?</p> <p><b>Literacy Numeracy Survey Consent</b></p> <p>In a few weeks from today, we will conduct a follow up survey with some adolescents to assess whether Coronavirus has had any impacts on learning for adolescents. The adolescents to participate in this follow up survey will be randomly selected from those we are interviewing for this KAP survey. The interview process will include administration of a literacy and numeracy test which will be administered face to face by an interviewer. The interview process will take about 25 minutes. There are no risks or benefits to participating in the survey. Their participation is voluntary and they can stop the interview at any time if they do not wish to continue. There will be no direct benefits to the study. If your child is selected to participate in this follow up survey, they will be given Ksh.200 to compensate for their time.</p> <p>Wika chache kuanzia leo, tutafanya utafiti wa dhauliigi na kuuadi ya vijana ili kutathmini kama Korona imekuwa na athari zozote kuika mafunzi ya vijana.</p> <p>Do you give us permission to interview your child for the follow up survey if they are selected to participate? Bende imyowa fluodi mar myi penjo e norro mar kuwo ka oyeni mar bebo?</p> <p>Je, unapoa kiali dha kuming mbo wako kwe giti ya utafiti wa kuuatima tenge dachapilwa kushiriki?</p> <p>Bende imyowa fluodi mar myo nyathia penjo e norro mar kuwo ka oyeni mar bebo?</p> <p>[Automatic fill in indicating that this is Round 3]</p> <p>[Confirm respondent using pre-pull from last round - name, sex, age, location]</p>	
101	1	<p>How old are you?</p> <p>Una umri wa miaka mingapi?</p> <p>In ja nigri ad?</p>	Years
101b	1	<p>Are you the head of your household?</p> <p>Je, wewe ndiwe kiongozi wa Nyumba yenu?</p> <p>In e jattio mar odi?</p>	<p>Yes Ndiyo: Ee</p> <p>No La Oyo</p>

100	2	Record sex of respondent. <i>Andika jinsia ya Mhizi/ Ndiki kik chuch mar jachire ka en dichwa kata miyo</i>	Male Female	1 2	
WAJ	2	I want to know a bit about how many men, women, boys and girls live in this household. For each category, kindly tell me how many people live in this household, including yourself. EXPLAIN: 'ive' is someone who sleeps in your house the majority of the nights of the week. EXPLAIN: 'household' is one that shares a kitchen (pot) and has the same head of household. <i>Nataka kuhahamu kidogo kuhusu idadi ya wanume, wanawake, watoto na wasichana wanaoishi katika makao haya. Kwa kila kikundi, tafadhali nambie ni wangepi wanaoishi katika makao haya, ikijumuishia ELEZA: 'ishi' ni mtu anayekata katika makao haya mara nyingi kwa wiki. ELEZA: 'makao' ni yule mliyeshirikiana kwenye jikoni (chungu) kimoja na kiongozi mmoja wa makao. Adwa ng'nyo matini ni ginji ad ma chwa, mon, yawudi kod nyi ma odak e odhi. Na kidenyi ka kidenyi, ye nyia ni ginji ad ma odak e odhi. kowe. LER: 'dak' en ng'ama rindo e odu ng'eny ofano mag juma. LER: 'odu' en ng'ama urwego jikon kod jato achiel mar ot.</i>	MALE FEMALE		
1					
		Babies (0-4) <i>Watoto wachanga [0-4]</i> <i>Nyithindo matindo [0-4]</i>			
		Children (5-9) <i>Watoto [5-9]</i> <i>Nyithindo [5-9]</i>			
		Adolescents (10-19) <i>Vijana [10-19]</i> <i>Rowero [10-19]</i>			
		Adults (20-64) <i>Watu wazima [20-64]</i> <i>Jomadongo [20-64]</i>			
		Elderly (65+) <i>Wazee [65+]</i> <i>Juma oti [65+]</i>			
201	3	The last time we interviewed you, you were living in [pre-pull from last location]. Are you still living in that location? If not, where are you living? <i>Wakati wa mwisho tulipokuhoji, ulikuwa ukishi [pre-pull from R1]. Je, bado wishi sehemu hii? Kama sivyo, wishi wapi? E tuhoio mogik mane wasenji penjo ni wacho ni ne idak [pre-pull from R1]. Bende pod idak kanyo? Ka ooyo, idak kanyo?</i>	a. Have not moved <i>Sipahama</i> Pok adar b. Same county, rural location <i>Kaunti ile ile, kijijini</i> Kaonti achiel, gwegw c. Same county, urban location <i>Kaunti ile ile, mjini</i> Kaonti achiel, taon d. Other county, urban location <i>Kaunti nyingine, mjini</i> Kaonti machielo, taon e. Other county, rural location <i>Kaunti nyingine, kijijini</i> Kaonti machielo, gwegw f. Other (specify) <i>Pengine (eleza)</i> Machielo (ler)	1 2 3 4 5 6	107
202	4	Why did you leave [Last location]. <i>Kwa nini ulihama kutoka [line la mahali R1]</i> <i>Ang o ma omoyo ne idak [location R1]</i>  Do NOT read answer categories aloud	a. To get away from Coronavirus <i>Ii kujepusha na Vitusi vya Korona</i> Mondo adhi mabor gi b. Economic reasons (no food, no work, couldn't pay rent, etc.) <i>Sababu za kichumi</i> hakuna c. To take care of my family that live here <i>Ii kutunza familia yangu inayoshi hapa</i> Rito jood d. Better place for my children <i>Mahali pazuri zaidi kwa watoto wange</i> Kama ber mokojo ne e. Other <i>Nyingine</i> Machielo	1 2 3 4 9	
COVID-19 RISK PERCEPTION, STIGMA AND PREVENTION <i>MTAZAMO WA HATARI YA COVID-19, UNYANTAPAA NA KINGA</i>					
107	5	Do you think your chance of getting infected with Corona is low, medium, or high, or do you have no risk at all? <i>Je unafikiri uwezekano wako wa kupata Korona ni wa chini, wastari au juu, au hauna uwezekano wowote? Ipara ni nyatoni mar yado Korona ni piny, diere, koso malo, koso longe nyatruok mar yude?</i>	Low <i>Chini</i> Piny Medium <i>Wastari</i> Diere High <i>Juu</i> Malo No risk <i>Hakuna uwezekano wowote</i> Onge nyatruok Already had Coronavirus <i>Tayari nimepata virusi vya Korona</i> Naseyudo Korona Don't know, no response <i>Sijui, hakuna jibu</i> Akia, onge duoko	1 2 3 4 5 88	108a 204 204

				Nr fcs	
			a. I'm young <i>Mini ni mdogo/mchanga</i> An ng'ama tin	0 1	
			b. God protects me <i>Mungu anankinga</i> Nyasaye rita	0 1	
			c. The hot weather/climate <i>Hali ya hewa yenye joto</i> Liet mar piny	0 1	
			d. There is no more COVID <i>COVID haiko tena</i> Onge COVID kendo	0 1	
			e. I haven't travelled <i>Sijasafiri</i> Pok adhi wuoth	0 1	
			f. I am not a Mzungu or Chinese <i>Mini si mzungu au Mchina</i> Ok an Jasungu kata Jachi	0 1	
			g. COVID is a feigov't just trying to get money <i>COVID ni uwongor serikali</i> Injaribu tu kupata pesa <i>COVID en miriamba/sikal temo mana yudo pesa</i>	0 1	
			h. Don't know anyone with Corona <i>Simjui mtu yeyote aliye na Corona</i> Akia ng'alo ang'ala marigi Corona	0 1	
			i. I have been staying at home <i>Nimekuwa nikikaa nyumbani</i> Asebedo ka an dala	0 1	
			l. Have been adhering to government guidelines <i>Nimekuwa nikifuta maagizo ya serikali</i> Asebedo ka arito chike mag sikali	0 1	
			m. Practice social distancing/staying 1-2 meters apart/not shaking hands/not interacting with people <i>Nimekuwa nikikaa mbali na watu/nimekuwa nikikaa umbali wa mita 1-2/kutosimiana kwa mikono/kutotangamana na watu</i> Asebedo ka abedo mabor gi ji / ma kindwa mita 1-2 / ok amos ji gi lwedo / ok studra gi ji	0 1	
		Why do you think you are not at high risk? <i>Kwa nini unafikiri uwezekano wako wa kupata Corona hauko juu?</i> <i>Ana'o momiyo iparo ni ok in gi nyathuk ma malo?</i>	n. Have been washing hands with soap and running water/using sanitizer <i>Nimekuwa nikinawa na sabuni na maji yanayotirika/natumia vyezi</i> Asebedo ka alogo gi sabun e pi ma mchaleye gi sentiza	0 1	
		Do NOT read answer categories out loud	o. Have been wearing a face mask <i>Nimekuwa nikivaa barakoa</i> Asebedo ka anwako mask	0 1	
		Note: Probe - anything else? <i>Kumbuka: Changua - chochote kingine?</i>	p. I am healthy <i>Nina alya bora</i> An gi ngima maber	0 1	
			q. I have been vaccinated <i>Nimechangwa</i> Ouchungu	0 1	ALL 204
		Record all mentioned	r. I already got Covid 19 <i>Ninapasa Covid 19 tayari</i> Asebedo Corona	0 1	
			s. Other <i>Nyingine</i> Machielo	0 1	
			t. There is no Coronavirus in this county <i>Hakuna virusi vya Corona katika kaunti hii</i> Onge Corona e kaunti ni	0 1	
			u. Don't know/no response <i>Sijui/hakuna jibu</i> Akia/onge duoko	0 1	
108a	7	Why do you think you are at high risk? <i>Kwa nini unafikiri uwezekano wako wa kupata Corona uko juu?</i> <i>Ana'o momiyo iparo ni in gi nyathuk ma malo?</i>	a. Have been in contact with someone who is infected <i>Nimewasiliana na mtu aliyeamboziwa</i>	0 1	NIS
			b. Travelled recently <i>Nitasafiri hivi karibuni</i> Asechi wuoth machiegni	0 1	
			c. Health care worker <i>Mhudumu wa alya</i> An jathiehi	0 1	
			d. I interact with a lot of people every day <i>Nashirikiana na watu wengi kila siku</i> Atudora gi ji ma	0 1	
		Do NOT read answer categories aloud	e. Ride public transportation a lot <i>Natumia usafiri wa umma mara nyingi</i> Atyo gi yor wuoth i	0 1	
			f. Am not able to wash my hands <i>Siwezi kunawa</i> Ok anyal logo	0 1	
			g. Am not able to wear a mask <i>Siwezi kuvaa barakoa</i> Ok anyal resko mask	0 1	
		Probe: Anything else <i>Probe: Chochote kingine</i> Non malut. Gimoro amora machielo	h. Am not able to follow government guidelines <i>Siwezi kufuta kanuni za serikali</i> Ok anyal luw	0 1	
			i. Am elderly <i>Mini ni mzee</i> Asi	0 1	
			j. Live in a place with crowded living conditions/shared toilets <i>Ninaishi pahalil penye msongamano wa watu/tunatumia choo kimoja watu wengi</i> Adak kama ji ng enye/waitho choo	0 1	
			k. Handle cash <i>Kushughulikia pesa</i> Amulo pesa	0 1	
			l. Am sick/have a health condition <i>Mini ni mgong'wanina tatizo la kiafya</i> Atuolan gi chandrud	0 1	
			m. Someone in my household is high risk (for any reason) <i>Mtu fulani katika nyumba yangu ana uwezekano mkubwa wa kupata masambukizi (kwa sababu yoyote ile)</i> Ng'alo kuom jodwa nigi nyathuk ma malo mar yudo tuo (nikach wach moro amora)	0 1	
			n. Live in or near a hotspot/place with many confirmed cases <i>Ninaishi katika au karibu na eneo la habari / pahalil paipo na watu wengi waliotibitishwa</i> Adak kama kaka machiegni gi kama oreyuole ji mang emy gi luo	0 1	
			o. My kids are back in school <i>Watoto wangu wamerudi shuleni</i> Nyithinda oseedok skul	0 1	
			p. I have gone back to work <i>Nimerudi kazini</i> Aseedok e tich	0 1	
			q. I have not been vaccinated <i>Sijachangwa</i> Pok chachya	0 1	
			r. Other (specify) <i>Nyingine (baja)</i> Machielo (ter)	0 1	



