REAL-TIME MONITORING OF COVID-19 IMPACTS AMONG ADOLESCENTS AND YOUNG PEOPLE, THEIR FAMILIES, AND COMMUNITIES IN SOUTHERN HIGHLANDS REGIONS IN TANZANIA

University at Buffalo
EDI Global
UNICEF Tanzania
Tanzania Social Action Fund
(TASAF)

July 2021

Tia Palermo, Stephanie Zuilkowski, Sarah Quiñones, Graca Marwerwe, Hassan Kihanzah, Leah Prencipe, and Lusajo Kajula

University at Buffalo
Global Health Equity
Community of Excellence

Suggestion Citation

Tia Palermo, Stephanie Zuilkowski, Sarah Quiñones, Graca Marwerwe, Hassan Kihanzah, Leah Prencipe, and Lusajo Kajula. (2021). "Real-time monitoring of COVID-19 impact among adolescents and young people, their families, and communities in Southern Highlands regions in Tanzania." UNICEF Tanzania and University at Buffalo: Dar es Salaam and Buffalo.

Acknowledgments

Funding for this mobile study on COVID-19 impacts has generously been provided by UNICEF Tanzania and Deutsche Gesellschaft für Internationale Zusammenarbeit GIZ GmbH under the umbrella of the P4H Health Financing Network. Funding for the larger study [Ujana Salama A Cash Plus Model for Safe Transitions to a Healthy and Productive Adulthood (2017-2019)] from which the cohort was leveraged was provided by Oak Foundation ((#OCAY-16-73); UNICEF Tanzania; as well as the UK's Department of International Development (DFID 203529-102) and the Swedish Development Cooperation Agency (Sida G41102), both through a grant to UNICEF Office of Research—Innocenti supporting the Transfer Project. We would like to acknowledge the hard-working field teams of EDI Global, who conducted the data collection for this study to the highest professional standards. We would also like to acknowledge the Tanzania Adolescent Cash Plus Evaluation Team, who designed and implemented the on-going longitudinal study leveraged for the current mobile data collection and analysis. Evaluation team members include: University at Buffalo: Tia Palermo (co-Principal Investigator); UNICEF Office of Research: Lusajo Kajula, Jacobus de Hoop, Leah Prencipe, Valeria Groppo, Jennifer Waidler; EDI Global: Johanna Choumert Nkolo (co-Principal Investigator), Respichius Mitti (co-Principal Investigator), Marie Mallet, Bhoke Munanka; TASAF: Paul Luchemba, Tumpe Mnyawami Lukongo; TACAIDS: Aroldia Mulokozi; UNICEF Tanzania: Ulrike Gilbert, Paul Quarles van Ufford, Rikke Le Kirkegaard, Frank Eetaama

Table of Contents

Abbreviations

COVID-19	Coronavirus Disease 2019
DC	District Council
IPV	Intimate Partner Violence
MoHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children
PLHIV	People living with HIV
PSSN	Productive Social Safety Net
SOP	Standard Operating Procedures
SRH	Sexual and Reproductive Health
TACAIDS	Tanzania Commission for AIDS
TASAF	Tanzania Social Action Fund
TC	Town Council
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
WHO	World Health Organization

Executive Summary

This report provides findings from a study examining effects of the COVID-19 pandemic on livelihoods and health-related well-being among adolescents and youth in Tanzania. The study leverages a cohort of adolescents in poor households from an existing impact evaluation in the Mbeya and Iringa regions of Tanzania.

University at Buffalo (State University of New York), and EDI Global, in collaboration with TASAF, and UNICEF Tanzania, designed and carried out mobile phone surveys to understand knowledge, information sources and prevention practices related to COVID-19, as well as the effects of COVID-19 on youth well-being; outcomes examined include livelihoods, food and water security, schooling, time use, violence, health and care seeking, and coping strategies.

The cohort leveraged for this study of COVID-19 impacts comes from the evaluation of the Ujana Salama: A Cash Plus Model for Safe Transitions to a Healthy and Productive Adulthood pilot being implemented within the Government of the Republic of Tanzania's Productive Social Safety Net (PSSN), by the Tanzania Social Action Fund (TASAF) in collaboration with TACAIDS, and with technical assistance from UNICEF. However, the current report does not discuss impacts of that intervention.

The findings discussed in this report come from a sample of 760 adolescents, 542 households, 83 health facilities, and 16 community leaders in this cohort surveyed across 5 rounds and 130 villages in two regions of Tanzania (Iringa and Mbeya). Interviews were conducted in Swahili between September 2020 and January 2021 over mobile phones and comprise both quantitative surveys (with youth, households and health facilities) and qualitative interviews (with a sub-sample of youth and community leaders).

Below we highlight some key findings from these mobile surveys.

COVID-19 knowledge, attitudes, and practices

- Most youth are informed to some extent about COVID-19 symptoms and transmission.
- Airborne transmission of the virus is readily acknowledged; however, average knowledge was 3.39 out of scale of 10.
- Males reported higher COVID-19 knowledge than females, on average.
- Youth reported that they most commonly received messages on COVID-19 from the media, public health officers, and the government.
- The majority of youth knew to avoid gatherings, wash hands with soap and water, and wear a face mask.
- The prevention practices actually implemented by this sample mostly include washing hands and wearing a face mask.
- Males enacted prevention measures more commonly than females.

Health-seeking

- Among those youth or household members with a sickness in the previous month, the most commonly reported symptoms included fever, aches, and headache.
- Most of those who were sick reported seeking care.
- Those not seeking care when needed reported barriers related to costs, distance, and fear of COVID-19.
- Reported changes in caseload by health facilities was mixed: 37% reported a decrease in caseload, while 29% reported an increase, and 38% reported no change.
- Most facilities (71%) reported no change in their ability to provide regular services (including well-baby check-ups, vaccinations, maternal health, family planning, etc.) compared to before March 2020. However, 29% of facilities were negatively impacted and attended fewer patients due

to limited staffing, funding, or supplies or increased COVID-19-related caseloads.

- Thirty-one percent of households reported being enrolled in the community health fund (CHF). When we examine the smaller panel sample of households who responded to the SMS surveys over time (n=95), reported CHF enrolment increased from 28% to 52% between September and November 2020. This may be due to the fact that households received their first PSSN payments of 2020 in September after long delays, and therefore with more available funds, households may have chosen to use these PSSN payments to enroll in CHF.

Impacts of COVID-19 on livelihoods, food and water security, time use, and schooling

- Most youth reported major economic impacts in their households resulting from COVID-19.
- Factors that affected livelihoods include fear of large gatherings and crowds, closures of businesses, and reduced transport of goods and resources.
- Most individuals reported no changes in their standard of living since March 2020; however, females were more likely than males to report improvements in their standard of living.
- Changes to livelihoods attributed to COVID-19 triggered cascading impacts on household provisions, including food.
- COVID-19 impacts on food security were more often reported by females than males, though many participants reported market changes that affected food access.
- Over time, youth reported increasing food security in SMS surveys.
- Water insecurity also proved problematic for a small percentage of households that did not have reliable access to water for washing.
- Compared to the time period prior to the COVID-19 pandemic, youth reported spending more time caring for elderly or sick household members and gathering firewood or nuts.
- Females reported spending twice as much time caring and working on domestic chores than males.
- Through strong community efforts, most of the youth who were attending school in March 2020 had returned to school, according to qualitative interviews of community leaders, though only 14% of the adolescents and youth in the cohort studied were attending pre-COVID.
- Fifteen percent of households lacked the financial resources to send their youth to school in the preceding four weeks.
- Negative coping mechanisms were quite common in response to the shocks from COVID-19.
- Households engaged in an average of one negative coping strategy, such as selling land or livestock, in the past six months.

Mental health

- Adverse mental health outcomes such as fear, anxiety, isolation, frustration, and trouble sleeping emerged in qualitative interviews and quantitative surveys.
- Males reported worse sleep in the preceding week than females.

Pregnancy, violence, and exploitation

- Physical and emotional violence was reported by 9 and 12% of the sample, respectively, and did not change significantly over time, compared to one year prior.
- Females were less likely to report starting a sexual relationship for financial reasons when compared to a year prior.
- Unintended pregnancies during school closures, possibly due to changes to health care provisions, were speculated

by participants to affect girls' return to schools during re-opening.

1. Introduction and Background

In 2020, the coronavirus disease 2019 (COVID-19) spread globally. As of December 2020, there had been more than 63.4 million confirmed cases and more than 1.47 million confirmed deaths globally (1). In the same time period, the continent of Africa had more than 1.4 million confirmed cases of COVID-19 and more than 32,000 deaths (2), and these are likely underestimates.

COVID-19 is an infectious disease transmitting via respiratory droplets with country-specific case-fatality rates ranging from 0% in Singapore to 29% in Yemen (3, 4). Among the many symptoms of COVID-19 are fever, dry cough, and fatigue, while more serious symptoms include difficulty breathing and shortness of breath, chest pain or pressure, and loss of speech or movement (5). Groups considered particularly vulnerable to COVID-19 infection and complications are elderly persons, those with pre-existing chronic conditions, and those who are overweight or obese.

The COVID-19 infection itself poses significant health risks to individuals, but the pandemic may also have indirect effects on broader health and well-being, through overburdening of health systems and broader, adverse economic impacts. These combined effects of human suffering, severe global economic recession, and deep financial distress are mutually reinforcing (6).

COVID-19 has reduced access to food, and subsequently food security, due to income losses and macroeconomic shocks (7). Researchers from the World Bank estimated that COVID-19 is likely to push between 88 and 115 million people into extreme poverty in 2020 (8). This would mean a setback in poverty reduction efforts by approximately three years, making COVID-19 the worst reversal in poverty reduction in the last three decades (8). In addition to these general macroeconomic conditions, East Africa faces simultaneous environmental and other shocks, threatening food security. These include floods, desert locusts, and violence/unrest (7). Taken together with the COVID-19 induced socioeconomic consequences, these shocks could increase the number of highly acute food insecure people by 73% by the end of 2020 (an increase from 24 million pre-COVID to 41.5 million) in the region (7). A below average rainy season was predicted for October-December 2020 in parts of Burundi, Ethiopia, Kenya, Somalia, Tanzania, and Uganda, and this is expected to negatively affect livelihood well-being and secondary-season cereal crops to be harvested in February 2021 (7).

Government responses to slow the spread of COVID-19

Many governments have implemented a combination of social distancing or lockdown measures to slow the spread of COVID-19. These, in turn, have affected schooling and general economic conditions. Many lockdown measures have required markets and businesses to shut down completely or reduce operating hours. This, in turn, has affected income and increased economic insecurity. Further, school closures have exacerbated gender inequitable care burdens and left many parents of young children without options for childcare, further constraining their ability to earn a living. One-third of the African labour force is considered vulnerable to income disruptions and job loss due to the COVID-19 pandemic and the widespread responses to contain disease transmission (9). In formal sectors including tourism and retail, up to half of the workforce is likely to be impacted by the COVID-19 crisis. Two-thirds of respondents in English speaking African countries reported having their daily lives disrupted by the COVID-19 crisis in recent months with respondents from

Francophone countries reporting lower levels of concern (10).