204	8	Do you know anyone in your family, neighborhood or workplace who has been infected with the Coronavirus? Your answer is confidential and no action will be taken based on your answer. Would you say... Je unanjanja mtu yeyote katika familia yako, kitongoji chako au pahali pa kazi ambaye ameambuliziwa na virusi vya Korona? Jibu lako ni sahihi na hakuna hatua itakayochukuliwa kwa sababu ya jibu hilo. Je, ungesema: Ise ing'ni ng'ato ang'ata kuum joodu, jirende kuta kama iliyen na Korona osemako? Duukoni en maling'ing' kendo onge okang' ma biro kaw kaluware gi duukoni. Diwachi ni	a. Yes, I know someone who tested positive Ndiyo, namjanja mtu ambaye amepimwa na ako na virusi vya Korona. Ee, ang'eyo ng'ama ropim moyud gi tuo b. Yes, I know someone who is suspected of being positive but hasn't gone for a test Ndio namjanja mtu ambaye anashukiwa kuwa na virusi vya Korona lakini hapenda kupimwa. Ee, ang'eyo ng'ama idichid godo ni tuo to pok odhi e pim c. No, I don't know anyone Hapana, siji mtu yeyote Ooyo, aka ng'ato ang'ata	302
501	9	Who had Coronavirus? Ni nani aliyekuwa na virusi vya Korona? Ng'a mane ngi Korona?	Me Mini An Someone in my family Mtu fulani katika familia yangu Ng'ato kuum joodwa Someone in a friend's family Mtu fulani katika familia ya rafiki yangu Ng'ato kuum joo Someone in my neighborhood/community Mtu fulani katika kitongoji changu/jami yangu My friend Rafiki yangu Osepeza Co worker Mnyakazi mwenza Jitich wadwa Someone at my child's school Mtu fulani shuleni mwa mwanangu Ng'ato e skund gi nye Someone else Mtu mwingine Ng'amachiyo Refuse Katika kujibu Otamore duoko	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1
1, R3		In general, for the people you just listed, how many had a COVID-19 test at that time? Would you say most, some, or a few (if you're not sure, please give a best guess)? Kwa ujumla, kwa watu ulioawadhiacha hivi punde, ni wazote wakulwa na kimo cha COVID-19 wakati hao? Je, select one. Chagua moja. Tier achai	a. Most Wangi Ng'enyi b. Some Wangingi Moko c. A few Wlachache Monda d. Don't know/Refuse to answer e. Only me	0 1 2 3 1
2, R3		Did anyone you knew well pass away from COVID-19? Je, kumi yeyote uliyetambua yeyote aliyefariki kutokana na COVID-19? Bende ng'ato ang'ata mane ing'e maber na oho gi COVID-19?	a. No La Ooyo b. Yes Ndiyo Ee	0 1
3, R3		Did anyone from your household pass away from COVID-19? Je, kumi mtu yeyote kutika katika makao yenu aliyefariki kutokana na COVID-19? Bende ng'ato ang'ata kuum joodu na oho gi COVID-19?	a. No La Ooyo b. Yes Ndiyo Ee	0 1
302	10	Now I want you to imagine that people suspected that you were infected with Coronavirus, or that you have tested positive for Coronavirus. How do you think that people in your family and neighborhood would treat you. For each statement tell me if you think it's true or false. Sasa nitaka uwazie kwa watu wanakushuku kuwa umeambuliziwa na virusi vya Korona, au kuwa umethibitishwa kuwa umeambuliziwa. Unafikiri watu katika familia yako na katika ujani wako wangeliundelea? Katika kila kauli nambie ikiwa ni kweli au uongo. Koro adika ni ipatane ni ji chich ni Korona omaki, kati ni ropim moyud gi Korona. Bapo ni joodu kod jirende de kawi nade. Ne wach ka wach nyisa ka iparo ni en adier koso miambo.	a. People would stop talking to me Watu wangesha kuzungumza nami Ji de we wuojo c. People would gossip about me Watu wangenisenganya Ji de kuodha d. People I know would bring me food I need Watu rinawajua wangeniletea chakula rinachotaji Joma ang'eyo de kaina chemo ma adwiro e. People I know would bring me the medicines I need Watu rinawajua wangeniletea madawa rinayohitaji Joma ang'eyo de kaina yedhe ma adwiro f. People in the community would treat my family badly Watu katika jami yetu wangenidua familia yangu mabaya Joma nio ogardwa de since joodwa masochi g. After I have recovered from Corona virus, people in the community would still avoid me Benda ya kupona virusi vya Korona, watu katika jami yetu bado wangenihaji Joma nio ogardwa pidi de kuodha kuta ka asichango h. After I have recovered from Coronavirus, I would not be welcome back into my house by family Stakaribishwa tena katika nyumba yangu na familia yangu bado ya kupona kutokana na coronavirus Joodwa ok de mwaka kendo e oda bang' ka asichango i. After I have recovered from Coronavirus, I would not be welcome back at my place of work Stakaribishwa tena kazini baada ya kupona Ok de mwaka kendo kar tich bang' ka asichango j. After I have recovered from Coronavirus I would still not be welcome back to my place of worship Baada ya kupona kutokana na Korona, bado stakaribishwa pahali pangu pa bado Pod ok de mwaka kama alima kaka bang' ka asichango l. After I have recovered from Coronavirus my child would not be welcomed back to school Baada ya kupona kutokana na Korona, mtoto wangu hatakuwatwa kurudi shuleni Nyathina ok de mwaka e skul kendo bang' ka asichango kuom Korona	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1

502	11	How true are the following sentences describing the people in your community? Je, sentensi zifuatazo zinazoezea watu katika jumuiya yako ni za kweli kiasi gani? Wechegei lero adieri machal nade jama nie gwing'u?  People in my community are taking steps to protect themselves and others from coronavirus (COVID-19). Would you say: Very true, somewhat true, not very true, not true at all? Wata katika jami yetu wanachukua hatua za kujikinga na kukinga wengine dhidi ya virusi vya Korona (COVID-19). Je, ungesema ni kweli kabisa, kweli kiasi, si kweli kabisa, si kweli hata kidogo. Jama nie gwing'wa kawo kengele mag g'eng'ore kendo g'eng'o jamanoko kik gam kule Korona (COVID-19). Dweacha ni: Adieri ahinya, bet adieri, ok adieri ahinya, ok	<p>a. Very true <b>Kweli kabisa</b> Adieri ahinya 1</p> <p>b. Somewhat true <b>Kweli kiasi</b> Bet adieri 2</p> <p>c. Not very true <b>Si kweli sana</b> Ok adieri ahinya 3</p> <p>d. Not true at all <b>Si kweli hata kidogo</b> Ok adieri kama matn 4</p>	
511	20	Which of the following statements best describes you: I used to follow COVID-19 prevention guidelines (i.e. washing hands, social distancing, wearing a mask when around others, avoiding gatherings, etc.) and I still do. I used to follow guidelines but now I don't as much. I didn't used to follow guidelines but now I do, or I never used to follow guidelines that much and I still don't. Ni kauli gani kat ya yalutayo inayokuweza yema zaidi. Nilikuwa nikifuata miongozo ya kulinga dhidi ya COVID-19 (k.m. kunawa, kutangamana na watu, kuwa baraka nikiwa karibu na watu wengine, kupuka mikusanyiko, n.k.) na bado nafuata. Nilikuwa nikifuata miongozo lakini sasa nafuata, au sikuwa nikifuata miongozo lakini bado	<p>a. I used to follow guidelines and I still do <b>Nilikuwa nikifuata miongozo na bado nafuata</b> 1</p> <p>b. I used to follow guidelines and now I don't as much <b>Nilikuwa nikifuata miongozo na:</b> 2</p> <p>c. I never followed guidelines that much and now I do <b>Sikuwa nikifuata miongozo vile n</b> 3</p> <p>d. I never used to follow guidelines that much and I still don't <b>Sikuwa nikifuata miongozo vile na bado si nafuata</b> 4</p> <p>e. Don't know <b>Sijui</b> Akia 5</p>	
213	26	Prior to the "mask mandate" When you were outside of your house, did you wear the facemask covering your nose and your mouth, always, most of the time, sometimes, or rarely? Uningeeleza je ya nyuma yako, je unawas baraka (maski kufika ndomo) kila wakati, wakati mwingine, au mara chache? Kila wakati mara chache, bende iraka maski mouni umi gi <b>Probe - anything else? Chuinguza - chochote kingine?</b>	<p>a. Always <b>Kila mara</b> Seche te 1</p> <p>b. Most of the time <b>Mara nyingi</b> Seche mang'eny 2</p> <p>c. Sometimes <b>Wakati mwingine</b> Seche mang'eny 3</p> <p>d. Other <b>Nyingine</b> Machelo 0 1</p> <p>e. Rarely <b>Mara chache</b> Dimanik 3</p> <p>f. Never 3</p>	to the responses. Replace other with never.
4_R3		When you are outside of your house, do you try to keep away from other people (at least 1-2 meters) always, most of the time sometimes, or rarely? Uningeeleza je ya nyuma yako, je unajitibu kuwa mbali na watu wengine (angalia mita 1-2) kila mara, mara nyingi, wakati mwingine, au mara chache? Kila wakati mara chache, bende iraka maski mouni umi gi	<p>a. Always <b>Kila mara</b> Seche te 1</p> <p>b. Most of the time <b>Mara nyingi</b> Seche mang'eny 2</p> <p>c. Sometimes <b>Wakati mwingine</b> Seche mang'eny 3</p> <p>d. Rarely <b>Mara chache</b> Dimanik 3</p>	to the responses. Replace other with never.
5_R3		Please tell me if you think each of the following statements is true, false, or you're not sure. Tafadhali nambae kwa unafiki kila moja ya kauli zifuatazo ni kweli, umgao, au huna uhakika. Tafadhali kila moja ya kauli kila wakati mara chache, bende iraka maski mouni umi gi	<p>a. You cannot become infected with COVID-19 if you've been vaccinated <b>Huwezi kuambuki</b> 1 0</p> <p>b. Being vaccinated makes it less likely you would be hospitalized with or die from COVID-19 <b>Bado unaweza</b> 1 0</p> <p>c. You can still become infected with COVID-19 if you've had COVID before <b>Bado unaweza</b> 1 0</p> <p>d. Almost everyone in my neighborhood has had COVID-19 already <b>Karibu kila mtu katika n</b> 1 0</p> <p>e. If there was a new more deadly COVID-19 variant people would be willing to go back into 1 0</p>	
WAJ 2	29	Have you ever been tested for Coronavirus (Please note - this is not the temperature test)? Je, ushawahi kupimwa dhidi ya Korona (Tafadhali kumbuka - hi si kupimwa joto)? Bende osepini ne kule Korona (jye ipar - ma ok en pin mar let del)?	<p>a. No <b>La</b> Ooyo 0</p> <p>b. Yes <b>Ndoyo</b> Ee 1</p>	
VACCINATION KUCHANWA CHENJO				
6_R3		Have you had at least one dose of a COVID-19 vaccine? Je, umipata angalau dozi moja ya chanzo ya COVID-19? Bende kuyata kwa kila wakati mara chache, bende iraka maski mouni umi gi	<p>No <b>La</b> Ooyo</p> <p>Yes <b>Ndoyo</b> Ee</p>	9_R3
7_R3		If a vaccine to prevent COVID-19 were offered to you today for free, and you were eligible, would you choose to get vaccinated? Kama chanzo ya kukata COVID-19 ingitolewa kwako leo bila chaguo, na ukasahili, ungetachagua kuata chanzo? Read each answer option aloud <b>Soma kila chaguo la jibu kwa</b> Select all that apply <b>Chagua yote yanayotumika</b>	<p>1 Yes, definitely <b>Ndoyo, bila shaka</b> Ee, mionge kiawa</p> <p>2 Yes, probably <b>Ndoyo, pengine</b> Ee, samoro</p> <p>3 No, probably not <b>La, pengine siyo</b> Ooyo, ok apar</p> <p>4 No, definitely not <b>La, bila shaka</b> Ooyo mionge kiawa</p> <p>[Note: we prefer not to have a don't know option here]</p>	12_R3 12_R3