Tanzania confirmed its first case on March 16, 2020. After this confirmed case, the following measures were taken: the government banned all forms of public gatherings, including seminars, weddings, sports activities; schools were closed (through June 28, 2020); and inbound and outbound international flights were cancelled (between April 11 and May 18). In March 2020, the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) issued a series Standard Operating Procedures (SOP) to respond to COVID-19, which detailed procedures for community-based prevention efforts, including hand hygiene. Masks were not required for non-sick persons, and physical distancing was mentioned in the context of health care, isolation, and burials. In this early response to COVID-19, social distancing may have affected income generating ability for those who earn a living in the informal sector and depend on daily activities outside the house for their subsistence. Further, travel and movement restrictions may have had a secondary impact on distribution systems and supply chains, affecting prices of food and other essential goods (including drugs). Inflation may further have been compounded by exchange rate pressures.

While President President Magufuli declared the Tanzania coronavirus outbreak "absolutely finished" in June 2020 (11), other governments worldwide have continued their pandemic response strategies through 2020 and into 2021, and these global actions continue to affect the economy of Tanzania through reduced demand for exports, as well as travel and movement restrictions. The latter has resulted in a near-total drop-off in tourism, which accounted for over 10% of GDP for Mainland Tanzania and 28% of GDP in Zanzibar, pre-COVID (12). Moreover, the World Health Organization (WHO) expressed concern over the Government's COVID-19 strategy. One month prior to declaration of a Coronavirus-free Tanzania, the US embassy had warned that hospitals in Dar es Salaam were overwhelmed and chances of contracting COVID-19 were extremely high (13), claims which the Government denied (14).

Government responses to economic impacts of COVID-19

In response to increased economic insecurity in the face of COVID-19, 215 countries and territories introduced 1,414 social protection measures between March and December 2020 (15). Social protection is defined as "the set of policies and programs aimed at preventing or protecting all people against poverty, vulnerability and social exclusion throughout their lifecycle, with a particular emphasis towards vulnerable groups."[1] These measures implemented in response to COVID-19 included a combination of social assistance, social insurance, and labour market interventions. The most common social assistance response was cash transfers (conditional and unconditional as well as social pensions), followed by utility and financial obligation support. Other measures included in-kind food or voucher schemes, school feeding, and cash for work. Social insurance measures included paid sick support, healthcare insurance support, pensions, social security contribution waivers or subsidies, and unemployment benefits.

The Government of the Republic of Tanzania adapted delivery of its flagship social protection programme, the Productive Social Safety Net (PSSN) Phase II, a programme which covers both the Mainland and Zanzibar, reaching one million households

[1] Definition developed by SPIAC-B, the Social Protection Interagency Committee – Board. SPIAC-B is an inter-agency coordination mechanism composed of representatives of international organizations and bilateral institutions to enhance global coordination and advocacy on social protection issues and to coordinate international cooperation in country demand-driven actions.

nationally. In September and October 2020, the first two payments of the PSSN II were made to eligible households. Payments for July and September/October (two payment cycles) together in one payment to mitigate effects of COVID 19. Further, because schools were closed from April to July, the health and education conditions used to calculate conditional cash transfer payment amounts were temporarily waived (expected to be reinstated in December 2020). These first payments of PSSN II come after more than a year of uncertainty and delayed payments in the PSSN Phase I, which ran from 2015 to 2019. Regular, on-time payments were made from roll-out in 2015 through March 2019. Then funding for the program ran out, and delays in securing funding for the second phase caused bi-monthly payments to stop completely between March and December 2019, when bilateral donors provided funding for one last payment under PSSN I. The PSSN II was then rolled out after a validation process, whereby officials verified eligibility for households enrolled in PSSN I to continue receiving payments under PSSN II. Additional plans under PSSN II include roll-out to a new set of communities previously excluded from PSSN I (planned for 2021). While these social protection measures may mitigate some of the adverse impacts of the COVID-19 pandemic, they may not be enough to fully mitigate all the adverse health and economic consequences of the pandemic.

Relevance of COVID-19 effects on the adolescent population

Adolescence is a key period of development when adolescents acquire assets and capabilities, including those related to health, agency, education and learning, and productive capacity. Investments in adolescence are often thought to have a "triple dividend," with benefits today, tomorrow and in the next generation (16). Conversely, adverse events such as the pandemic and related consequences during this development window may have long-lasting consequences. Sub-Saharan Africa has the worst regional adolescent health profile (17). As such, adolescents in the region are particularly vulnerable to negative shocks such as the economic and health effects of COVID-19. These poor health indicators, potentially exacerbated by the pandemic, are problematic for countries' (such as Tanzania's) ability to harness the so-called "Demographic Dividend," a one-time opportunity for poverty reduction and accelerated economic growth due to changes in a country's population structure. Tanzania has approximately 13.6 million adolescents (out of a total population of 56.32 million). Policymakers interested in strengthening adolescents' multidimensional capacities with the aim of ensuring future growth for their country need more information about how the pandemic is affecting youth well-being, including along dimensions related to livelihoods, time use, schooling, health and health services utilization, mental health, violence, and exploitation.

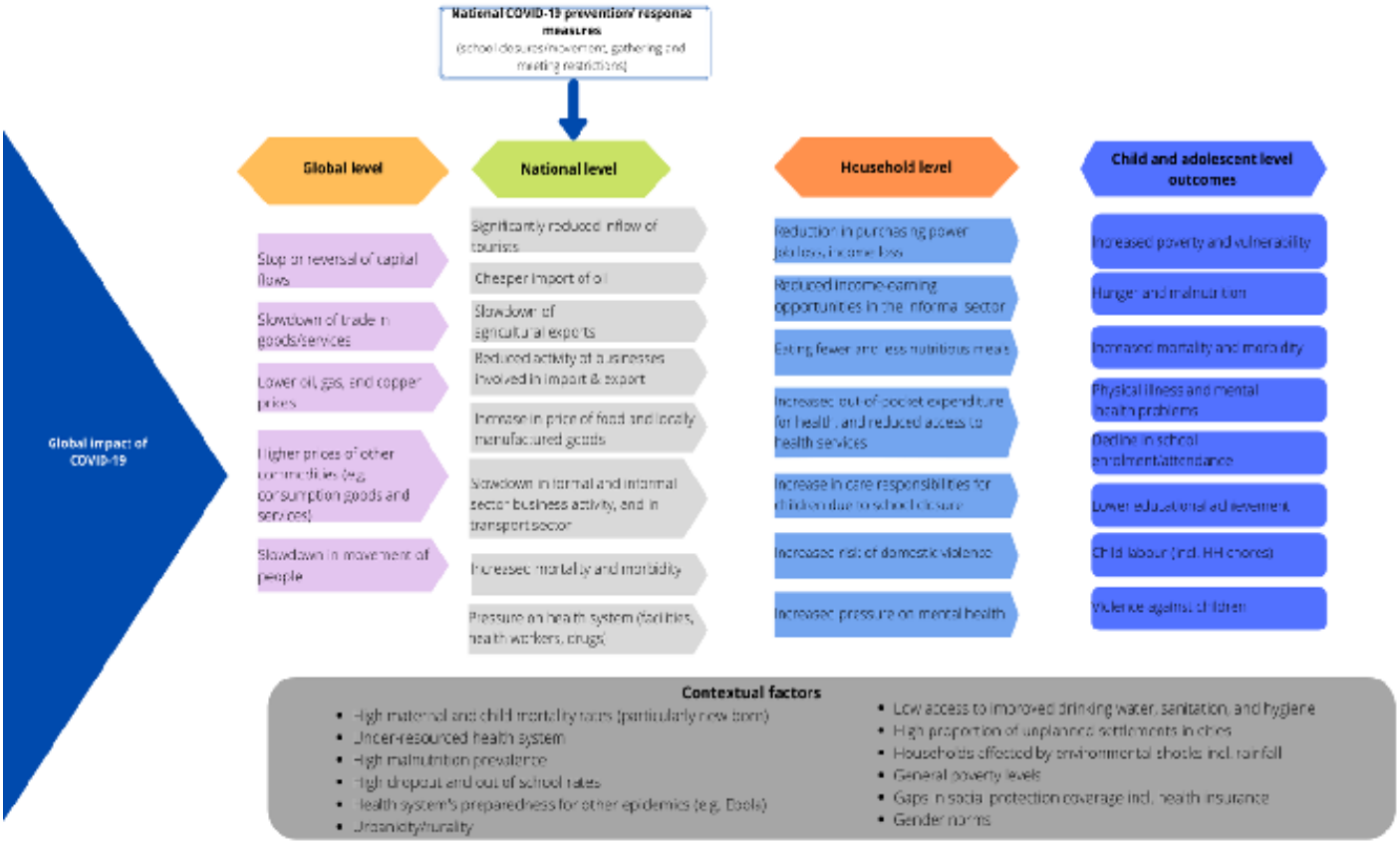
Even with what is known from previous epidemics, there remain several gaps in our understanding of how the COVID-19 pandemic is affecting adolescent well-being in Tanzania. In this report, we summarize findings from a sample of adolescents and youth[2] in the Iringa and Mbeya Regions of Tanzania to elucidate 1) COVID-19 knowledge, attitudes, and practices and describe possible effects on mental health and health-seeking behaviours; 2) impacts of COVID-19 on economic security, time use activities, and coping strategies utilized by households to mitigate or respond to these impacts; and 3) violence, sexual exploitation, and vulnerability arising from the COVID-19 pandemic.

[2] The National Policy of Youth Development (2007) in Tanzania defines youth as individuals aged 15-35 years.

2. Conceptual Framework

The COVID-19 pandemic and responses to slow its spread have had both health and economic adverse consequences. In this section we outline potential pathways of impact on several dimensions of well-being outlined in the conceptual framework (Figure 1).

Figure 1. Conceptual framework of COVID-19 impacts on global, national, household, and adolescent-level outcomes.



Macroeconomic pathways of impact

At the global level, the following factors have contributed to a global recession: stoppage or reversal of capital flows; slowdown of trade in goods and services; lower gas, oil, and copper prices; higher prices of commodities; disruptions to global value chains (18); and a slowdown in the movement of people.

At the national level, the following factors have further contributed to economic insecurity: reduction in foreign direct investment (FDI); significantly reduced inflow of tourists; slowdown of agricultural

exports; reduced activity of businesses involved in import and export; increased price of food; and slowdown in business sectors (formal and informal).

Nevertheless, the combination of lower oil prices and higher gold prices in 2020 did benefit Tanzania. The country's external position is highly vulnerable to volatility in prices of these, and the recent developments in prices may have mitigated the adverse impacts of the COVID-19 pandemic nationally to some extent (19).

Pathways of impact on economic security, food security, and nutrition

Social distancing measures, including those mandated by Government and other precautions that individuals take to decrease their risk of infection, both restrict supply of goods and services as well as demand. In turn, this reduces income and economic security. Additionally, when schools close and young children are out of school, increased care burdens, which largely fall to adolescent girls and women, may translate into less available time for income-generating activities. Further, food systems and, subsequently food security, have been impacted by the COVID-19 crisis due to spikes in prices of food and food imports, disruptions to trade flows and market functions, and difficulty supplying agricultural goods (20). Finally, inflation may be compounded by exchange rate pressures. Taken together, these impacts on income and inflation may reduce food security, including caloric intake and diet diversity.

It is expected that the crisis will reduce demand for vegetables, fruits, and animal-sourced proteins, which are the main source of essential micronutrients (21). Combined with supply chain breakdowns which supply perishable foods, this is expected to lead to reduced dietary diversity and result in nutrient-poor diets (21). Reduced food security, in turn has consequences for nutrition. Children between the ages of zero and two years are particularly vulnerable to malnutrition, with lifelong consequences, as this is the key development window in which stunting is determined. These combined shortages related to food security and health care access (described in more detail below) may lead to increased incidence of malnutrition and barriers to access to prenatal care and micronutrient supplementation, as well as treatment for childhood diarrhoea, infections, and acute malnutrition (21).

Pathways of impact on time use

In response to increased economic insecurity, households may increase workloads of children, including both domestic responsibilities or paid work outside the household. This, in turn, may mean that children are unable to return to school once they reopen, due to the need to support households economically. Alternatively, adults in the household may need to take on additional work, including casual labour, outside the household. This may translate into less farming for household consumption, with implications for future food security, but in the short-term may translate into increased need for children to contribute to domestic chores. Simultaneously, as adults spend more time outside the household, care practices may change, and this may affect supervision as well as physical and mental health of children.

Pathways of impact on population health and health services utilization

The pandemic has both direct and indirect impacts on population health and access to health services. First, in terms of primary prevention, handwashing to prevent the spread is severely hampered by the lack of access to water and soap and poor hygiene conditions experienced by many Tanzanian households and schools (22, 23), both in rural and urban areas. Large

household sizes and crowded living conditions may increase risk of infection passing between household members and neighbours. Taken together, these may increase risk of infection.

Assessments indicated that many health care systems in Africa were ill-prepared to respond to the COVID-19 pandemic due to inadequate personal protective equipment for health care workers and high work burdens (24). Increased strain on health facilities and medical resources resulting from the COVID-19 caseload may have implications for the effective delivery of other health services. For example, the Ebola outbreak in West Africa between 2014 and 2016 led to increased reproductive health risks and maternal mortality due to overburdened health systems (25, 26). Early in the COVID-19 pandemic there were adverse effects on the supply chain for contraceptive commodities globally (27), which may result in an increase in unwanted or mistimed pregnancies. These, in turn, may have adverse consequences on women's health as well as perinatal health and child survival (28). Relatedly, school closures may increase the risk of adolescent childbearing through a decrease in protective environments and social networks for adolescent girls (29). This adverse outcome was seen in West Africa's Ebola outbreak (26). A modelling exercise among 118 lower- and middle-income countries taking into account disruptions to reproductive, maternal, new-born and child health services and decreased access to food estimated that COVID-19 might result in 253,500 (upper range 1,157,000) additional child deaths and 12,200 (upper range 56,700) additional maternal deaths over six months across 118 countries (30).

Supply chain interruptions also have implications for people living with HIV (PLHIV). In July 2020, the World Health Organization (WHO) reported that access to HIV medicines was severely impacted by COVID-19 globally. They reported that, as a result of the COVID-19 pandemic, 73 countries warned they were at risk of stock-outs of antiretroviral (ARV) medicines (31). If PLHIV stop taking their ARVs, then they are susceptible to other infections, including COVID-19, due to a weakened immune system.

Individuals may also opt to not seek treatment for other conditions when needed due to anticipated long waiting lines at hospitals and health facilities, or due to fear of COVID-19 infection in these settings. Delayed care seeking or avoidance in seeking care during the COVID-19 pandemic has been reported in other settings and may lead to increases in morbidity and mortality (32, 33).

Pathways of impact on mental health

In terms of indirect effects of the pandemic on health, there are several potential economic and psychosocial pathways affecting health outcomes, including mental health. These effects may include isolation, adverse psychosocial outcomes, disruptions to schooling, food insecurity, increased economic insecurity, and adverse coping mechanisms, all of which may, in turn, affect health. In normal times, job loss and isolation have been linked to adverse health and behavioural outcomes such as difficulty sleeping, changes to appetite, increased substance use and abuse, and increased worry and stress (34). In other settings (outside of Tanzania), worry and stress arising from the COVID-19 pandemic and the ensuing economic downturn have resulted in increased reports of difficulty sleeping or eating, increases in alcohol consumption or substance use, and worsening chronic conditions (34). Thus, we may expect to see increased rates of reporting of anxiety and depressive symptoms in the wake of the pandemic.

Indeed, the WHO has reported that the morbidity and mortality of COVID-19, combined with the isolation and livelihood impacts resulting from the policy responses to COVID-19 have

produced anxiety across the globe (35). A recent WHO study of 130 countries highlighted major disruptions to mental health services while demand has increased, as affected populations deal with bereavement, isolation, and loss of income (36). The survey highlights that while 80% of high-income countries have responded to this increased demand and service disruption with telehealth and telemedicine, fewer than 50% of low-income countries have deployed these mental health remote services. The mental health implications of the pandemic are likely to vary across populations, affecting some groups more acutely than others. For example, school closures can adversely affect the mental health of children and adolescents as social interaction is reduced and they lose contact with their peers and social support networks (37).

Pathways of impact on schooling attendance and attainment

School closures as a preventive measure to stop the spread of COVID-19 have immediate impacts on school attendance and learning. In the medium-term, school closures can lead to increases in adolescent pregnancy, violence, and poor mental health outcomes. In addition to these short- and medium-term consequences, disruptions to learning and subsequent events (for example, pregnancy, early marriage, or increases in household poverty) may make it more difficult or even impossible for children and adolescents to return to school once they do open. Girls who become pregnant rarely return to school, due to either stigma, childcare or financial barriers, as well as laws and policies preventing them from doing so (38). This is the case in Tanzania, where adolescent girls who were pregnant or gave birth were prohibited by a law dating back to 1961 from returning to school. In 2017, President Magufuli voiced support for this ban. However, this issue became contentious between the government and the international community, as the World Bank froze 1.7 billion USD in loans to Tanzania between 2018 and 2019 as a result of this ban and another policy making it illegal to question official government statistics (39). While pregnant girls can now theoretically return to school, it is unclear whether the previous ban and lack of clarity on the issue still dissuade pregnant girls from returning to school. Thus, even though school closures were relatively short in Tanzania (March – June 2020) compared to those in some other countries, there may still be long-term consequences. Some children may never return to school and others may return but achieve lower total school attainment due to this disruption. This in turn, will have implications for future income and economic security.

Pathways of impact on violence

Economic insecurity caused by the pandemic and social distancing can create stressful and isolated situations. As a result of this increased stress, intimate partner violence (IPV) and violence against children may increase (40, 41). Violence may also increase due to increased amount of time in the home and therefore exposure to perpetrators. Moreover, access to informal and formal support, including access to health care workers, for survivors of violence is restricted due to social distancing (41). Indeed, there is ample evidence now that COVID-19 and corresponding responses, including lockdowns and job loss, have increased violence against women and children around the world (42).

Factors found to exacerbate violence against women during COVID-19 include security, health, and money worries, cramped living conditions, isolation with abusers, movement restrictions, and deserted public spaces (43). Other drivers of violence against women and children during pandemics and humanitarian crises include quarantine and isolation, instability, exposure to exploitative relationships, reduced health service availability, inability to temporarily escape abusive partners, and exposure to

violence and coercion in response efforts (41).

Moreover, perpetrators may exploit girls' need for basic goods and food and demand sex in return for these items, increasing the prevalence of transactional sex. Accounts from other humanitarian crises have highlighted these risks (38). Transactional sex is defined as "noncommercial, nonmarital sexual relationships motivated by an implicit assumption that sex will be exchanged for material support or other benefits (44)," and is associated with increased risk of violence and HIV infection (45, 46).

Age and gender considerations

Some of these aforementioned pathways and risk factors may be more acute for different segments of the population. In particular, age and gender may interact to produce particular vulnerabilities for groups such as adolescent girls (29). Gender inequalities mean that women and girls are more likely than men to experience reproductive health risks; maternal mortality; loss of jobs, as they are more likely employed in the informal sector; gender-based violence; and risk of infection due to the fact that women are employed in health services at higher rates than men and are more likely to care for the sick in households (47). Pandemics exacerbate underlying inequalities in societies, including gender inequalities (48). Women and adolescent girls have unique health needs, and the reallocation of resources in a pandemic adversely affects their health and provision of sexual and reproductive health services (SRH). Compounding this, gender norms may further restrict their access to SRH services through reduced access to household resources, mobility restrictions, and attitudes around providing SRH services to unmarried adolescents. In a recent report, Tanzania was ranked among the most vulnerable countries globally in terms of potential for negative effects on women resulting from the pandemic (49). Assessment criteria included indexes of women's well-being, health and economic impacts of COVID-19, and assessed risk of suffering from primary and secondary effects of the pandemic. It was noted that Tanzania scored among the highest in terms of vulnerability for women across multiple domains, but the authors noted the pandemic has yet to have severe health or economic consequences. Nevertheless, they warned that should effects materialize, women are highly vulnerable in Tanzania.

Additionally, women around the world, on average, earn less, save less, hold less secure jobs, and are more likely to hold informal sector jobs, than men (48). This makes women disproportionately affected by job loss and macroeconomic shocks, and their vulnerability is further exacerbated by the fact that informal sector employment means that they are often not covered by social protection benefits, including sick leave or unemployment benefits. Market closures and travel restrictions may disproportionately affect women and girls, who are more likely to work in informal and low-income sectors (29, 50). Evidence from the Ebola epidemic showed that quarantines significantly reduce women's economic and livelihood activities; increase their poverty rates and food insecurity; and that these impacts on women's economic security and livelihoods tend to last longer than those of men's (48). At the same time, women do approximately three times more unpaid care and domestic work than men, and this inequality is further deepened by the pandemic, given their roles as caregivers and overrepresentation in the ranks of poorly paid community health workers (48). Adolescent girls from Bangladesh and Kenya have reported unequal or increased household responsibilities during the COVID-19 pandemic (29).

Another gender-related consideration is disparities in access to technology. Men and boys are more likely to own phones

than women and girls in lower- and middle-income countries (LMICs) (29, 51). Thus, even if efforts are made to support learning using digital resources during schooling breaks, girls will be at a disadvantage. The disparity among adults has implications for financial inclusion, especially as mobile money transactions expand.

Adolescent girls are also at increased risk of child marriage as compared to boys generally (52), and this risk may be exacerbated during a pandemic. Drivers of early marriage during the pandemic may include economic pressures, disruptions to schooling, and adolescent pregnancy (53). Early marriage of adolescent girls may be a negative coping strategy employed by households in the face of COVID-19 as they seek to reduce the number of household members to relieve economic pressures (38). The United Nations Population Fund (UNFPA) is predicting that the economic crisis and disruption to efforts to prevent child marriage will result in 13 million more child marriages occurring in the next decade as a result of the pandemic (54).

In terms of mitigation strategies and government responses, children and adolescents may be overlooked. For example, children have lower rates of coverage of social protection as compared to other age groups (55). Women are also less likely than men to be employed in the formal sector, where they are covered by social protection benefits such as health insurance and unemployment (48). Thus, attempts to adapt or scale-up existing social protection programs without new targeting or horizonal expansion may not effectively reach this population.

In addition to vulnerabilities at young ages, older women tend to be at increased risk of economic security, as they have, on average, lower incomes across their lifetime and thus lower pensions, or no pension at all. Indeed, in our current sample, a majority of households are female-headed and the average of the household head is 59 years. Thus, these households often face increased vulnerability and are labour-constrained.