14_R3		<p>[For ALL respondents]</p> <p>Do you have any children ages 12-17?          Je, uko na watoto wotele wakiwa na umri wa miaka 12-17?          Je ni g'i nyathi muna amara mara kwa mara hizi 12-17?</p>	<p>0 No La Ooyo</p> <p>1 Yes Ndiyo Ee</p>	16_R3	
15_R3		<p>If a vaccine to prevent COVID-19 were offered to your children age 12-17 today for free, and they were eligible, would you choose to get them vaccinated?          Kwa chanzo ya kuzuza COVID-19 ingetaweka leo kwa watoto wakiwa umri wa miaka 12-17 bila malipo, na watawajibu, je...</p> <p>Read each answer option aloud <b>Soma kila chaguo la jibu kwa...</b></p> <p>Select all that apply <b>Chagua yote yanayotumika</b></p>	<p>0 Yes, definitely Ndiyo, bila shaka Ee, mazingira kwawa</p> <p>1 Yes, probably Ndiyo, pengine Ee, samoro</p> <p>2 No, probably not La, pengine siyo Ooyo, ok apar</p> <p>3 No, definitely not La, bila shaka Ooyo mazingira kwawa</p> <p>4 They (or some) have already gotten a COVID vaccine Wapo (au wengine) tayari wamepata chanzo ya COVID Giseyudo (kata moko oseyudo)</p> <p>[Note: we prefer not to have a don't know option here]</p>	Swahili wording has changed	
16_R3		<p>[For ALL respondents]</p> <p>Do you have any children under age 12?          Je, uko na watoto wotele wakiwa chini ya miaka 12?          Bende ni g'i nyathi muna amara mara kwa mara hizi 12?</p>	<p>0 No La Ooyo</p> <p>1 Yes Ndiyo Ee</p>	18_R3	
17_R3		<p>If a vaccine to prevent COVID-19 were offered to your children under age 12 today for free, and they were eligible, would you choose to get them vaccinated?          Kwa chanzo ya kuzuza COVID-19 ingetaweka leo kwa watoto wakiwa chini ya miaka 12 bila malipo, na watawajibu, je...</p> <p>Read each answer option aloud <b>Soma kila chaguo la jibu kwa...</b></p> <p>Select all that apply <b>Chagua yote yanayotumika</b></p>	<p>0 Yes, definitely Ndiyo, bila shaka Ee, mazingira kwawa</p> <p>1 Yes, probably Ndiyo, pengine Ee, samoro</p> <p>2 No, probably not La, pengine siyo Ooyo, ok apar</p> <p>3 No, definitely not La, bila shaka Ooyo mazingira kwawa</p> <p>4 They (or some) have already gotten a COVID vaccine Wapo (au wengine) tayari wamepata chanzo ya COVID Giseyudo (kata moko oseyudo)</p> <p>[Note: we prefer not to have a don't know option here]</p>		
18_R3		<p>[For ALL respondents]</p> <p>How important do you think it is that the Government ensure everyone can get vaccinated as soon as possible?          Je, unathani kama umuhimu gani kwa Serikali kuhakikisha kuwa kila mtu anaweka kupata chanzo hatakiwa kwa wakati?          Je, gani ni kile kile muhimu kama mtu anaweka kupata chanzo hatakiwa kwa wakati?</p>	<p>0 Not at all important Si muhimu hata kidogo Onge tende kata matini</p> <p>1 Somewhat important Muhimu kwa kiasi fulani Bet nigi tende</p> <p>2 Very important Muhimu sana Ngi tendo alinye</p>		
FOOD SECURITY/ASSISTANCE					
216	30	<p>In the past seven days have you/your household eaten less or skipped meals because you did not have enough money or food? Katika muda wa wiki moja iliyoita, je wewe/italo katika makao yenu umekua/mmekua kiasi kidogo au umekosa/mmekosa kula kwa sababu kukunahamkwa na pesa za kutisha au chukula cha kutisha?          E ndalo abiryo makalo be osechui/osechuno jodi munda ochien matini kati yari kach nakech nionge pesa mromomo nyewe chemo?</p>	<p>No La Ooyo</p> <p>Yes Ndiyo Ee</p>	220	
318	31	<p>How frequently are you/your household skipping meals or eating less. Would you say every day, a couple times a week or once a week? Je, wewe/italo katika makao yenu umekosa/mmekosa mlo au kula kidogo mara nyingi kiasi gani? Je, ungesema ni kila siku, mara kadhaa kwa wiki au mara moja kwa wiki?          Iliyo kach kata chemo matini marom rade, Diwach ni pile pile, dimand e juma koso dimand e juma?</p>	<p>a. Every day Kila siku Pile pile</p> <p>b. A couple times a week Mara kadhaa kwa wiki Dimand e juma</p> <p>c. Once a week Mara moja kwa wiki Dichiel e juma</p>		
217	32	<p>Was eating less/skipping meals related to the situation with Coronavirus? Je, kula kidogo/kukosa mlo kuhusiana na janga la virusi vya Korona?          Be chemo matini/nyo kach notidore gi wach mar Korona?</p>	<p>No La Ooyo</p> <p>Yes Ndiyo Ee</p>		
220	33	<p>In the past seven days have you received any cash, vouchers, food, soap/sanitizer or other goods because of Corona virus? Your response will not increase or decrease your chances of getting any of these items, so please answer as honestly as you can. Would you say, Katika muda wa wiki moja iliyoita je umepokea pesa tasimu, vouchi, chukula, sabuni/sanitizer (sanitiza) au bidhaa nyingine kwa sababu ya virusi vya Korona? Jibu lako halitongeza au kupungaza uwezekano wako wa kupata chochote kati ya vilu hivyo, kwa hivyo sishitaji jibu kwa uaminifu unayoweza. Je, wawezza kusema, Kuum ndalo abiryo makalo, bende iseyudo pesa, vouchi, chemo, sabuni/sanitizer kama gimo amara machielo nakech Korona? Duokoni ok bi mendo kata duoko chien nyatoni mar yudo muna amara kuum gige, koro yie iduok ma ratiro kaka nyalo, Diwach ni.</p>	<p>a. No assistance received Ysidume usaidizi ulitapata</p> <p>b. Yes, received assistance due to Coronavirus Ndiyo, nilipata usaidizi kwa ajili ya Korona Ee, nayudo kony nakech Korona</p> <p>c. Yes, received assistance due to another reason Ndiyo, nilipata usaidizi kwa sababu nyingine Ee, nayudo kony nakech wach machielo</p> <p>d. Yes, received assistance but do not know the reason for it Ndiyo, nilipata usaidizi lakini sijui sababu Ee, nayudo kony, to ok ang'e ginoimyo</p>	225	
Read all options out loud					

221	34	Where did you get the assistance from? Ulipata usaidizi kutoka wapi? Niyudo kony kowuok kure?	a. Government; Serikali Sirkali b. NGO; Shirika la kiserikali Riwuruk ma ok mar sirkali (NGO) c. Church/mosque; Kanisa/maskiti Kanisa/Maskiti d. Good samaritan/Philanthropist Corporate Sponsorship; Maamaria mwema/uchamini wa shirika Jassamaria mang'won/Jang'wono/Kawo Ting' gi Riwuruk e. Family/relatives; Jami/jamaa yangu Joo/iwede f. Other: Nyirigine Machielo	0 1 0 1 0 1 0 1 0 1 0 1	
222	35	What have you received? Umepokea nini? Niyudo ang o?  Ask all answer categories aloud Uliiza kategoria zote za majibu kwa sauli Pasa kategoria zote za majibu kwa sauli	a. Cash/Money Pesa/pesa tasimu Pesa b. Food Chakula Chemo c. Water Maji Pii d. Soap/hand sanitizer Sabuni/vieuzi (sanitiza) Sabun/sanitiza e. Medicine Dawa Yath f. Other Nyirigine Machielo		
223	36	Does the assistance you receive currently cover your most important needs? Je usaidizi uliopokea hivi karibuni zinakusaidia kukimu mahitaji yako ya muhimu zaidi? Bende kony ma lyudo sani chopo dwareni madongo?	No La Oyo Yes Ndiyo Ee		225
224	37	What needs do you have that are not being met by the assistance you receive? Ni mahitaji gani uliyonayo ambayo hayawazi kukimwa na usaidizi uliopokea? Gin dwaro mige ma in godo ma ok chop gi kony ma lyudo?	a. Food Chakula Chemo b. Cash Pesa Pesa c. Shelter nyumbainakaaizi Kar dak d. Water Maji Pii e. Soap/hand sanitizer Sabuni/vieuzi (sanitiza) Sabun/sanitiza f. Medical care/medicine Uunzaji wa kiafya Arita mar theth g. Other Lingine Machielo		
225	36	What is the one biggest need that you have at this time that is not being addressed? Ni hitaji lpi kubwa ulilo rato kwa sasa ambalo halipashughulikiwa? En dwaro mane madung' ma in godo sani ma ok ngi?	a. Food Chakula Chemo b. Cash Pesa Pesa c. Shelter nyumbainakaaizi Kar dak d. Water Maji Pii e. Soap/hand sanitizer Sabuni/vieuzi (sanitiza) Sabun/sanitiza f. Medical care/medicine Uunzaji wa kiafya/dawa Arita mar theth g. Sanitary Towels Taalo za hedhi Taalo mag ria h. Other Nyirigine Machielo		
WAJ 3	37	Have you visited a health facility in the past three months? Ushawahi kutembea kituo cha afya katika muda wa mreezi mitatu iliyopita? Bende tseethi kar theth ei dicheche adek mokalo?	No La Oyo Yes Ndiyo Ee		226
WAJ 4	38	I'm going to ask you some questions about your experience at the health facility. For each one tell me if it was true or false. Nenda kukuliza mizamo wako uliopokea kwenye kituo cha afya. Kwa kila moja niantie kama ni kweli au uongo. Adhi penji penji moko kum kaka ne ineno kar theth. Ne thono ka ineno nyika ka ne en adier kata mirambo.	a. I was satisfied with my visit to the health facility Niliridhika na matembizi yangu katika kituo cha afya. Ne amor gi limbena kar theth b. I received the medical attention that I was seeking Nilipata huduma ya afya niliyokuwa nikafuta Nayudo theth mane amanyo c. There was a hand washing station with soap and water at the health facility Kulikuwa na sehemu ya kuhawa yenye maji and sabuni katika kituo cha afya. Ne nite kar logo mangi sabun gi pi kar theth d. Health care providers were wearing masks covering their nose and mouth Wahudumu wa afya walivisa barakoa iliyoziba pia na midomo yao Jotheth ne onwako mask mane oumo umgi gi dhigi e. The service/commodity that I went for was not available huduma/bidhaa niliyotaka haikuwepo Konyigima ne adhi manyo ne onge f. I was not able to receive services because of the health workers strike. Sikuwaza kupata h	### ### 0 1 0 1 0 1 0 1 0 1	