3. Research Methodology Employed in the Study

Sample and Data collection

Data used in this study come from a longitudinal impact evaluation of a programme entitled "Ujana Salama: A Cash Plus Model for Safe Transitions to a Healthy and Productive Adulthood." This pilot intervention was implemented from 2018 to 2019 within the Government of the Republic of Tanzania's Productive Social Safety Net (PSSN), by the Tanzania Social Action Fund (TASAF) in collaboration with TACAIDS and with technical support from UNICEF. The corresponding impact evaluation is being implemented between 2017 and 2021 to measure the impacts of the pilot, which was targeted to adolescents aged 14 to 19 years at baseline (in 2017) and living in PSSN households (56). These households are among the poorest 10% of households in Tanzania, based on PSSN targeting criteria. They started receiving the PSSN in 2015, which has been found to have various positive impacts on households and helped to reduce poverty and improve food security (57). Nevertheless, these households are extremely vulnerable to economic, health, and environmental shocks.

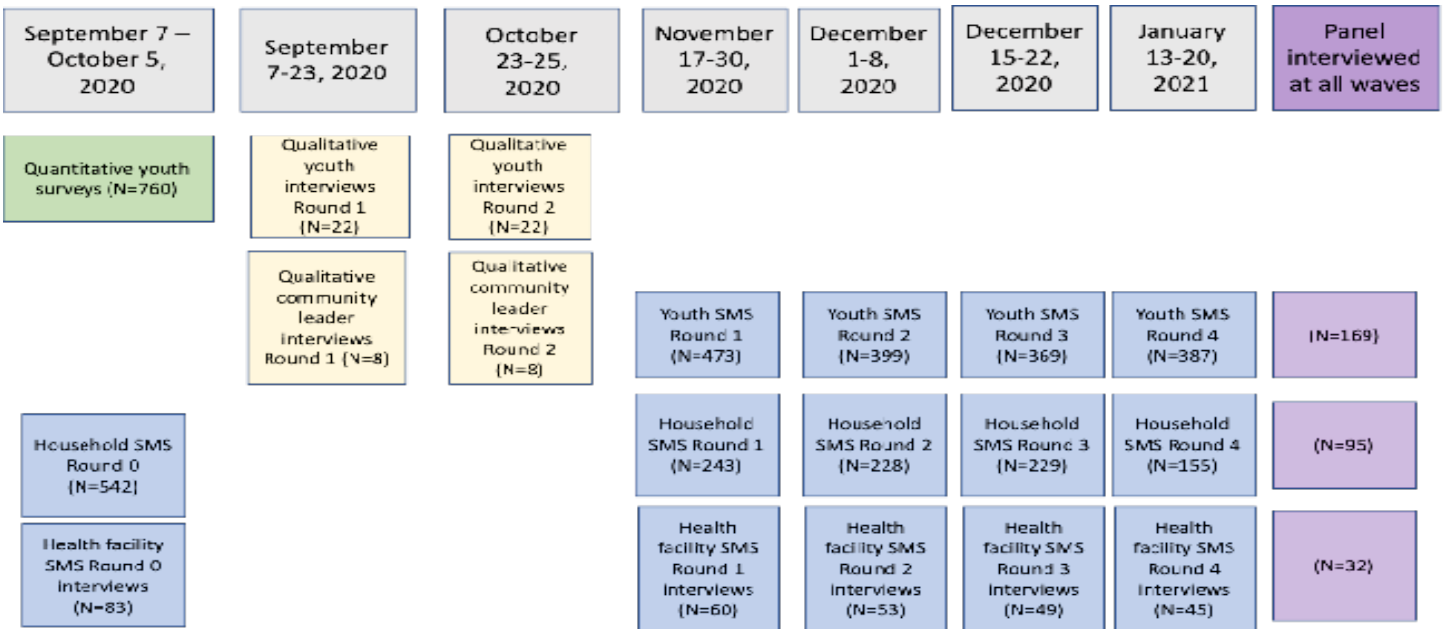
Study districts and councils include Mufindi DC District Council (DC) and Mafinga TC Town Council (TC) in Iringa and Rungwe DC and Busokelo DC in Mbeya. The study areas (130 villages total) are generally remote, rural villages. After baseline, we followed this sample again in 2018 and 2019. Then, in 2020, conducted quantitative surveys and qualitative interviews via mobile phone for the current study. Due to ethical concerns around securing

parental consent for interviews of unmarried minors, we did not attempt to contact unmarried minors. Thus, the eligibility criteria for the current study (a sub-set of the larger impact evaluation sample) were: being a participant of the existing longitudinal study; and a) being aged 18 years or older; or b) being married and aged 18 years or less. The total eligible sample consisted of 1,727 adolescents; we aimed to sample 1,066 for mobile quantitative surveys. Of these, we successfully completed a total of 760 interviews (71% response rate). Among the eligible sample we further selected 46 youth to interview in depth with semi-structured interviews (22 in a first round in October and 22 in a second round). These youth were purposively selected, and we gave priority to 2/3 of this purposive sample for youth in households with young children of school age, or youth who were particularly vulnerable, including having previously reported experiencing depressive symptoms, violence, or pregnancy.

In addition to data collection among youth, we interviewed a sub-sample of 542 household heads in households where the adolescents live and 83 health facilities via mobile phone and asked each four short questions. In addition, we conducted qualitative interviews with 16 randomly selected community leaders. All were previously interviewed as part of the larger longitudinal study.

EDI Global administered youth quantitative surveys between 7 September to 5 October 2020 via mobile phone interviews. During this period, they also conducted consent phone calls with eligible households and health facilities for the SMS surveys and took advantage of these consent calls to administer a first round of the questions from the SMS questionnaires (subsequently referred to as "Round 0" of SMS interviews). With youth and community leaders, round 1 qualitative interviews were conducted 7-23 September 2020, and round 2 qualitative interviews were carried out 23-25 October 2020. All interviews were conducted in Swahili. Enumerators who conducted the interviews inputted responses directly into Surveybe software, while qualitative interviewers were recorded and then transcribed.

Figure 2. Overview of sample and data collection timing



Additional data were collected via SMS with households, youth, and health facilities during the following dates:

- Round 1: 17 - 30 November
- Round 2: 1 - 8 December 2020
- Round 3: 15 - 22 December 2020
- Round 4: 13 - 20 January 2021

Each round of SMS surveys was intended to be implemented over one week. However, there were delays coordinating with some of the phone networks prior to Round 1, with Vodacom and Tigo networks being implemented first, then Airtel, then Halotel networks. Thus, Round 1 lasted for approximately two weeks. Subsequent rounds (2-4) were implemented over one week at the same time with all networks. The samples and dates of data collection are elaborated in Figure 2.

Measures

Enumerators conducted qualitative interviews using semi-structured guides, guided by the conceptual framework (Figure 1) and covering topics related to COVID-19 knowledge, prevention and messaging; livelihoods and food security; time use; schooling; health and health-seeking; pregnancy, violence and exploitation. Quantitative measures are described in more detail below.

COVID-19 knowledge, prevention, and sources of information

To measure COVID-19 related knowledge, we asked about the symptoms of COVID-19 (referred to as "Corona" in the survey, as it is commonly referred to in Tanzania). Potential responses included cough, shortness of breath/difficulty breathing, fever, chills, aches, headache, sore throat, loss of taste and/or smell, congestion, or other. Then we created an index summing the number of symptoms they were able to spontaneously name (range: 0-10). Next, we asked about prevention-related behaviours, including what the youth is doing to protect him/herself from COVID-19. Response options included wash hands with soap and water; avoid touching eyes, nose, mouth with unwashed hands; use of sanitizer to clean hands when soap and water not available; stay home when sick or had a cold; cover mouth and nose when coughing or sneezing; wear a face mask; use antibiotics; take teas of lemon, ginger, cloves and lemon grass; inhale vapours from a brew of herbs; practice physical distancing; avoid going to work; stop sending children to school or day care; disinfect surfaces; disinfect the mobile phone; do not shake hands; don't go to weddings or funerals; take chloroquine or malaria medication; avoid hospitals or clinics; avoid public transport or traveling; prayer or other spiritual methods; or nothing. Next, we asked how the respondent washes his/her hands, with responses including: with water; with soap and water; with sanitizer; and other.

We also asked where people received their information regarding COVID-19. Response options included: not informed; radio; friends and family; work; health professional; church or mosque; community members; public health facility; private health facility; traditional healer; television program; public announcement; megaphone; internet; books, magazines; posters or print advertisements; social media; community meetings or spaces; community health workers; government SMS; or other. Then we asked what directives or instructions they received about COVID-19. Response options included: no large gatherings; stay home if you have nothing to do outside; wash your hands frequently for more than 20 seconds; don't touch your face; wear face mask; avoid physical contact; keep at least one and a half meter apart; cough into your elbow; or other.

Livelihoods and time use

To assess livelihood activities, we asked about participation

(number of hours) in the following in the past seven days: farm work; caring for livestock or poultry; non-agricultural business activity for self or someone in the household; paid work for someone outside the household. We then created a combined indicator to represent engagement in any work equal to one if the respondent reported any of the following: farm work, paid work, or household business related work in the past seven days.

Next, we asked about participation (number of hours) in the previous day in the following domestic chores: collecting water of firewood; collecting nuts or other tree fruits, honey, or other products from forests, either for food consumption, medicine or sales for the household; care of children, cooking or cleaning; and taking care of elderly or sick household members.

Changes in the number of hours youth spent each week in farming, tending livestock, and fishing were assessed in youth SMS surveys to examine COVID-19 related impacts on adolescent labour and domestic chore demands.

Food and water insecurity

We included measures of food and water insecurity in youth and household quantitative surveys. To measure food insecurity, we used items from the Household Food Insecurity Access Scale (HFIAS) (58). In household surveys, the item from the HFIAS we included was "In October, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources?" Response options were yes or no. Then in youth surveys, we included the two following items from the HFIAS: "In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of lack of resources?" and "In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?". Response options included never, rarely (1-2 times), sometimes (3-10 times), and often (more than 10 times).

Water insecurity was measured using items from the Household Water Insecurity Experiences (HWISE) Scale (59). The HWISE comprises 12 items, and there is also a short-form called the HWISE-4 comprised of four items (60). In youth surveys, we used the following two items from the HWISE-4: "In the last four weeks, how frequently has there not been as much water to drink as you would like for you or anyone in your household?" and "In the last four weeks, how frequently have you or anyone in your household had to go without washing hands after dirty activities (e.g., defecating or changing diapers, cleaning animal dung) because of problems with water?".

For analysis purposes, we combined responses of "sometimes" or "often" for the food or water insecurity indicators. Then, for food security, we created a combined indicator equal to one if they responded "sometimes" or "often" to either of the indicators. Additionally, a question asking whether a youth or household member had to eat unwanted foods in the past four weeks due to lack of resources was included in youth and household SMS surveys to assess food security.

Coping strategies

In response to economic insecurity, households may implement positive or negative coping strategies. We asked youth whether, in response to changes in general economic conditions in the past six months and the resulting hardship, they had done any of the following: relied on own savings; received unconditional help from relatives or friend; received unconditional help from government; received unconditional help from an NGO or religious institution;

changed eating patterns (relied on less preferred food options, reduced the proportion or number of meals per day, or household members skipped days of eating); employed household members took on more employment; adult household members who were previously not working had to find work; household members migrated; reduced expenditures on health and/or education; obtained credit; sold agricultural assets; sold durable assets; sold land/building; sold crop stock; sold livestock; intensified fishing; sent children to live elsewhere. Among these, we classified the following six strategies as "negative" coping strategies: six negative coping strategies (changed eating patterns, sold agricultural assets, sold durable goods, sold land, sold crop stocks, sold livestock). Then we created an index ranging from 0-6 indicating how many negative coping strategies households employed.

Schooling

We asked whether youth were attending school when they closed in March 2020 and what level or type of training they were enrolled in at that time. For analysis, schooling was defined as attending (=1 if yes and =0 otherwise). For those not attending, we asked why they stopped going to school. Possible responses included achieved all desired education, pregnancy/marriage, failed promotional examination, lack of money for fees or uniforms, lack of money, or COVID-19-related disruptions. Youth SMS surveys also included a question on current school attendance, and household SMS surveys asked whether lack of money prevented households from sending youth to school in October (round 1), November (rounds 2 and 3), and December (round 4).

Illness, health-seeking, access to health services

In terms of health-related outcomes and health seeking, we asked about incidents of sickness in the past month (self or household member), recent household member death, and symptoms of most recent illness (self or household member). Potential responses for symptoms included cough, shortness of breath/difficulty breathing, fever, chills, aches, headache, sore throat, loss of taste and/or smell, or other. Then, among those who reported sickness (self or household member), where care was sought, and if they did not seek care when needed, the reasons for this. Potential responses for not seeking care included no money, distance, crowding or wait times, fear of catching COVID-19, spouse or other household member did not allow it, and other.

At the household level, we reported whether the household is enrolled in the Community Health Fund (CHF).

Finally, at the health facility level, we report information on changes in caseload, ability to provide regular sources, and patients' ability to pay for medical services and drugs. Reference periods for comparison were average caseload before March 2020 for Rounds 0 to 1 and compared to the past month for Rounds 2 to 4. If they report changes in ability to provide regular services, then we asked whether this change was due to: 1) fewer staffing, funding or supplies shortages, 2) increased caseload related to COVID-19, or 3) other reason.

Mental health, violence and vulnerability

To assess mental health, we included two indicators related to depressive symptoms. These were drawn from the internationally validated, 10-item short-form of the Epidemiological Studies–Depression Scale (CES-D) (61). Items included from this were "In the past seven days, how often did you sleep well?" and "In the past seven days, how often were you bothered by things that don't usually bother you?" Response options included rarely (less than one day), sometimes (1-2 days), most of the time (3-4 days), and all of the time (5-7 days). Generally, to calculate the

CES-D10, scores are summed for all 10 items, ranging from 0 to 30. We coded binary indicators for each item equal to one if the respondent answered some of the time, most of the time, or all of the time. The sleep mental health indicator responses were reversed in our analysis to be a measure of distress rather than good sleep. However, since we only asked two out of the 10 items from the short-form of the scale to accommodate time constraints in the mobile survey, we analysed these items separately and do not claim that these two indicators alone correspond to the depressive symptoms cut-off as measured in the full CESD-10.

We assessed experiences of emotional and physical violence in the past 12 months using an adapted version of questionnaire items used in the WHO multi-country study on women's health and domestic violence (62), which draws on the Conflict Tactics Scale (63). For the current study, we adapted these items to include any perpetrator (not just intimate partners). We asked the following question regarding emotional violence: "In the past 12 months has anyone belittled, called you names, or humiliated you in front of other people?" Then for physical violence, we asked the following two questions: "In the past 12 months has anyone slapped or pushed you?" and "In the past 12 months has anyone hit you with a fist, kicked you, or beaten you up?" We created binary indicators for emotional and physical violence and coded them =1 if the respondent answered affirmatively to the item (or either question in the case of physical violence). Then we created a composite violence indicator equal to one if the respondent reported any emotional or physical violence. We did not ask about sexual violence due to safety and ethical concerns around asking this information in a mobile format.

To measure sexual exploitation, we used one indicator from an innovative new scale developed to measure transactional sex (44), previously tested in Tanzania and Uganda and collected in previous waves of the larger cohort study which is leveraged for the current mobile survey. The item we included in the mobile survey from this scale was, "In the past 12 months, did you start a sexual relationship with someone in order to get things that you needed, such as money or gifts?"

Next, we created a vulnerability index by summing responses to the set of indicators related to mental health, violence, transactional sex, food security, and water security, with higher scores indicating greater vulnerability.

General economic impact measures

To assess the general economic impacts of COVID-19, we asked youth whether prices increased in the past six months (since March 2020) more than usual at the market their household usually shops at. We also asked if there were any food or essential items that their household purchases frequently that they have tried to purchase but were unable to purchase at any time in the past four months due to limited supply or they were not available in the market. Finally, we asked a general question about standard of living, asking whether they think their standard of living is getting worse, about the same, or getting better compared to before March 2020.

Analysis

The qualitative interviews were transcribed and translated into English. All interviews were double-coded, using a codebook composed of codes drawn from the literature and the team's previous work with this population, as well as emergent codes. We used a thematic analysis approach to analyse the qualitative data (64, 65).

Due to logistical and budgetary constraints in re-contacting all youth in the cohort, we sampled only a sub-set of eligible youth from the overall impact evaluation sample. To understand any biases this may introduce, we compared characteristics of youth: 1) in the full cohort versus those eligible for the mobile surveys and 2) those eligible for mobile surveys versus those interviewed for mobile surveys. Comparisons were made by running regressions with the characteristic of interest as the outcome variable and the eligibility or interviewed indicator as the covariate of interest. All regressions controlled for district and village size, and standard errors were adjusted for clustering at the village-level.

For analysis of youth quantitative surveys, we summarized background characteristics of the sample. Next, we summarized responses to questions by thematic area (e.g., knowledge of COVID-19 symptoms, prevention measures, and sources of information around COVID-19; food and water security; livelihoods and time use; mental health; illness and health-seeking; and violence). Finally, we examined changes in youth-level outcomes compared to a period pre-COVID-19 (in 2019, approximately 13-14 months prior to the mobile surveys) using multivariate regression. For binary outcomes of interest, we ran generalized linear models and report risk ratios (RR) and 95% confidence intervals (CI). For time use outcomes reported in hours, we ran ordinary least squares (OLS) regressions and report estimated β coefficients accompanied by standard errors (SE).

In the regression models, the covariate of interest is that representing estimates for a binary indicator of time T (=1 if 2020), suggesting changes post-COVID-19. A risk ratio less than one would indicate reduced risk for the outcome post-COVID, whereas a risk ratio greater than one indicates increased risk post-COVID. For OLS regressions, a positive coefficient indicates an increase in the number of hours spent in the activity examined post-COVID. In all regressions, we control for age, gender, and district x village size (large or small) dummy variables. Standard errors were adjusted for clustering at the village-level.

These analyses are intended to be descriptive only and cannot conclude causality (that is, that changes are a direct result of the COVID-19 crisis). This is because we do not have a counterfactual, defined as a group not exposed to general conditions caused by the COVID-19 pandemic, with which we could compare changes pre- and post-COVID-19 in the exposed group.

Analyses were conducted separately for health facilities, households, and youth surveys. Descriptive statistics of outcomes from the SMS surveys with youth, households, and health facilities are presented. In the main report, we first summarize findings from Round 0 of the household and health facilities (when they were contacted over the phone during the consent call and asked the first set of questions; this is the round with the highest response rates). Then we present findings from the panel of youth, household, and health facility respondents (that is, the sub-sample who responded at all rounds) to allow for valid comparisons of changes over time. Outcomes for the full sample responding at each wave (varies over time) are presented in the appendix. All quantitative analyses were conducted using Stata Version 16.

4. Sample and Selection Bias

When comparing the full cohort (n=2,191; last interviewed in June – August 2019) to the eligible sample (n=1,727), we found some statistically significant differences in outcomes and background characteristics at the time of the last interview in 2019 (Appendix Table 1). Some of these were by design (that is, we sampled older and married adolescents in the mobile sample for ethics reasons).

Thus, it is not surprising that the eligible sample was older (18.73 years v. 18.11 years), more likely to be married (9% v. 7%), less likely to attend school (23% v. 33%), had higher grade attainment (7.93 years v. 7.85 years), and was more likely to be engaged in economic activities (83% v. 81%), household business (17% v. 16%), and paid work (29% v. 26%) than those not eligible for the mobile surveys (Appendix Table 1). In terms of outcomes of interest, the eligible sample was more likely to report at Wave 3 having higher levels of depressive symptoms, well-being related stress, relationship-related stress, lower quality of life, were more likely to have sought sexual and reproductive health services or HIV testing in the past year, were more likely to be looking for a job, had higher levels of locus of control, were more likely to have been pregnant (females) or made a female pregnant (males), and experienced lower levels of physical violence.

When comparing differences in characteristics at the time of the last interview in 2019 between the full sample of eligible youth (n=1,727) and those who were successfully interviewed in the mobile surveys (n=760), we found fewer statistically significant differences (Appendix Table 1). Those successfully interviewed were more likely to live in Iringa (52% v. 51%), were older (18.84 years v. 18.73 years), had higher grade attainment (8.16 years v. 7.93 years), spent less time gathering nuts (0.05 hours v. 0.07 hours), and reported lower levels of relationship-related stress (0.37 v. 0.45). Given the limited number of differences and the fact that the differences are not large, we conclude that the interviewed sample is representative of the larger eligible sample.

Characteristics of the interviewed sample (n=760) in 2020 are summarized in Table 1 below. These statistics represent a time period of approximately 13 to 14 months after surveys from which the statistics summarized above were drawn; thus, age and marriage rates have increased. The average age of respondents was 19.95 years, and approximately 13.68% were attending school in March 2020. Twenty-six percent of females and 18.5 percent of males were married at the time of the survey.

Table 1. Summary Statistics, Youth Surveys (N=760)

	Pooled	Females	Males	p-values
Region				
Iringa	52.24	51.45	52.88	0.694
Mbeya	47.76	48.55	47.12	0.694
Age (years)	19.95	19.93	19.97	0.741
Attending school	13.68	16.28	11.54	0.058
Married	21.84	25.87	18.51	0.014

Note: p-values refer to differences between males and females

5. COVID-19 knowledge, sources of information, and prevention practices

Limited knowledge of COVID-19 symptoms and sources of information

In the qualitative interviews, most participants were able to give some accurate information about the symptoms and transmission of COVID-19. Participants generally knew that symptoms included cough, shortness of breath, and fever, and that the disease could be transmitted through the air. However, some participants had poor understanding of the disease. One community member had difficulty naming symptoms of COVID-19, and, when pressed, said, "bleeding from the ears." She continued, "These posters [about COVID-19] are there but I haven't read them closely."

These qualitative findings generally aligned with the survey findings (Table 2). When asked what were the symptoms of COVID-19, the most common responses were cough (74%), shortness of breath or difficulties breathing (55%), fever (53%),

sore throat (25%), tiredness (23%), and loss of taste and/or smell (12%). When aggregated into a scale of symptom knowledge (range 0-10), the average "knowledge" score was only 3.39. Males reported higher levels of COVID-19 knowledge than females. This difference may be due to more restricted movement and access to technology and resources among females.

A higher percentage of males in Tanzania access mass media compared to females. Overall, 25, 39, and 60% of males read the newspaper, watch television, or listen the radio at least once a week, respectively compared to 13, 27, and 45% of females (66). Additionally, females tend to experience educational exclusion more so than males in Tanzania (67). Factors influencing this educational exclusion of females (and to a lesser degree for males) include teenage pregnancy and early marriage, poverty, and cultural norms that prioritize the education of males over that of females (68). Further, pronounced gender divisions in labour in Tanzania mean that males tend to engage in work that occurs away from the home while females stay home more frequently to tend to household responsibilities and domestic chores. Compared to 5% of males, 15% of females in Tanzania engage in unpaid work that encompasses care of persons and other forms of unpaid care work (69). These implications on movement and exposure media of gendered division of labour may have influenced the disparity in knowledge of COVID-19 between males and females in our sample.