EFFECTS OF COVID-19 MITIGATION MEASURES				
226	39	<p>I want to ask a few more questions about how the Coronavirus pandemic, and the responses of the government and others to try prevent the spread of Coronavirus, may have affected you. Your responses will not have an effect on anything you may receive, so please answer as honestly as possible. In the past two weeks, have you experienced any of the following as compared to before the Coronavirus started? <b>Nataka kukuliza mawili zaidi machache kuhusu vile mkupuko wa Virusi vya Korona, na jina serikali na wadau wengine wamehughulika kujibu kuzua kuesha kwa virusi vya Korona, iweza kuwa imekuathiri. Majibu yako hayakuwa na athari yoyote kuhusu chochote ambacho huenda ukapokea, kwa hivyo tafadhali jibu kwa uaminifu iwezekanavyo. Je, katika muda wa wiki mbili zilizoita umepata mamba yoyote yaliutoaji kwa kutingamisha na kabisa ya kuanza kwa virusi vya Korona?</b></p> <p><b>Adwa peni peni mko mkand kuum kaka muochi mar Korona, kod ya ma sirikali kod penko temo geng'ogo landruk mar Korona, dipo ni osemu. Duokoni ok bi loko gimono amona ma nyalo yuto, koro yie shuk ma ritiro kaka nyalo. Kuoni jumbe anyo mokalo, benke iwekale magie kipimo gi ndalo mokalo ne chakruok Korona?</b></p> <p><b>READ ALL ANSWERS ALOUD SOMA MAJIBU YOTE KWA SAUTI</b></p>	<p>NC/ES</p> <p>a. See my family less <b>Nimewaona watu wa familia yangu mara chache zaidi</b> <b>Neno joda c</b> 0 1</p> <p>b. See my friends less <b>Nimewaona marafiki zangu mara chache zaidi</b> <b>Neno osiepe di m</b> 0 1</p> <p>c. Avoid public transport <b>Nakupuka usafiri wa umma</b> <b>Weyo yor wuoth mar oganda</b> 0 1</p> <p>d. Complete loss of job/income <b>Nimepoteza kabisa kazi/ajira</b> <b>Wito yor yuto chutho</b> 0 1</p> <p>e. Partial loss of job/income <b>Nimepoteza kazi/ajira kwa kiasi fulani</b> <b>Wito bath yor yuto</b> 0 1</p> <p>f. Increased expenses for the household <b>Matumizi ya nyumbani yameongezeka</b> <b>Medruo</b> 0 1</p> <p>g. More time spent cooking for the household <b>Natumia muda mwingi zaidi kupika familia</b> <b>Kawo thudo mang'eny mar tado ne joo</b> 0 1</p> <p>h. More time spent cleaning the house <b>Natumia muda mwingi zaidi kuafisha nyumba</b> <b>Kawo thudo mang'eny mar kelo ot malar</b> 0 1</p> <p>i. More time spent taking care of children <b>Natumia muda mwingi zaidi kuwatunza watoto</b> <b>Kawo thudo mang'eny mar rito nyithindo</b> 0 1</p> <p>j. More time spent taking care of livestock/farming <b>Natumia muda mwingi kuchunga mitugokuluma</b> <b>Kawo thudo mang'eny mar rito chiayepur</b> 0 1</p> <p>k. More time fetching water <b>Natumia muda mwingi kuteka maji</b> <b>Kawo thudo mang'eny ma</b> 0 1</p> <p>l. More tensions in the household <b>Uhasama zaidi nyumbani</b> <b>Medruok mar chury marach</b> 0 1</p> <p>m. More arguing in the household <b>Magombano zaidi nyumbani</b> <b>Medruok mar lwemruok</b> 0 1</p> <p>n. Increase of crime in your neighborhood? <b>Kuongezeka kwa uhalifu katika kilongoti cheni</b> 0 1</p> <p>o. Experienced more violence outside the house? <b>Kushuhudia ukataji zaidi rija ya nyumba?</b> <b>Romo gi ang'engelmasira mang'eny oko mar uti</b> 0 1</p> <p>p. More fear that your partner will harm you <b>Woga zaidi kuwa mwenzi wako atakuumiza</b> <b>Medruok mar fuoro ni nyawadu biro hini</b> 0 1</p> <p>q. Experienced more violence inside the household? <b>Kushuhudia ukataji zaidi nyumbani?</b> <b>Romo gi ang'engelmasira mang'eny ei ot?</b> 0 1</p> <p>r. Not accessing health care/services/medicines that you would have otherwise needed <b>Kutoweza kupata utunzaji wa kiafya/hudumamadawa ambayo ungehitaji</b> <b>We yudo siriafory mar theeth kaka yedhe ma idearo</b> 0 1</p> <p>s. Increase in food prices <b>Kuongezeka kwa bei ya chakula</b> <b>Medruokmar nengo chiamo</b> 0 1</p> <p>t. Increase in the cost of cooking fuel <b>Kuongezeka kwa bei ya rija ya kupika</b> <b>Medruok mar nengo yor tado</b> 0 1</p> <p>u. Less time spent praying <b>Nachukua muda mchache kuomba/kusali/kuabudu</b> <b>Kawo thud</b> 0 1</p> <p>v. Other <b>Nyingine</b> <b>Machiolo</b> 0 1</p>	<p>Ask 414- If option r,s,t,y = yes (if atleast one is yes)</p> <p>(code to give referral)</p> <p>If NO (at option m), SKIP</p> <p>WAJ</p> <p>9</p>
414	40	<p>How has the increase in household work had an impact in your ability to generate income in the past two weeks? <b>Ni sababu gani kuu iliyokufanya ukakosa kwenda kupata huduma za alya?</b> <b>En wach mane madung' mane omioyo lewo ne kony mar theeth?</b></p> <p><b>Ere kaka medruok mar ije ni osedachio nyaloni mar yuto e jumbe anyo mokalo. Diwach ni:</b></p>	<p>a. It has had no impact <b>Hakujakuwa na athari yoyote</b> <b>Pok ochacho</b> 1</p> <p>b. It's causing you to earn a bit less money <b>Inakufanya upate pesa kidogo</b> <b>Omioyo bet iloso pi</b> 2</p> <p>c. It's causing you to earn a lot less money <b>Inakufanya upate pesa kidogo sana</b> <b>Omioyo ilo</b> 3</p> <p>d. It has caused you to completely stop earning money <b>Imesababisha uache kabisa kupata i</b> 4</p> <p>e. It has led to an increase in the money I earn <b>Kumentanya riweze kupata pesa nyingi za</b> 5</p>	
319	40	<p>What is the main reason that you skipped health services, in the last two weeks? <b>Ni sababu gani kuu iliyokufanya ukakosa kwenda kupata huduma za alya?</b> <b>En wach mane madung' mane omioyo lewo ne kony mar theeth?</b></p> <p><b>Do not read answer categories aloud. Probe "anyone else"? Usisome majibu kwa sauti. Chunguza "mtu yeyote mwingine?"</b></p>	<p>NCS</p> <p>a. The clinics are closed because of Coronavirus <b>Kliniki zimefungwa kwa sababu ya virusi vya Korona</b> <b>Otor kliniki rikedi Korona</b> 0 1</p> <p>b. People will think I have Corona if I go to the clinic <b>Nikenda kwenye kliniki watu watafikiri nina virusi vya Korona</b> <b>Ji biro paro ni an gi Korona ka adhi e kliniki</b> 0 1</p> <p>c. I am scared that I will get infected with Coronavirus if I go to the clinic <b>Ninaogopa kuwa nisambukikwa virusi vya Korona rikenda kwenye kliniki</b> <b>Aluor ni Korona nyalo maka ka adhi e kliniki</b> 0 1</p> <p>d. I cannot afford the cost of health care services right now <b>Siwazi kupata pesa za kupika huduma za kiafya katika kliniki kwa sasa</b> <b>Ok anyai chulo nengo mar theeth gie sani</b> 0 1</p> <p>e. The health facilities do not have the medication I need <b>Vituo vya alya havina madawa ninayohitaji</b> <b>Kuonde theeth onge gi yedhe ma adwaro</b> 0 1</p> <p>f. The health facilities are only seeing a small number of patients each day <b>Vituo vya alya vyawahudumia wagonjwa wachache tu kila siku</b> <b>Kuonde theeth neno mana joto matn pile ka pile</b> 0 1</p> <p>g. The health care workers strike <b>Mogomo wa wahudumu wa alya</b> <b>Gomo mar jotheth</b> 0 1</p> <p>h. Other (specify) <b>nyingine (baja)</b> <b>Machiolo (ler)</b> 0 1</p>	

227	41	Which health care services/medicines have you given up? Ni huduma gani ya kiafya/madawa ambayo umesacha? Gin ania/konyi/edhe mage mag theth ma iseweyo?	<div><div><div>a. Check/medicine for malaria Kuchunguzwa/kupata madawa ya malaria Pimo/yadh malaria</div><div>0 1</div></div><div><div>b. Check/medicine for stomach/digestive problems Kuchunguzwa/ kupata dawa kwa ajili ya tumbo/matako ya chakula kusagika tumboni Pimo/yadh chandruk mar ichi/chiemo e ichi</div><div>0 1</div></div><div><div>c. Check/medicine for diabetes/blood pressure Kuchunguzwa/kupata madawa ya ugonjwa wa kisukari/mongo wa damu Pimo/yadh diabetes/ing'we remo</div><div>0 1</div></div><div><div>d. Care for any acute illness; Utunzaji wa ugonjwa wowote wa ghafl</div><div>0 1</div></div><div><div>e. Refills of any other regular medications you may take; Kuongezwa kwa madawa ya kawaida unayoweza kutumia Medo yath moro amora ma (ja biyogo;</div><div>0 1</div></div><div><div>f. Immunizations/nutrition services for children; Chanjo/huduma ya ishe ya watoto Chanjo/weche chiemo mag nyithindo</div><div>0 1</div></div><div><div>g. Check/medicine for pre-natal care (only women) Kuchunguzwa/kupata dawa kwa ajili ya uja uzito (kwa wanawake pekee) Pimo/yadh rit mar ndato mola/olima bang' nyuol (mwa kande)</div><div>0 1</div></div><div><div>h. Family Planning/Child spacing methods (only women) Mpango wa uzazi (kwa wanawake pekee) Yore mag komo nyuol (mwa kande)</div><div>0 1</div></div><div><div>i. Other Nyingine Machielo</div><div>0 1</div></div></div>	
CHILD MARRIAGE				
WAJ 9	42	Has anyone in your household gotten married since the start of Coronavirus? Je kama mtu yeyote katika mkao yako amotelewa/meseli tangu Korona (arise)? Dawid ni mte ang awa a nda mawele/mawelewadu nyola ne Korona dukano. Refers to where participant currently resides	<div><div><div>a. No La Ooyo</div><div>0</div></div><div><div>b. Yes Ndiyo Ee</div><div>1</div></div></div>	415
	19_R3	How many people in your household got married since start of Coronavirus? Je, ni wata wengine katika Pogramming: If Yes, ask how many and loop 43-46 accordingly	<div><div>Insert Number</div><div><div></div><div></div></div></div>	
WAJ 10	43	Who got married? Ni nani aliyelewa/aliyeoa? Ng'o mane okendi/okendo? Do not read answer categories aloud. Probe "anyone else"? Unalosome majibu kwa sauti. Chunguza "mtu yeyote mwingine?"	<div><div><div>a. Son Mwana wa kume Wuoda</div><div>1</div></div><div><div>b. Daughter Binti Nyara</div><div>2</div></div><div><div>c. Self Mimi An</div><div>3</div></div><div><div>d. Other female (specify) Mwachana mwingine (fafanua) Nyako machielo (ier)</div><div>4</div></div><div><div>e. Other male (specify) Mvulana mwingine (fafanua) Wuoi machielo (ier)</div><div>5</div></div></div>	
WAJ 11	44	About how old is the person who got married? Mtu ambaye alielewa ana umri wa miaka mingapi hivi? Ng'ama ne okendi/okendo ne en kar jahigni adi?	<div><div>AGE IN YEARS UMRI KWA MIKA</div><div><div></div><div></div></div></div> <div>DONT KNOW SUU #</div>	
513	45	In what month and year did they get married? Alielewa/alioa mwa/ni na mwaka gani? Ne gikendore dawa mane e higa mane?	<div><div>Month (drop down)</div><div>Year (2020/2021/2022)</div></div>	
WAJ 12	46	I'm going to read some statements about that marriage. For each one tell me if it is true or false. Nianza kusoma mambo mengine kuhusu ndoa hi. Kwa kila moja nambie kama ni kweli au uongo. Adhi some weche ndoa kum kendo. Ne moro ka moro nyisa ka en adier kata mrambo.	<div><div><div>a. The marriage was planned to happen before Coronavirus Ndoa ilipangwa kutanyika kabla ya Korona Huchen kend ka pok Korona ochakore</div><div>0 1</div></div><div><div>b. The marriage happened because the person was out of school before Coronavirus started Ndoa ilifanyika kwa sababu huyo mtu aliwacha shule kabla ya korona Kend notimore nitech jagono ne owe skul ka pok Korona ochakore</div><div>0 1</div></div><div><div>c. The marriage happened because schools were closed for Coronavirus Ndoa ilifanyika kwa sababu shule zifungwa kwa ajili ya Korona Kend notimore nitech notor skunde ne wach Korona</div><div>0 1</div></div><div><div>d. The marriage happened because our family needed money Ndoa ilifanyika kwa sababu familia yetu ilihitaji pesa Kend notimore nitech joodwa ne dwa pesa</div><div>0 1</div></div><div><div>e. The marriage happened to cope with changes in that person's life, or their families' lives, that were caused by the Coronavirus pandemic Ndoa ilifanyika ili kukabiliana na mabadiliko katika maisha ya mtu huyo, au maisha ya familia yake, iliyotewa na janga la Korona Kend notimore moro okony lakisage mane olmore e ngima jagono, kata e ngima joodgi, mane olmore nitech muoch mar Korona</div><div>0 1</div></div><div><div>f. There was another reason why the marriage happened (specify) Kulikuwa na sababu nyingine iliyofanya ndoa ilianike (fafanua) Nise gimachielo mane omio kend olmore (ier)</div><div>0 1</div></div></div>	



RELATIONSHIP/PREGNANCY/FP					
415	47	Which statement best describes your current situation? Je! Ni kauli gani kauli ya zifuatazo inayopoteza vizuri zaidi hali yako kwa sasa? Ewe macha ma lero maber mdoyo chalni ma sani?  Read all answer categories aloud. Choose only one	a. Have a husband/partner and currently living with them Nina mume/mwenzi na ninaishi ni 1 b. Have a husband/partner and NOT currently living with them Nina mume/mwenzi ambaye 2 c. Do not have a husband/partner Sina mume/mwenzi Aonje jada/nyawadwa 0 d. Partner deceased Mwenza amefariki Nyawadwa ne osetho		417  F1
416	48	When was the last time you saw this husband/partner? Ni lini mara ya mwisho ulipomwona mume/mwenzi huyu? Nineno jacininiyavuduni karani o mogik?	a. Within the past 2 weeks Katika muda wa wiki 2 zilizopita Eji jumbe 2 mozik 1 b. Between 2-4 weeks ago Kati ya wiki 2-4 zilizopita Kindi jumbe 2-4 makoala 2 c. More than 1 month ago Zaidi ya mwazi mmoja uliopita Moyo dwe 1 makoala 3		
417	49	Are you currently satisfied in your relationship with your main partner? Would you say... Je kwa sasa umeridhika katika uhusiano na mwenzi wako? Je, waweza kusuma: Bende iwingi ka tushuk ma in godo gi osepni mithoro tudongo mdoyo mait gi sani? Diwazi ni:  Read answer categories aloud and select one. Soma majibu kwa sauti na uchague jibu moja	a. Very satisfied Nimeridhika sana Oroma ahinya 1 b. Somewhat satisfied Nimeridhika kwa kiasi fulani Bet oroma 2 c. Not satisfied or unsatisfied Siwezi kusuma nimeridhika au la Ok anyai wacho ka oror 3 d. Somewhat unsatisfied Sijidhika kwa kiasi fulani Bet ok oroma 4 e. Very unsatisfied Sijidhika hata kidogo Ok oroma ahinya 5		
F1		IF MALE -> SKIP			450
Now I would like to ask a few questions about pregnancy and if and how Coronavirus may have affected you or your partner's use of family planning. I know these questions may be a bit personal, but please be as honest as you can Sasa ningependa kukuliza maswali kadhaa kuhusiana na uga-uzito na kama au jinsi gani kuwepo kika virusi vya Korona huenda kumebathiri ukumizi wako au wa mwenzi wako wa mpango wa uzazi. Najua maswali haya yanaweza kuwa nyeti sana, lakini nitakuomba ujibu kwa umwazi wa kweli. Koro dhati perjo perjo mambi kuoni ichi kendo ka dipo ni kendo kaka Korona osemulika kaka ityo kaka osepni ityo gi yore komo nyusi. Angiyo ni perjo gi nyalo bado maye, to ye bedi jaratiro kaka nyalo					
514	50	Have you been pregnant any time since March 2020, regardless of the state of the pregnancy or how it ended? Je, umewazi kuwa mja mtoke wakati wote kutoka mwazi wa tatu 2020, bila kuzingatia hali ya mimba au jinsi ilivyokamilika? Bende isibede gi ichi e shuulo mmo amora chakre dwe mar adek 2020, ka ok ingiyo chali mar jino kaka kaka mogik?	No La Oovo 1 Yes Ndiyo Akia 2 Don't know Sina Akia 3		
418	51	Which statement best describes your current situation? Would you say... Ni kauli gani inayopoteza vyema zaidi hali yako kwa sasa? Je, waweza kusuma: En wach mane ma lero maber mdoyo chalni masani? Diwazi ni:  Read all answer categories aloud. Select only one. Soma majibu yote kwa sauti. Chague jibu moja tu. Som kidienje duto mag duoko matek. Yier schiel kende.	Currently pregnant or probably pregnant Kwa sasa nina mimba au yaweza kuwa nina mimba 1 Currently living to become pregnant Kwa sasa ninaaribu kushika mimba Ileni mako ichi si 2 Recently had a baby Nimeifunua mtoto karibuni Ninyudi machigini 3 Not currently pregnant and do not wish to become pregnant Kwa sasa sina mimba na sindoi 4 Can no longer have children because you or your partner are infertile Siwezi tena kupata watoto kwa sababu mimi au mwenzi wangu ni tasa Ok inyal yudo nyithindo nilechi in kata osepni onge nyalo mar nyusi 5		516 450 450
419	52	If you found out today that you were pregnant, you would feel... Uingefurahi ungingufurika kwa una mimba: Ka de ilweny kawuoni ni in gi ichi, diwazi ka:  Read answer categories aloud Soma majibu kwa sauti	Very unhappy Ninohezunika sana Okamor kata matini 3 Somewhat unhappy Ningehezunika kwa kiasi fulani Bet okamor 2 Somewhat happy Ningefurahi kwa kiasi fulani Bet amor 1 Very happy Ningefurahi sana Amor ahinya 0		
425	53	Are you or your partner currently doing something to avoid or delay pregnancy? Je, kwa sasa wewe au mwenzi wako mnaifanya lolote kuipuka au kucheleweshia kushika mimba? Bende itimo kaka nyawadu timo gimoro mar geng'o kaka dhoro mako ichi?	No La Ooyo 0 Yes Ndiyo Ee 1		430
426	54	What method are you or your partner currently using? Kwa sasa wewe au mwenzi wako mnamia njia gani ya kupanga uzazi? Ityo kaka nyawadu ityo gi jo mane gie sani?	a. Female sterilization Kufungwa kizazi kwa mwanamke 0 1 b. Male sterilization Kufungwa uzazi kwa mwanamume 0 1 c. IUD IUD (Kali) 0 1 d. Injectables Sindano 0 1 e. Implants Chembe za kupachika mwilini 0 1 f. Oral contraceptive pills Tembe za kumeza 0 1 g. Male condom Kondomu za kiume 0 1 h. Female condom Kondomu za kike 0 1 i. Emergency contraception Tembe za kumeza za wakati wa dhanura (E-pill) 0 1 j. Standard days method Njia ya kuhesabu siku 0 1 k. Lactational Amenorrhea Method/ Breastfeeding Njia ya kuzuia kuanza kwa hedhi kwa kur 0 1 l. Withdrawal Njia ya kutoa uume kabla ya kumwaga shahawa 0 1 m. Abstinence Kujizula 0 1 n. Other (specify) Nyingine (fafanus) 0 1	N: YES	

[illegible]