Quantitative surveys indicated that the most common sources of information about COVID-19 (Table 2) included radio (88%), television (58%), friends (32%), community members (33%), and social media (22%). Similarly, sources of information about COVID-19 mentioned in the qualitative interviews included the media, public health officers, and the government. A 22-year-old male shared, "there are so many speakers [about COVID-19], we are even sent SMS through phones, even just using smartphone we see through YouTube." However, the quality of information obtained through social media was likely variable, and a community member said, "we need more education."

There is a clear gendered pattern in access to COVID-19-related information via social media and internet. Fewer than 1% of females in our sample were exposed to COVID-19 information using the internet compared to 19% of males. Similarly, 31% of males reported being exposed to COVID-19 information on social media compared to 12% of females. Because of the aforementioned gendered divisions of labour and subsequent differences in movement, males may be exposed to internet and social media through mixing with other community members, who may be more affluent and have more access to internet and smart phones. Participants in our sample come from PSSN households who are poor and few are likely to have smart phones themselves. These differences in exposure to information may be artefacts of the differential access to technology that is prevalent in rural sub-Saharan Africa (70). Women are often excluded from shared access of mobile phones, let alone smart phones, and, thus, have less access to information that may be made available through these devices (71).

Table 2. COVID-19 Knowledge, Information, and Preventive Measures, Youth Surveys (N=760)

	Pooled	Females	Males	p-values
Knowledge of COVID-19 symptoms		N=344	N=416	
Cough	73.95	63.37	82.69	<0.001
Shortness of breath/difficulties breathing	55	40.99	66.59	<0.001
Fever	52.89	40.41	63.22	<0.001
Chills	12.89	15.12	11.06	0.097
Aches	25	7.85	39.18	<0.001
Headache	46.84	40.7	51.92	0.002
Sore throat	25	7.56	39.42	<0.001
Loss of taste and/or smell	12.37	2.03	20.91	<0.001
Congestion	1.71	0.29	2.88	0.006
Tiredness	23.42	15.41	30.05	<0.001
Flu-like symptoms	10	17.15	4.09	<0.001
Symptom Index (Range 0-10)	3.39	2.51	4.12	<0.0001
Measures taken to prevent COVID-19 infection				
Wash hands with soap and water	81.97	71.8	90.38	<0.001
Avoid touching eyes, nose and mouth with unwashed hands	35.79	7.85	58.89	<0.001
Use of sanitizer to clean hands when soap and water not available	32.63	18.02	44.71	<0.001
Stay home when sick	18.68	4.07	30.77	<0.001
Don't go to weddings/funerals	9.47	10.17	8.89	0.549
Cover mouth and nose when you cough or sneeze	21.18	6.4	33.41	<0.001
Wear a face mask	78.03	74.13	81.25	0.018
Take antibiotics	4.21	1.16	6.73	<0.001
Taking teas of lemon, ginger, cloves and/or lemon grass	10	2.33	16.35	<0.001
Inhalation of vapors from a brew of herbs	8.95	2.33	14.42	<0.001
Physical distancing	45.13	29.07	58.41	<0.001
Avoid going to work	4.61	0.29	8.17	<0.001
Disinfect surfaces or mobile phone	8.16	1.16	13.94	<0.001
No handshakes	33.03	30.23	35.34	0.136
Preventive Measures Index (Range 0-14)	3.92	2.59	5.02	<0.0001
Source of COVID-19 information				
None	0.39	0.87	0	0.056
Radio	88.03	80.52	94.23	<0.001
Friends	31.97	11.63	48.8	<0.001
Work	6.97	0.58	12.26	<0.001
Health Professional	16.18	4.36	25.96	<0.001
Church/mosque	15.92	7.56	22.84	<0.001
Community members	33.03	25.58	39.18	<0.001
Health Facility	18.16	11.63	23.56	<0.001

Table 2. Continued

Traditional healer	0.26	0	0.48	0.198
Television	58.29	45.35	68.99	<0.001
Public announcements	16.45	10.76	21.15	<0.001
Internet	10.53	0.87	18.51	<0.001
Books/magazines	11.05	1.74	18.75	<0.001
Social media	22.11	11.92	30.53	<0.001
Information Index (Range 0-12)	3.29	2.13	4.25	<0.001
COVID-19 Directives/Instructions Received				
No large gatherings	70.53	64.24	75.72	0.001
Stay home if you have nothing to do outside	34.87	9.59	55.77	<0.001
Wash your hands frequently for more than 20 seconds	58.55	47.97	67.31	<0.001
Don't touch your face	28.42	0.87	51.2	<0.001
Wear a face mask	69.61	61.34	76.44	<0.001
Avoid physical contact	38.16	25.87	48.32	<0.001
Keep at least one and a half meters apart	35.66	15.7	52.16	<0.001
Cough into your elbow	12.76	5.52	18.75	<0.001

Notes: p-values refer to differences between male and female samples.

Prevention practices aligned with prevailing directives/guidelines

Directives or instructions youth reported receiving included avoiding large gatherings (71%), staying home (35%), washing hands frequently (59%), wearing a face mask (70%), and keeping at least one and a half metres apart from others (36%; Table 2). When asked which measures they actually implemented, youth most commonly reported washing hands with soap and water (82%), wearing a face mask (78%), physical distancing (45%), avoiding touching eyes, nose, and mouth with unwashed hands (36%), and avoiding handshakes (33%). Males reported higher levels of prevention measures than females, and this may be a function of their higher levels of prevention knowledge or greater autonomy in their daily lives to practice preventive measures, as compared to females. Fewer than 1% of the sample reported doing nothing at all to prevent COVID-19 transmission (Table 2).

Qualitative interview participants were also able to correctly identify a number of prevention practices, including mask wearing, social distancing, avoiding crowds, staying home, handwashing, and not shaking hands. However, one community member stated that people should boil water to prevent COVID-19. Three community respondents mentioned consuming natural remedies as a preventive. "Most people say garlic… ginger and… lemons help. That is what people were doing, everyone preparing at home and children drinking the mixture as medicine." Given that these community members are adults and presumably better connected to government communications, this pattern is interesting. It may suggest a greater tendency among older generations to rely on traditional treatments rather than greater exposure to misinformation.

Both adolescent and community participants claimed that prevention practices were weakening with time, however. A community member said that people "are now used to the fact that COVID-19 is no longer there." Funerals, churches, and bars were discussed as potential problem sites for transmission, as people again gather without taking precautions. "In fact they have started to forget being cautious," said one community participant. Another said, "People no longer remember wearing masks, we go without them to funerals." Practices like shaking hands and gathering in groups for sports and large-group religious activities were resuming in some areas. An 18-year-old female said, "we even greet each other by shaking hands without any problem." A 24-year-old female explained that many people, particularly elders, would be offended if she refused to shake their hands, as "distance greeting… does not make a good picture."

Taken together, these findings suggest that knowledge about COVID-19 has reached adolescents, and they have put this newly gained knowledge into practice to prevent the risk of infection. Nevertheless, gaps in knowledge were identified, and prevention efforts have decreased over time.

Recent illnesses and symptoms among youth and their families

In the quantitative surveys (Table 3), 8% reported having been sick in the past month, while 14% reported that a household member had been sick in the same time period. A further 2% of the sample reported a death of a household member in the past month. When asked about the symptoms of this most recent illness (either among the youth or their household member), the most commonly reported symptoms were fever (57%), aches (51%), and headache (37%). The fevers may also have been cases of malaria. There were no confirmed or suspected cases of COVID-19 in the households of the participants in the qualitative sample, but eight participants discussed having heard rumours about COVID-19

cases in the broader community. As one community member said, "we have seen its symptoms, but in this area... we haven't heard it announced that so and so has died of COVID-19." Indeed, COVID-19 testing capacity was initially limited to the national laboratory in Dar es Salaam, and so cases from other regions had to be transported to the national laboratory; likely the capacity to transport cases from rural areas was limited.

Access to health care services

In quantitative surveys, among those who were sick or reported a sick household member (n=148), most sought care at a health centre or dispensary (57%), followed by pharmacy (41%), and hospital (24%)[3].

Despite the pressures COVID-19 placed on the health system, only one of the participants in the qualitative sample said they or anyone in their households had difficulty obtaining needed medical care during the pandemic. An 18-year-old male reported that lines at the hospital were long and he wanted to avoid crowds, so he had "to wait until people have left." He said that he had waited all day at the hospital for a consultation. More broadly, however, a community leader said that people "received services as usual." Several participants described strict preventive policies that were in place at health facilities: "you are supposed to keep social distance, staying several steps from others in the queue" and "if you are not wearing a mask you are sent home." Many reported confidence in the protective procedures in place at government health facilities.

However, participants generally reported wanting to stay away from hospitals and clinics when they could, "because they believed that at the hospital there was danger of infection." Stigma related to COVID-19 was reported by participants, and this was seen as a reason to avoid hospitals. One community member said that people thought, "If I go [to the hospital] and I am tested, I will be seen by the community like I am different, that I have got an infection." An adolescent said, "When you go to the hospital, even if it is because of malaria, you would be said to have COVID-19." One community member related the story of a man in his village who had been afraid to go to the hospital when he fell ill with a fever, fearing being confirmed as a COVID-19 case. In the end the fever was diagnosed as malaria and could have been identified and treated earlier. In round 3 of the youth SMS surveys, 38% of the panel sample of youth (N=169) and the full sample reported not seeking health care when needing it in the past month (Table 7 and Appendix Table 10). In the quantitative survey, among those who reported needing care but did not seek it, 10% reported not seeking care due to a fear of contracting COVID-19, while a majority cited costs as the main reason (67%). Females were more likely than males to not seek care when ill or when needed (Table 3).

Table 3. Illness and Health-seeking, Youth Surveys (N=760)

	Pooled	Females	Males	p-value
Sickness in past month		N=344	N=416	
Self	8.16	3.78	11.78	<0.001
Household member	13.82	8.72	18.03	<0.001
None	78.42	84.01	73.8	0.001
Household member death - past month	2.37	3.49	1.44	0.065
Symptoms of recent illness (self or household member)				
Cough	12.84	9.30	14.29	0.411
Shortness of breath/difficulties breathing	6.08	4.65	6.67	0.641
Fever	57.43	30.23	68.57	<0.001
Chills	6.76	9.30	5.71	0.430
Aches	50.68	27.91	60	<0.001
Headache	37.16	23.26	42.86	0.025
Sore throat	2.03	0	2.86	0.263
Loss of taste and/or smell	3.38	6.98	1.91	0.121
Where sought care (N=148)		N=43	N=105	
Did not seek care	3.38	9.30	0.95	0.011
Health center or dispensary	56.76	51.16	59.05	0.379
Hospital	24.32	37.21	19.05	0.019
Pharmacy	40.54	4.65	55.24	<0.001
Traditional Healer	2.03	0	2.86	0.263
Did not seek care when needed to - past month (N=58)	7.63	8.43(N=29)	6.97(N=29)	0.451
Reason did not seek care (N=58)				
No money	67.24	55.17	79.31	0.05
Distance too far	22.41	31.03	13.79	0.115
Worried about crowds/long line	6.9	10.34	3.45	0.3
Fear of contracting COVID-19	10.34	6.9	13.79	0.389

Barriers to health care utilization

Among the 8% of the quantitative sample (n=58) who reported not seeking health care when needed in the past month, the biggest reason was lack of money (67%), while 22% reported the distance was too far (Table 3). One way to improve health care access and reduce financial costs is through coverage by health insurance. Over the course of the government's social protection programme, the Productive Social Safety Net (PSSN) Phase I (2015-2019), PSSN households were encouraged to use a portion of their PSSN cash transfers to enrol in Community Health Fund (CHF). Among the sample of households interviewed over mobile phones at Round 0 (n=542), 31% reported being enrolled in CHF (Figure 3). When we asked youth directly, 30% reported that their household was enrolled in CHF. When we examine the smaller panel sample of households over time (those that responded at all SMS waves; n=95), we see that reported CHF enrolment increased from 28% to 52% between Round 0 (September and October 2020) and Round 1 (second half of November 2020; Table 10). This may be due to the fact that households received their first PSSN payments of 2020 in September after long delays, and therefore with more available funds, households may have chosen to use these PSSN payments to enrol in CHF.

We further examined inability to seek health care by CHF enrolment and did not find a statistically significant association between the two variables. Among those enrolled in CHF (according to youth reports), 9.29% wanted to seek care but did not, compared to 6.93% not enrolled in CHF (p=0.262). Alternatively, it is possible that households with individuals more prone to illness were the ones who chose to enrol in CHF, a voluntary program, and thus this equality in health seeking between enrolled and not enrolled households may indicate a protective effect of CHF enrolment among those who would have been more likely to need care but not able to afford it prior to enrolling in CHF. Indeed, previous studies have shown that community-based health insurance schemes suffer from this adverse selection, whereby those without specific or frequent health needs tend not to join (72). While the difference was not statistically significant, females were more likely than males to not seek care when needed (8.43% v. 6.07%; p=0.451). Given the small number of youths who reported not seeking care when needed, the statistical power to detect differences in this outcome by background characteristics is low. Differences by gender (should these reflect real differences) may be due to contextual factors such as gender norms, whereby females often need permission from their husbands to seek health services, or they may have reduced access to financial resources for transport and payment for services, as compared to males.

Figure 3. Enrolment in Community Health Fund, Household Surveys, Round 0

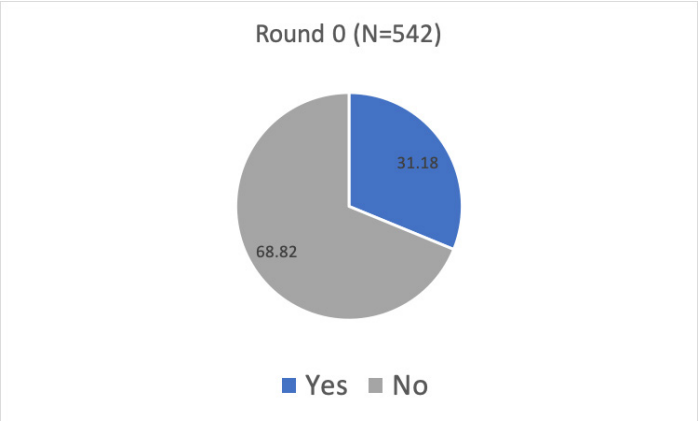


Table 4. Health services delivery, Health Facilities SMS Round 0 Survey (N=83)

	Percentage
Region	
Iringa	50.6
Mbeya	49.4
Reported change in caseload compared to before March 2020	
No change	37.73
Increased	28.92
Decreased	37.35
Ability to provide regular services has changed since March 2020	
Have attended fewer patients due to fewer staffing, funding or supplies	10.84
Have attended fewer patients due to increased caseload related to COVID-19	18.07
No change	71.08
Have noticed increases in patients' difficulties paying for medical services and drugs since March 2020	
Yes	45.78
No	54.22

Note: "Regular services" include well-baby check-ups, vaccinations, maternal health, family planning, etc.

Table 5. Descriptive Summary of Outcomes among the Full Panel Sample of Health Facilities, by Round (N=32)

	Round 0	Round 1	Round 2	Round 3	Round 4
District					
Mufindi/Mafinga	0.44	0.44	0.44	0.44	0.44
Rungwe/Busokelo	0.56	0.56	0.56	0.56	0.56
Caseload					
Increased	0.19	0.25	0.47	0.31	0.28
Decreased	0.38	0.28	0.13	0.38	0.28
Unchanged	0.44	0.47	0.41	0.31	0.44
Ability to provide regular services changed	0.22	0.38	0.34	0.47	0.53
Less funding, staffing, resources	0.13	0.42 (N=12)	0.45 (N=11)	0.40 (N=15)	0.35 (N=17)
Covid-related changes	0.09	0.08 (N=12)	-	-	-
Increase in patients' difficulty paying	0.44	0.53	0.41	0.28	0.31
N	32	32	32	32	32

Note: "Regular services" include well-baby check-ups, vaccinations, maternal health, family planning, etc.

Turning to the health facility interviews (Table 4 and Figure 5), 29% of all facilities (n=83) reported increased caseloads as compared to March 2020, while 37% reported no change or decreased caseloads. As shown in Table 4 and Figure 4, 18% of facilities that reported changes to regular services attributed the changes to fewer staffing, funding, and supplies while 11% stated changes were due to increased caseload due to COVID-19. Further, 46% of health facilities noted increases in patients' difficulties paying for medical services and drugs since March 2020 (Table 4).

Among those health facilities in the panel sample (those that responded at all SMS waves; n=32) caseloads were reported to increase over time between rounds 0 and 2 (as compared to before March 2020 for SMS rounds 0 and 1) or in the past month SMS rounds 2; Table 5). Over time, more facilities reported a change in their ability to provide regular services (including well-baby check-ups, vaccinations, maternal health, family planning, etc.) compared to before March 2020. Appendix 2 provides results from all reporting health facilities between SMS rounds 0 and 4 (not just those in the panel). At SMS round 0, 9% of health facilities reported attending fewer patients for regular services due to increased caseload related to COVID-19, while 13% reported attending fewer patients for regular services due reductions in staffing, funding, or supplies as compared to the period before March 2020 (Table 5).

Further, Figure 6 shows the trends in health facilities' reports of increased caseloads compared to the previous month, among the panel sample. On average, less than 20% of all facilities interviewed reported increased caseloads at SMS round 0, which then increased precipitously to more than 40% at SMS round 2, and dropping to approximately 30% at SMS round 4.

Figure 4. Health Facilities Mobile Survey, Round 0 (N=83)

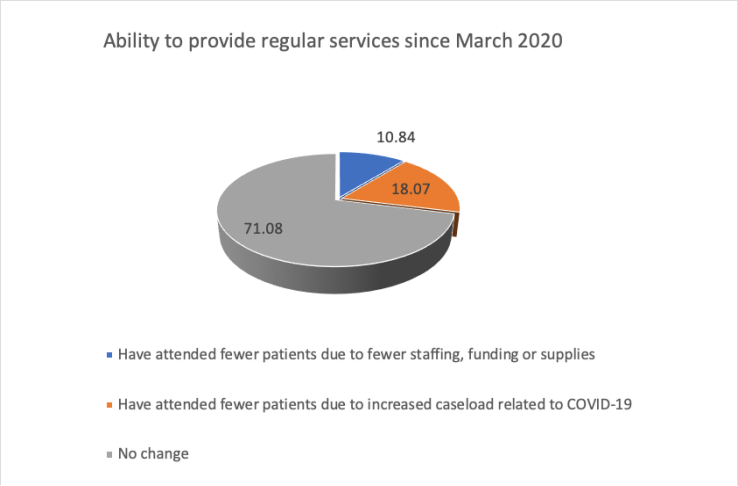


Figure 5. Reported change caseloads among all interviewed health facilities (N=83)

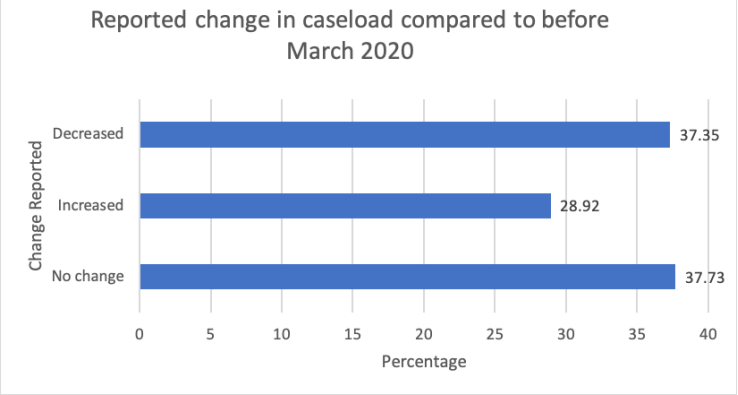
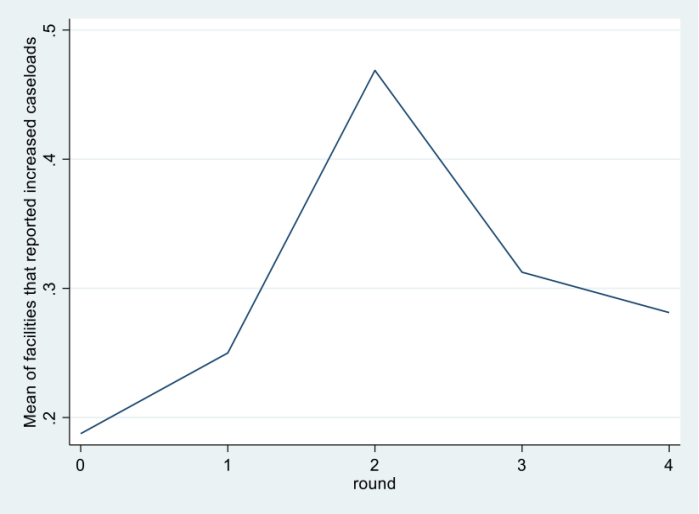


Figure 6. Means of reported increases in caseloads compared to



In summary, a significant portion of health facilities report reduced capacity for regular services due to COVID-19 caseload or shortages in staff and supplies. Facilities also reported increased difficulties in clients' ability to pay since the pandemic began. At the same time, youth and household members reported staying away from health facilities for fear of COVID-19 infection. When people did seek care, the most common sources of care were health center/dispensary or pharmacy. Very few youth reported that they or a household member did not seek care when needed in the past month, possibly due to selection bias, whereby the age group we surveyed tend to be healthy, on average, and less likely to need health services than very young or very old individuals. Among those that did experience barriers to care, distance and financial barriers were most common. The proportion of households in this sample enrolled in CHF is significantly higher than the national average, possibly mitigating financial barriers to accessing healthcare. Nevertheless, some of the impacts of capacity constraints at the health-facility level may materialize in the mid- or longer-term, and it is important to continue to monitor prevention-related outcomes such as vaccination rates and access to family planning. Indeed, a recent study from eight sub-Saharan African countries (Tanzania not included) found that all countries experienced disruptions in services due to COVID-19, with outpatient services and child vaccinations most affected (73). Reductions in provision of these health services may negatively impact the health of adolescent girls, women and their infants in the coming year(s).