517	63	Did you intend to get pregnant at the time that you did, want to get pregnant but at a different time, or not want to get pregnant at all? Wakati uliposhika mimba je ulikuwa unataka kuhitima mimba wakati huo, ulitaka kuhitima mimba lakini wakati mwingine tofauti, au hukutaka kuhitima mimba hata kidogo? Bende ne igeo maliko ich e kinde mane imake, ne idwa mako ich to e kinde mopogore, koso ne ok idwa mako ich kata matini?	<p>a. Yes, at that time Ndiyo, wakati huo Ee, e kindeno 1</p> <p>b. Yes, but at a different time Ndiyo, lakini wakati tofauti Ee, to e kinde mopogore 2</p> <p>c. No, not at all La skutaka hata kidogo Ooyo, ne ok adwar 3</p>	
518	64	Did any of the following apply to you at the time you became pregnant? Kati ya kaulika ulitazozo ni kaulika pi iliyokuwa kukuhusu wakati uliposhika mimba. Bende moro amara kum gigie notimoreni e kinde mane imake ich?	<p>a. Couldn't access family planning because of COVID Singeweza kupata njia ya kupanga uzazi kwa sababu ya COVID Ne ok inyal yudo yore komo nyusi nkech COVID 0 1</p> <p>b. Couldn't access emergency contraception because of COVID Singeweza kupata tembe za kuzura mimba za dhurura kwa sababu ya COVID Ne ok inyal yudo yor geng'o ich mapyo nkech COVID 0 1</p> <p>c. Couldn't access condoms because of COVID Singeweza kupata kondomu kwa sababu ya COVID Ne ok inyal yudo rabo yunga nkech COVID 0 1</p> <p>d. Needed the money/gifts from a sexual relationship Nihitaji pesa/ (zawadi kutoka kwa uhusiano wa kingono Ne idwa pesa/mich mane owuok e osep mar ringruok 0 1</p> <p>e. Needed the money I would have spent on FP or condoms for food or other basic needs Nihitaji pesa ambazo ningetumia kwa mpango wa uzazi au kondomu kununua chakula au mahitaji mengine Ne idwa pesa ma de iyogo e weche komo nyusi kata rabo yunga mondo inyawego chemo kata gik mamoko madwarore 0 1</p> <p>f. Spending more time with my husband/buyfriend/partner because of COVID Nitumia muda mwingi pamoja na rafiki yangu wa kiume/mwenzi wangu kwa sababu ya COVID 0 1</p> <p>g. Rako thudo mang'eny gi jao/osepihiyawado nkech COVID 0 1</p> <p>h. Other (specify) Nindine (ifanua) Machiolo (ier) 0 1</p>	NI YES
519	65	Have you experienced any of the following challenges accessing pre-natal care during this pregnancy? Je, umewahi kukumbwa na nyote kati ya changamoto zilizotazo kupata huduma ya kabla ya kuzaa wakati wa upa- uzozi? Bende isabedo gi moro amara kum agetegi mag yudo rit molo ne nyusi e kinde in?	<p>a. The clinics are not open to provide pre-natal care Kiniki hacikufungulwa kutoka huduma ya 0 1</p> <p>b. I cannot afford the cost of pre-natal care Siwezi kumudu gharama ya huduma ya kabla ya ku 0 1</p> <p>c. I skip prenatal care because I am worried I will get infected with Coronavirus Naeputa hudo 0 1</p> <p>d. Other challenges (specify) Chanasomoto zinaine (ifanua) Aotele miamoko (ier) 0 1</p>	
MENTAL HEALTH (PHQ-2 and GAD-2)				
450	78	Over the last 2 weeks, how often have you been bothered by any of the following problems. For each one, tell me about how many days. Katika kipindi cha wki mbili zilizotazo, ni mara ngapi umesumbuliwa na tatizo kote kati ya haya. Kwa kila moja, nambie ni kama siku ngapi havi? Kuum jumbe ariyo mokalo, nyadidi ma moro amara kum gigie osechandi? Ne moro ka moro, nyisa ni madinom ndalo asi.	<p>a. 0 days Siku 0 Ndalo 0 1</p> <p>b. 1-7 days Siku 1-7 Ndalo 1-7 2</p> <p>c. 8-12 days Siku 8-12 Ndalo 8-12 3</p> <p>d. 13 or 14 days Siku 13 au 14 Ndalo 13 kati 14 4</p> <p>e. REFUSE TO ANSWER KATAA KUJIBU TAMORE 5</p>	<p>Would you say that is more, less or about the same as compared to before the Coronavirus began? Je ungesema kuwa ni zaidi au ni kiasi kiasi kidogo au sawa kwa kulinganisha na kabla ya kuancika kwa virusi vya Korona? I a=0 or Refused, don't ask</p> <p>More 1</p> <p>Less 2</p> <p>Same 3</p>
451	79	Feeling down, depressed, or hopeless Kuvijika moyo, kuhuzunika au kukosa tama Bado gi churyi mudi, mokuyo, kata ma onge geno	<p>a. 0 days Siku 0 Ndalo 0 1</p> <p>b. 1-7 days Siku 1-7 Ndalo 1-7 2</p> <p>c. 8-12 days Siku 8-12 Ndalo 8-12 3</p> <p>d. 13 or 14 days Siku 13 au 14 Ndalo 13 kati 14 4</p> <p>e. REFUSE TO ANSWER KATAA KUJIBU TAMORE 5</p>	<p>More 1</p> <p>Less 2</p> <p>Same 3</p>
522	80	Feeling nervous, anxious or on edge Kuwa na uwoga, wasiwasi	<p>0 days Siku 0 Ndalo 0 1</p> <p>1-7 days Siku 1-7 Ndalo 1-7 2</p> <p>8-12 days Siku 8-12 Ndalo 8-12 3</p> <p>13 or 14 days Siku 13 au 14 Ndalo 13 kati 14 4</p> <p>REFUSE TO ANSWER KATAA KUJIBU TAMORE DI 5</p>	<p>=0 or Refused, don't ask</p> <p>More 1</p> <p>Less 2</p> <p>Same 3</p>
523	81	Not being able to stop or control worrying Kutoweza kuwacha au kudhibiti wasiwasi Bado ma ok nyal weyo kata qayo parruok	<p>0 days Siku 0 Ndalo 0 1</p> <p>1-7 days Siku 1-7 Ndalo 1-7 2</p> <p>8-12 days Siku 8-12 Ndalo 8-12 3</p> <p>13 or 14 days Siku 13 au 14 Ndalo 13 kati 14 4</p> <p>REFUSE TO ANSWER KATAA KUJIBU TAMORE DI 5</p>	<p>=0 or Refused, don't ask</p> <p>More 1</p> <p>Less 2</p> <p>Same 3</p>
524	82	Since the start of the Coronavirus (COVID-19) pandemic, have you sought help from family or friends because you felt low, anxious or stressed? Tangu janga la Korona (COVID-19) lazo, umewahi kuafika msaada kutoka kwa familia au marafiki kwa sababu ulihisi kuvunjika moyo, kuwa na wasiwasi au kuhitahika? Nyaka ne Korona (COVID-19) muji, bende isemanyo kony kum jodu kata osep nkech ne ibedo gi churyi mudi kata parruok?	<p>No La Ooyo 0</p> <p>Yes Ndiyo Ee 1</p> <p>Don't know Sijai Alia #</p> <p>Refuse to answer Kataa kujibu Tamore duoko #</p>	

PARTNER VIOLENCE & SEXUAL EXPLOITATION (EMERGE)					
IF MALE → SKIP				461	
IF NO PARTNER → SKIP				229	
459	83	<p>Now I would like to ask you about your difficulties that may be occurring in your relationship. Some couples are fighting more because of the stresses related to the COVID-19 pandemic. Is this the case for you to share with us a bit about your relationship. <b>Sasa nataka kukuliza kuhusu matatizo yaliyoitokea katika uhusiano wako. Wenzetu kufuatia wamekuwa wakigigana zaidi kwa sababu ya mkazo wa khatua inayohusiana na janga la Covid-19. Ningependa kukuliza ubatizaji mamba kufuatia kuhusu uhusiano wako.</b></p> <p>Koro dahir peng kuam chandruko ma nyolo beko ni wote e dahir. Juvu moko dhwa mwingi yotech parupuk mchudone gi muchi mar COVID-19. Dahir kwayi mondo nyolwase matin kuam dahir.</p>	<p><b>B. Does this occur more often or less often since the COVID-19 pandemic?</b> <b>B. Je, hi inatokkea mara nyingi zaidi au mara chache zaidi tangu janga la COVID-19 ilikae?</b> <b>B. Ma timore di mwingi koso matin mabayo nyaka na COVID-19 mug?</b></p> <p>MORE OFTEN MARA</p> <p>L E S S</p> <p>SA ME SA S</p>		
460	84	<p>In the past one month, has your male partner slapped you, hit you, kicked you, thrown things at you, or done anything else to physically hurt you? <b>Katika muda wa mwezi mmoja ulopita je mwenzako wa kiume amekupiga kofi, amekugunga, amekupiga lake, amekunusha viti, au amefanya jambo lingine lolote ili akuumiza kiumiwi?</b></p> <p><b>E dwe achiel mokalo, bende jachinyawadu ma wuo osechuni imo hera ka na ok idah?</b></p>	<p><b>A. In the past one month?</b> <b>A. Katika muda wa mwezi mmoja ulopita?</b> <b>A. E dwe achiel mokalo?</b></p> <p>(if no, skip b)</p> <p>NO LA OO</p> <p>YES NDIYO EE</p>	<p><b>B. Does this occur more often or less often since the COVID-19 pandemic?</b> <b>Je hi inatokkea mara nyingi zaidi au mara chache zaidi tangu janga la COVID-19 ilikae?</b></p> <p>MORE OFTEN MARA</p> <p>L E S S</p> <p>SA ME SA S</p>	
461	85	<p>In times of crisis, or just in cases when people are in need, they are asked sometimes to do sexual things for money or other resources. Sometimes people also enter into or stay in relationships because they anticipate that they will get money or other things they need like money, rent, clothes, etc. During the past one month, have you had sex in exchange for food, gifts, or money or stayed in a relationship because you thought you would get those things from your partner? <b>Wakati wa dhurura, au wakati tu ambapo watu wana mahitaji, wakati mwingine wanawomba wafanye ngono ili wapate pesa au viti vingine. Wakati mwingine watu huingia katika mahusiano au hukaa katika mahusiano kwa sababu wanatajiia kupata pesa au viti vingine wanavyohitaji kama, kodi ya nyumba, nguo na kadhalika. Katika muda wa mwezi mmoja ulopita je unafanya ngono ili kupata chukula, zawadi nyingine, au pesa au ukakaa katika uhusiano na mtu kwa sababu udhani kuwa utapata vitu hivyo kutoka kwa mwenzako?</b></p> <p><b>E kinde mag chandruko, kaka mana e kinde ma ji nigi dware, seche moko kionaji mondo giti timbe hera mondo giw pesa kaka gi mamoko. Seche moko bende</b></p>	<p><b>A. In the past one month?</b> <b>A. Katika muda wa mwezi mmoja ulopita?</b> <b>(if no, skip b)</b></p> <p>NO LA OO</p> <p>YES NDIYO OOYO</p>	<p><b>B. Does this occur more often or less often since the COVID-19 pandemic?</b> <b>Je hi inatokkea mara nyingi zaidi au mara chache zaidi tangu janga la COVID-19 ilikae?</b></p> <p>MORE OFTEN MARA</p> <p>L E S S</p> <p>SA ME SA S</p>	
CONCLUSION OF INTERVIEW					
229	86	<p>Do we have your permission to recontact you in the future? <b>Je tukio na dhiri yako kuwasiliana nawe tena siku zisizo?</b></p> <p><b>Bende imiyoa thudlo mar tudruok kodi kendo ndalo mabiro?</b></p>	<p>Yes NDIYO EE</p> <p>No LA OOYO</p>	<p>1</p> <p>2</p> <p>89</p>	
134	87	<p>Could you give me a contact we can use to contact you in the future? <b>Je, unaweza kumpa namba ambayo tunaweza kutumia kuwasiliana nawe siku zisizo?</b></p> <p><b>Bende inyalo miya yor tudruok ma wanyalo tudorego kodi ndalo mabiro?</b></p>	<p>Phone Number _____</p> <p>(confirm)</p>		
229	88	<p>Could you tell me your name or nickname? <b>Pia waweza kunambia jina lako halisi au la utani?</b></p> <p><b>Bende inyalo nyisa nyingi ma adiri kaka mar angere?</b></p>			
89		<p>As you may recall, [name of adolescent] is also participating in our COVID-19 research and we interviewed them last time as well. May we have your permission to interview them again? <b>Kama unavyoweza kukumbuka, [jina la kijana] pia anashiriki kwenye utafiti wetu wa COVID-19 na kufuata wakati ulopita pia. Je, tunaweza kupata kuhusu yako tena tena?</b></p> <p><b>Kaka inyalo paro, [jina rawera] bende nite e nono mar COVID-19 kendo en bende ne wamye penjo e thudlo mokalo. Bende imiyoa thudlo mar miye penjo kendo?</b></p>	<p>No LA OOYO</p> <p>Yes NDIYO EE</p>	<p>1</p> <p>2</p>	
90		<p>Is [ADOLESCENT GIRL] [THAT BOY] available for the interview? <b>Je, [JULIANA MSICHANA] MVULANA HUYO yako nyumba?</b></p> <p><b>Bende [RAINERA MA NYAKO] [WUCHI NO] in data?</b></p>	<p>Yes, available</p> <p>Not available</p>	<p>1</p> <p>2</p> <p>91</p> <p>Ask why not available</p>	
90 a		<p>If adolescent not available for interview ask: Why is [Spendine, participant_name] not available for interview? <b>Ikiwa kijana hapatikani kwa mahojiano utia: Mbona [Spendine, participant_name] hapatikani kwa mahojiano?</b></p> <p><b>Ka rawera ok yudre ne chero mar penjo, penjo. Ango, momiyo [Spendine, participant_name] ok yudre ne penjo?</b></p>	<p>Gone back to school <b>Amenuzi dhidhi</b> <b>Otoki sikul</b></p> <p>He/she travelled and can't be reached on phone <b>Aliafiri na hawati kufika kwa simu</b> <b>Odi wudh kendo ok nyai yude e simu</b></p> <p>Other <b>Ndavya</b> <b>Itachiselo</b></p>		
91		<p>Can you give me the phone number I can use to talk to [ADOLESCENT GIRL] [THAT BOY]? <b>Pia unaweza kunambia na namba ya simu inayoweza kutumia kuwasiliana na [JULIANA MSICHANA] MVULANA HUYO?</b></p> <p><b>Bende inyalo miya namba sime ma anyalo wuoyo</b></p>			

96	May we have your permission to interview (ADOLESCENT GIRL) (THAT BOY) if the school allows? Je! tunaweza kupata ruhusa yako ya kumbi? (KIJANA MSICHANA) (MULANA HUYO) ikiwa shule inaruhusu? Be wanyito guto thuo maiti mar penjo	No La Ooyo Yes Ndiyo Ee	
IF SITE = KISUMU SKIP TO END OF INTERVIEW NOTE			
97	Like I explained to you earlier in a few weeks from today, we will conduct a literacy and numeracy test which will be administered face to face by an interviewer. We would like to know where you currently live.	County sub-county	1 2
97a	Land marks Write in details how to get to the Household. Capture major roads, well known shops and how people refer to the respondent in the neighbourhood.		
	We have reached the end of the interview. Thank you so much for your time and for answering our questions. Do you have any question or comment for me? Tumelikia mwenito wa mahojiano. Ahsante sana kwa muda wako na kujibu maswali yetu. Je, una swali lolote au maoni yoyote? Wachaipo e giko mar chevo mar penjo. Erokamano maduong' kuom thudoni kendo kuom duoko perjowa. Bende in gi penjo kata wach moro amora ma dimya?	No La Ooyo Yes Ndiyo Ee	1 2
A REGISTERED NAME AND NUMBER FOR REIMBURSEMENT 226 - If yes, program a prompt offer a referral for SGBV counseling. If yes to four or more 450 and 451, referral for mental health services			

Supplementary Table 1: variables included in K-Means clustering to create the clusters with variable description, means and standard deviation

Variable Name	Mean	SD	Question Description
Educational attainment			
Pre-Primary/None	0.04	0.19	No Education/Pre-Primary (0 = No, 1 = Yes)
Primary	0.4	0.49	Primary Education (0 = No, 1 = Yes)
Secondary	0.43	0.5	Secondary Education (0 = No, 1 = Yes)
Higher Education	0.13	0.34	Higher Education (0 = No, 1 = Yes)
Age in years	36.45	11.3	Age (continuous)
Gender	0.63	0.48	Gender (0 = Male, 1 = Female)
Marital Status			
Married	0.59	0.49	Married (0 = No, 1 = Yes)
Single	0.24	0.43	Single (0 = No, 1 = Yes)
Divorced/Separated	0.17	0.37	Divorced/Separated (0 = No, 1 = Yes)
Slum of residence			
Kibera	0.22	0.42	Respondents from Kibera (0 = No, 1 = Yes)
Dandora	0.24	0.42	Respondents from Dandora (0 = No, 1 = Yes)
Huruma	0.13	0.34	Respondents from Huruma (0 = No, 1 = Yes)
Kariobangi	0.2	0.4	Respondents from Kariobangi (0 = No, 1 = Yes)
Mathare	0.21	0.41	Respondents from Mathare (0 = No, 1 = Yes)
Perceived Risk of COVID-19	1.07	0.83	Perceived Risk (0 = No/Low Risk, 1 = Medium Risk, 2 = High Risk)
Knowledge of COVID-19 symptoms			Participants were asked if they knew common symptoms of COVID-19

<b>No Known Symptoms</b>	0.07	0.26	No Known Symptoms (0 = No, 1 = Yes)
<b>Fever</b>	0.81	0.4	Fever (0 = No, 1 = Yes)
<b>Headache</b>	0.54	0.5	Headache (0 = No, 1 = Yes)
<b>Cough</b>	0.88	0.32	Cough (0 = No, 1 = Yes)
<b>Diarrhea</b>	0.06	0.23	Diarrhea (0 = No, 1 = Yes)
<b>Difficulty Breathing</b>	0.46	0.5	Difficulty Breathing (0 = No, 1 = Yes)
<b>Loss of Taste</b>	0.01	0.08	Loss of Taste (0 = No, 1 = Yes)
<b>Loss of Smell</b>	0.02	0.14	Loss of Smell (0 = No, 1 = Yes)
<b>Tiredness/Fatigue</b>	0.24	0.43	Tiredness/Fatigue (0 = No, 1 = Yes)
<b>Chest Pain</b>	0.05	0.22	Chest Pain (0 = No, 1 = Yes)
<b>Chills</b>	0.01	0.12	Chills (0 = No, 1 = Yes)
<b>Rash</b>	0.03	0.07	Rash (0 = No, 1 = Yes)
<b>Dizziness</b>	0.03	0.18	Dizziness (0 = No, 1 = Yes)
<b>Sneezing</b>	0.47	0.5	Sneezing (0 = No, 1 = Yes)
<b>Sore Throat</b>	0.08	0.26	Sore Throat (0 = No, 1 = Yes)
<b>Body Ache</b>	0.34	0.47	Bodyache (0 = No, 1 = Yes)
<b>Know Three Symptoms</b>	0.32	0.47	Know at least 3 symptoms of COVID-19 (0 = No, 1 = Yes)
<b>Believe myths about COVID-19</b>			
<b>God</b>	0.27	0.44	Believe myth that God protects (0 = No, 1 = Yes)
<b>Hot Places</b>	0.11	0.31	Believe myth that hot weather will prevent infection (0 = No, 1 = Yes)
<b>Rural</b>	0.05	0.23	Believe myth that rural areas are not affected (0 = No, 1 = Yes)



<b>Any Myth</b>	0.24	0.42	Believe any myth about COVID-19 (0 = No, 1 = Yes)
<b>Know Hotline for COVID-19 concerns and information</b>	0.6	0.49	Know hotline number (0 = No, 1 = Yes)
<b>Know someone positive for COVID-19</b>	0.03	0.17	Know anyone who is positive for COVID-19 (0 = No, 1 = Yes)
<b>If Sick, would ...</b>			
<b>Isolate</b>	0.24	0.43	If sick, will isolate (0 = No, 1 = Yes)
<b>Get Tested</b>	0.27	0.44	If sick, will get tested (0 = No, 1 = Yes)
<b>Distance 2m</b>	0.1	0.3	If sick, will distance 2 meters from others (0 = No, 1 = Yes)
<b>Go to Clinic</b>	0.64	0.48	If sick, will go to clinic (0 = No, 1 = Yes)
<b>Wears a Mask</b>	0.6	0.49	Will wear mask when going outside (0 = No, 1 = Yes)
<b>Wears Mask Correctly</b>	0.04	0.2	Will wear mask correctly when going outside, meaning over the nose and mouth (0 = No, 1 = Yes)
<b>Food insecurity</b>	0.68	0.47	Skipped meals due to COVID-19 (0 = No, 1 = Yes)
<b>Avoid Transport due to COVID-19 risks</b>	0.72	0.45	Avoided public transport due to COVID-19 (0 = No, 1 = Yes)
<b>Loss of Income</b>			
<b>Complete</b>	0.47	0.5	Complete loss of income (0 = No, 1 = Yes)
<b>Partial</b>	0.58	0.49	Partial Loss of Income (0 = No, 1 = Yes)
<b>Experience of symptoms</b>			
<b>Fever</b>	0.03	0.17	Has fever (0 = No, 1 = Yes)
<b>Difficulty Breathing</b>	0	0.07	Has difficulty breathing (0 = No, 1 = Yes)
<b>Cough</b>	0.04	0.2	Has cough (0 = No, 1 = Yes)
<b>Aches</b>	0.02	0.14	Has body aches (0 = No, 1 = Yes)
<b>Sore Throat</b>	0.01	0.09	Has sore throat (0 = No, 1 = Yes)
<b>Tired</b>	0.01	0.11	Is tired (0 = No, 1 = Yes)

<b>Lost sense of Taste/Smell</b>	0	0.05	Lost sense of taste and/or smell (0 = No, 1 = Yes)
<b>Sum of Symptoms</b>	0.12	0.44	Sum of COVID=19 symptoms present
<b>Have Two Symptoms</b>	0.02	0.14	Have two COVID-19 symptoms present (0 = No, 1 = Yes)
<b>Household Size</b>	2.61	0.93	Household size (# members)
<b>Travel Far for work</b>	0.53	0.5	Have to travel far for work (0 = No, 1 = Yes)
<b>Have Electricity</b>	0.72	0.45	Have electricity at home (0 = No, 1 = Yes)
<b>Have Social Support</b>	0.43	0.49	Have access to social support system meaning people who would bring food, bring medicine, and check in on them if sick (0 = No, 1 = Yes)
<b>Received government support</b>	0.09	0.29	Have received some form of government assistance, financial, food, or other (0 = No, 1 = Yes)
<b>Perceives Assistance Meets Needs</b>	0.34	0.47	Government assistance received meets needs (0 = No, 1 = Yes)
<b>Gender-Based Violence Risk</b>	0.37	0.48	Risk of gender-based violence at home (0 = No, 1 = Yes)
<b>Fears related to COVID-19</b>			
<b>Increased Crime</b>	0.04	0.19	Increased crime due to lockdown (0 = No, 1 = Yes)
<b>Crowds</b>	0.04	0.2	Difficult to keep away from crowds (0 = No, 1 = Yes)
<b>Deadly Virus</b>	0.59	0.49	It is a deadly virus (0 = No, 1 = Yes)
<b>Food Shortages</b>	0.3	0.46	Food shortages (0 = No, 1 = Yes)
<b>Hospitalization</b>	0.06	0.24	Fear of being hospitalized (0 = No, 1 = Yes)
<b>Infect Others</b>	0.21	0.41	Fear of infecting others (0 = No, 1 = Yes)
<b>Being Lied To</b>	0	0.04	Fear being lied to by the Government (0 = No, 1 = Yes)
<b>Loss of Income</b>	0.43	0.49	Fear loss of income (0 = No, 1 = Yes)
<b>No Cure</b>	0.42	0.49	There is no cure for this virus (0 = No, 1 = Yes)

No Transport	0.02	0.14	No transport available (0 = No, 1 = Yes)
Quarantine	0.11	0.32	Fear of being quarantined (0 = No, 1 = Yes)
Rent	0.12	0.33	Fear of not being able to pay rent (0 = No, 1 = Yes)
Separated from Family	0.18	0.38	Fear of being separated from family (0 = No, 1 = Yes)
Awareness of treatment	0.02	0.14	Don't know where to get treatment (0 = No, 1 = Yes)

Supplementary Table 2: cluster means of each variable by cluster used in K-Means clustering

Variable	Cluster 1 (mean (SD))	Cluster 2 (mean (SD))	Cluster 3 (mean (SD))
Educational Attainment			
Pre Primary/None	0.13 (0.36)	0.11 (0.35)	0.08 (0.31)
Primary	0.40 (0.48)	0.45 (0.49)	0.17 (0.36)
Secondary	0.38 (0.48)	0.35 (0.48)	0.53 (0.50)
Higher Education	0.09 (0.28)	0.09 (0.29)	0.21 (0.41)
Age in years	51.31 (6.10)	37.72 (3.75)	22.99 (3.18)
Gender	0.56 (0.49)	0.7 (0.46)	0.58 (0.50)
Marital Status			
Married	0.64 (0.49)	0.67 (0.48)	0.34 (0.48)
Single	0.12 (0.37)	0.13 (0.38)	0.58 (0.49)
Divorced/Separated	0.23 (0.41)	0.2 (0.40)	0.07 (0.25)
Slum of residence			
Kibera	0.26 (0.42)	0.22 (0.41)	0.16 (0.36)
Dandora	0.23 (0.45)	0.27 (0.46)	0.34 (0.48)
Huruma	0.14 (0.33)	0.12 (0.31)	0.09 (0.29)
Kariobangi	0.17 (0.37)	0.16 (0.35)	0.23 (0.42)
Mathare	0.19 (0.40)	0.24 (0.42)	0.18 (0.39)
Perceived Risk of COVID-19	0.95 (0.80)	0.94 (0.80)	0.90 (0.79)

<b>Knowledge of COVID-19 Symptoms</b>			
<b>No Known Symptoms</b>	0.02 (0.07)	0.02 (0.06)	0.01 (0.05)
<b>Fever</b>	0.55 (0.40)	0.55 (0.39)	0.58 (0.38)
<b>Headache</b>	0.47 (0.50)	0.44 (0.50)	0.44 (0.50)
<b>Cough</b>	0.80 (0.37)	0.80 (0.36)	0.84 (0.32)
<b>Diarrhea</b>	0.03 (0.29)	0.02 (0.31)	0.03 (0.32)
<b>Difficulty Breathing</b>	0.42 (0.47)	0.44 (0.47)	0.43 (0.46)
<b>Loss of Taste</b>	0.05 (0.25)	0.04 (0.26)	0.07 (0.26)
<b>Loss of Smell</b>	0.05 (0.41)	0.04 (0.41)	0.04 (0.41)
<b>Tiredness/Fatigue</b>	0.16 (0.45)	0.16 (0.46)	0.13 (0.44)
<b>Chest Pain</b>	0.09 (0.39)	0.1 (0.39)	0.08 (0.39)
<b>Chills</b>	0.03 (0.15)	0.03 (0.15)	0.02 (0.12)
<b>Rash</b>	0.01 (0.34)	0.02 (0.35)	0.01 (0.36)
<b>Dizziness</b>	0.19 (0.19)	0.19 (0.19)	0.21 (0.18)
<b>Sneezing</b>	0.51 (0.48)	0.51 (0.47)	0.49 (0.47)
<b>Sore Throat</b>	0.15 (0.45)	0.16 (0.44)	0.17 (0.45)
<b>Body Ache</b>	0.19 (0.37)	0.18 (0.38)	0.19 (0.37)
<b>Know Three Symptoms</b>	0.36 (0.37)	0.40 (0.41)	0.39 (0.41)
<b>Believe Myths about COVID-19</b>			
<b>God</b>	0.17 (0.44)	0.17 (0.43)	0.11 (0.38)
<b>Hot Places</b>	0.44 (0.29)	0.44 (0.29)	0.44 (0.28)
<b>Rural</b>	0.47 (0.23)	0.49 (0.21)	0.48 (0.24)
<b>Any Myth</b>	0.24 (0.41)	0.24 (0.40)	0.20 (0.36)
<b>Know Hotline for COVID-19 concerns and information</b>	0.25 (0.47)	0.23 (0.46)	0.24 (0.48)
<b>Know someone positive for COVID-19</b>	0.03 (0.20)	0.02 (0.17)	0.03 (0.18)
<b>If Sick, would ...</b>			
<b>Isolate</b>	0.28 (0.46)	0.30 (0.47)	0.41 (0.49)
<b>Get Tested</b>	0.33 (0.44)	0.36 (0.44)	0.35 (0.45)
<b>Distance 2m</b>	0.08 (0.47)	0.08 (0.47)	0.10 (0.48)

<b>Go to Clinic</b>	0.73 (0.45)	0.73 (0.45)	0.68 (0.47)
<b>Wear a Mask</b>	0.70 (0.50)	0.70 (0.50)	0.67 (0.50)
<b>Wears Mask Correctly</b>	0.06 (0.29)	0.15 (0.29)	0.16 (0.31)
<b>Food Insecurity</b>	0.47 (0.39)	0.52 (0.37)	0.42 (0.43)
<b>Avoid Transport due to COVID-19 risks</b>	0.63 (0.45)	0.63 (0.45)	0.64 (0.45)
<b>Loss of Income</b>			
<b>Complete</b>	0.50 (0.50)	0.51 (0.50)	0.46 (0.50)
<b>Partial</b>	0.33 (0.49)	0.34 (0.49)	0.28 (0.47)
<b>Experience of Symptoms</b>			
<b>Fever</b>	0.02 (0.14)	0.02 (0.13)	0.02 (0.13)
<b>Difficulty Breathing</b>	0 (0.06)	0 (0.05)	0 (0.06)
<b>Cough</b>	0.03 (0.15)	0.03 (0.17)	0.03 (0.17)
<b>Aches</b>	0.02 (0.13)	0.01 (0.11)	0.01 (0.10)
<b>Sore Throat</b>	0.01 (0.07)	0 (0.06)	0.01 (0.08)
<b>Tired</b>	0.01 (0.09)	0.01 (0.09)	0.01 (0.08)
<b>Lost sense of Taste/Smell</b>	0 (0.04)	0 (0.05)	0 (0.03)
<b>Sum of Symptoms</b>	0.10 (0.37)	0.09 (0.34)	0.09 (0.35)
<b>Have Two Symptoms</b>	0.02 (0.11)	0.02 (0.11)	0.02 (0.12)
<b>Household Size</b>	2.44 (0.96)	2.42 (0.91)	2.01 (1.18)
<b>Travel Far for Work</b>	0.64 (0.49)	0.63 (0.48)	0.63 (0.48)
<b>Have Electricity</b>	0.57 (0.50)	0.56 (0.50)	0.59 (0.50)
<b>Have Social Support</b>	0.61 (0.43)	0.61 (0.44)	0.65 (0.48)
<b>Received Government Support</b>	0.12 (0.48)	0.09 (0.46)	0.06 (0.45)
<b>Perceived Assistance Meets Needs</b>	0.53 (0.48)	0.50 (0.49)	0.57 (0.48)
<b>Gender-Based Violence Risk</b>	0.37 (0.48)	0.39 (0.47)	0.36 (0.48)
<b>Fears related to COVID-19</b>			
<b>Increased Crime</b>	0.02 (0.20)	0.02 (0.21)	0.03 (0.21)
<b>Crowds</b>	0.05 (0.38)	0.05 (0.38)	0.04 (0.38)
<b>Deadly Virus</b>	0.70 (0.50)	0.72 (0.50)	0.77 (0.49)
<b>Food Shortages</b>	0.33 (0.50)	0.32 (0.50)	0.28 (0.50)

<b>Hospitalization</b>	0.05 (0.24)	0.05 (0.26)	0.05 (0.26)
<b>Infect Others</b>	0.21 (0.43)	0.23 (0.45)	0.23 (0.44)
<b>Being Lied To</b>	0 (0.25)	0 (0.26)	0 (0.26)
<b>Loss of Income</b>	0.32 (0.50)	0.30 (0.50)	0.27 (0.50)
<b>No Cure</b>	0.27 (0.49)	0.27 (0.48)	0.27 (0.48)
<b>No Transport</b>	0.02 (0.36)	0.02 (0.36)	0.01 (0.36)
<b>Quarantine</b>	0.11 (0.42)	0.11 (0.42)	0.13 (0.42)
<b>Rent</b>	0.21 (0.26)	0.22 (0.25)	0.22 (0.21)
<b>Separated from Family</b>	0.10 (0.31)	0.12 (0.32)	0.10 (0.29)
<b>Awareness of Treatment</b>	0.08 (0.18)	0.07 (0.19)	0.06 (0.22)

**Supplementary Table 3: key characteristics of each cluster used in K-Means clustering**

<b>Cluster</b>	<b>Description</b>
Cluster 1	<ul style="list-style-type: none"> <li>• Older, less educated</li> <li>• Married (mostly) or divorced</li> <li>• Know less about the symptoms and are more likely to believe myths</li> <li>• Less likely to know positive for COVID-19, get tested, and isolate if sick</li> <li>• Live in largest households</li> <li>• Have more economic anxieties (fear of food shortages and loss of income), but have electricity, social support, and assistance</li> <li>• Second most likely to eat less due to COVID-19</li> </ul>
Cluster 2	<ul style="list-style-type: none"> <li>• Middle-aged, less educated women</li> <li>• Likely to be married, some divorced</li> <li>• Know symptoms, but more likely to believe myths</li> <li>• Most economically impacted (eat less, loss of income, lack electricity, lack social support)</li> <li>• Highest risk of gender-based violence/increased tension at home</li> </ul>
Cluster 3	<ul style="list-style-type: none"> <li>• Younger, more highly educated</li> <li>• Mostly single</li> <li>• Average knowledge of COVID-19 symptoms, but are less likely to believe most myths</li> <li>• Have electricity and social support</li> <li>• Live in smaller households</li> </ul>

	<ul style="list-style-type: none"> <li>Less fear around economic impacts (loss of income and food shortages)</li> </ul>
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For peer review only



STROBE Statement—Checklist of items that should be included in reports of *cohort studies*

	Item No	Recommendation	Page No
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found	1
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-5
Objectives	3	State specific objectives, including any prespecified hypotheses	4-5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up (b) For matched studies, give matching criteria and number of exposed and unexposed	5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	5
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	5
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) If applicable, explain how loss to follow-up was addressed (e) Describe any sensitivity analyses	6
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram	7
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) Summarise follow-up time (eg, average and total amount)	7
Outcome data	15*	Report numbers of outcome events or summary measures over time	7-8

Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	7-8
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	7-8
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	8
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	10
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	8-10
Generalisability	21	Discuss the generalisability (external validity) of the study results	9-10
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	10

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at <http://www.strobe-statement.org>.