6. Impacts of COVID-19 on livelihoods, food and water security, time use, and schooling

Detrimental impacts of COVID-19 on livelihoods and economic activities

Nearly all adolescents, in qualitative interviews, reported major economic impacts to their households during the COVID-19 pandemic. Barriers to economic activity included fear of being in crowds, closures of businesses, and inability to transport goods and supplies. Travel restrictions were particularly challenging. Many of the adolescents' families were involved in buying and selling produce and other goods. As one community member explained, "People could no longer travel to other places to do business, for example going to markets to purchase goods. The effects of COVID-19 on the economy are evidence in the disruption of the transportation of goods from where they are available to the consumer." Another community member detailed the disruption of supply chains in his area: "[A farmer] will grow his vegetables here in Mafinga, and a person from Iringa will not be able to come here to take the consignment of vegetables to go and sell the produce the farmer cultivated." Several participants noted that produce rotted before it could be sold, even in a context where many were going hungry. The travel restrictions also had consequences for future food production, as farmers had difficulty procuring fertilizer for their fields.

Even when people did have goods to sell, they "were afraid of going out to sell due to the pandemic." Customers were also scarce at markets. As a 21-year-old male adolescent reported, "My mother goes to the market and returns [with] all items unsold." Several interviewed participants lost jobs in shops, restaurants, and as guards during the pandemic. Demand for casual labour also fell sharply, because employers "were afraid people from other families might be sick and might infect them," according to a community member.

At both the community and youth levels, in qualitative interviews, participants reported improvements in economic conditions recently, though the reopening brought with it greater risk of

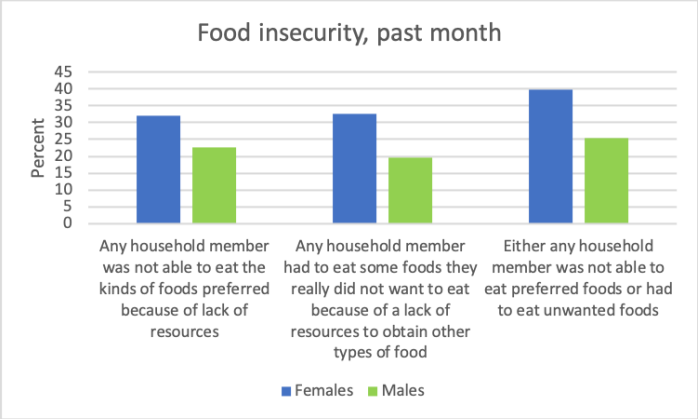
COVID-19 spread. However, some continue to struggle, as they spent their savings during the closures, and now struggle to obtain the capital they need to restart businesses—to buy fertilizer and new seeds for fields or to buy building materials for construction, for example.

When asked about changes in their standard of living compared to six months ago (in quantitative surveys [Table 6]), 56% reported that it was staying the same, 15% reported it was getting worse, and 29% reported it was getting better. Females were more likely than males to report improvements in their standard of living. Households were asked similar questions on standard of living in the SMS surveys (Tables 9 and 10). Among the households interviewed at SMS round 0 (N=542), 19%, 22%, and 59% of households reported worse, better, or unchanged standard of living since March 2020 (Table 9). Among the full panel sample of households interviewed at all SMS rounds (N=95), reports of better standard of living increased to 39% at SMS round 1, levelled off at SMS round 2 and 3, and, ultimately, 29% of households reported better standard of living at SMS round 4 (Table 10). Reporting of worse standard of living ranged from 16% at Round 3 to 21% at Rounds 2 and 4 (Table 10).

COVID-19 induced changes to food and water security

Some households reported difficulties getting enough food during this period, due to increased financial strains and other challenges. Prices went up, especially for sugar, beans, tomatoes, and other basic commodities. One adolescent, a 20-year-old male, said, "When you went to the market you found prices were up while the money you had was not enough. As a result, you couldn't buy anything." In quantitative surveys, 51% of respondents reported that prices had increased more than usual in the markets they usually shop at, as compared to March 2020 (Table 6).

Figure 7 Food security, past month among youth, by sex



In some cases, some types of food were unavailable at any price. One adolescent said, "Getting supplies was a challenge, because they were not available when you wanted them." A 20-year-old male reported, "there was no maize" available in his local market, while another said he had "problems getting meat or fish." In other cases, food was available in the market but "people were afraid to go out and bring more supplies." In quantitative surveys, 38% of youth reported difficulties finding items in the market that their household typically buys (Table 6).

These findings were also supported in the quantitative surveys, where food insecurity was reported by many respondents (Figure 7). Twenty-seven percent of youth reported that household members were not able to eat the kinds of food they preferred in the past month due to a lack of resources, while 25% reported that household members had to eat some foods they really did not want to eat because of a lack of resources to obtain other types of food, either sometimes or often in the past month. Females were more likely than males to report food insecurity. Over time, as reported in youth SMS surveys, an increasing percentage of youth in the panel sample reported eating unwanted foods due to limited resources in October, November, and December (Table

7). These percentages of food insecurity were even higher when analyzing all interviewed youth across the SMS survey rounds (not just those in the panel; Appendix Table 10).

Table 6. Time use and economic activities, Youth quantitative surveys (N=760)

	Pooled	Females	Males	p-values
Time Use - yesterday (hours)				
Collecting water or firewood	1.16	1.49	0.88	<0.001
Collecting nuts or other tree fruits, honey or other products from forest	0.24	0.33	0.18	0.009
Caring for children, cooking, cleaning	1.66	2.58	0.89	<0.001
Caring for elderly or sick household members	0.6	0.89	0.36	<0.001
Changes at market household usually shops at - compared to March 2020 (N=756)				
Prices increased more than usual	51.06	55.23	47.57	0.036
Tried to purchase food or essential items that household purchases frequently but was unable to purchase due to limited supply or they were not available in the market - compared to March 2020	38.36	40.12	36.89	0.364
Standard of living compared to March 2020				
Getting worse	15.13	15.7	14.66	0.692
Getting better	29.08	32.85	25.96	0.037
Staying the same	55.79	51.45	59.38	0.029
Food insecurity				
Any household member was not able to eat the kinds of foods preferred because of lack of resources - sometimes or often (past month)	26.84	31.98	22.6	0.004
Any household member had to eat some foods they really did not want to eat because of a lack of resources to obtain other types of food - sometimes or often (past month)	25.53	32.56	19.71	<0.001
Either unable to eat preferred foods or ate unwanted foods	18.52	23.66	14.46	<0.001
Water insecurity				
There has not been as much water to drink as you would like for you or anyone in your household (often or sometimes) - past month	6.45	9.01	4.32	0.009
Anyone in household had to go without washing hands after dirty activities (e.g., defecating or changing diapers, cleaning animal dung) because of problems with water (often or sometimes) - past month	5.66	9.01	2.88	<0.001
Engaged in negative coping strategy index (range 0-5)	1	0.93	1.06	0.102

A few youth also reported water insecurity in the quantitative survey, which is problematic for effective hygiene practices to prevent transmission of COVID-19. Six percent of youth reported that someone in the household had to go without washing hands after performing dirty activities (for example, defecating, changing diapers, or cleaning animal dung) because of problems with water in the same time period (Table 6). Additionally, six percent reported that there was not as much water to drink often or sometimes in the household in the past month.

Table 7. Descriptive Summary of full panel youth sample outcomes for rounds 1-4, by round

	Round 1	Round 2	Round 3	Round 4
District				
Mufindi/Mafinga	0.53	0.53	0.53	0.53
Rungwe/Busokelo	0.47	0.47	0.47	0.47
Attends School	0.25	0.28	0.29	0.29
Hours spent in farming, tending livestock, or fishing				
Increased	0.40	-	-	0.40
Decreased	0.19	-	-	0.25
Same	0.41	-	-	0.35
Ate unwanted foods due to limited resources	0.51	-	0.57	0.58
Felt bothered by things that don't typically bother	0.11	-	-	-
Did not seek health care when needed	-	0.4	0.38	-
N	169	169	169	169

Shifts in time use among children and youth

When schools closed, some children and youth became more involved in household chores, such as fetching water or gathering firewood, or family economic activities. As one community member explained, "Some were even selling vegetables, without worrying about the presence of diseases, for the economy of the household." Children were reported to be engaging in activities such as collecting scrap metal, farming, gathering garbage, and selling mandazi, second-hand clothes, and produce. One adolescent said of his siblings, "when I was alone at home, I had a lot of work to do, but during the time when they were at home, they really helped me a lot with work."

Females reported twice as much time spent in domestic chores and caring as compared to males. Compared to a year prior (pre-COVID) in multivariate regressions controlling for age and other characteristics (Table 8), youth were more likely to be engaged in the following activities: any work, farm work, livestock work, household business work, and paid work (Table 8). Examined separately by gender, we find that males, but not females, were more likely to be engaging in household business activities or paid work as compared to one year prior (Appendix Tables 4 and 6). However, females, but not males, were more likely to be engaging in any work (including unpaid). Both males and females reported increases in farm work and livestock tending as compared to one year prior. Moreover, youth reported spending, on average, 0.41 more hours caring for elderly, 0.82 more hours gathering firewood, and 0.16 more hours collecting nuts or other tree fruits, honey, or other products form forests in the past day, as compared to one year prior. This is consistent with reports in the qualitative interviews. When examining total hours spent in activities by gender, we found males reported engaging in more hours of all chores (cooking, caring, and gathering firewood and nuts) while females reported spending more hours caring for elderly and gathering firewood and nuts compared to pre-COVID (Appendix

Tables 7 and 8).

When asked about changes in hours spent farming, tending livestock, or fishing, 40% of youth reported increased hours in October and December (Table 7). Nineteen percent of youth reported decreased hours in those activities in October whereas 25% reported increased hours in December compared to a regular season (Table 7). Descriptive summaries of these outcomes among all interviewed youth are shown in Appendix Table 10.

Table 8: Changes over time in time use in the past week, school attendance, and chores in the past 24 hours

	Any work RR (95% CI)	Farm work RR (95% CI)	Livestock work RR (95% CI)	Household business work RR (95% CI)	Paid work RR (95% CI)	Attends school RR (95% CI)	Hours cooking, cleaning, and caring for children β (SE)	Hours caring for elderly β (SE)	Hours gathering firewood β (SE)	Hours gathering nuts β (SE)
Time=2020 (reference=2019)	1.05*	1.21**	1.21**	1.47**	1.36**	1.11	0.04	0.41**	0.82**	0.16**
	(1.01 - 1.09)	(1.12 - 1.32)	(1.10 - 1.33)	(1.19 - 1.81)	(1.18 - 1.58)	(0.92 - 1.33)	(0.11)	(0.06)	(0.06)	(0.04)
Age (years)	1.02**	1.00	0.97	1.07*	1.06**	0.61**	0.03	-0.02	0.01	0.00
	(1.01 - 1.04)	(0.96 - 1.03)	(0.93 - 1.00)	(1.00 - 1.13)	(1.02 - 1.10)	(0.53 - 0.70)	(0.03)	(0.02)	(0.02)	(0.01)
Female	0.92**	0.98	0.99	0.77*	0.51**	1.29*	1.94**	0.31**	0.38**	0.06
	(0.88 - 0.96)	(0.89 - 1.08)	(0.91 - 1.07)	(0.61 - 0.97)	(0.43 - 0.61)	(1.01 - 1.66)	(0.12)	(0.07)	(0.05)	(0.04)
District (ref: Iringa – small)										
Iringa - large	1.02	0.99	0.89	1.07	1.07	0.94	0.10	-0.02	-0.08	-0.13*
	(0.96 - 1.08)	(0.86 - 1.15)	(0.76 - 1.03)	(0.79 - 1.45)	(0.88 - 1.29)	(0.65 - 1.37)	(0.13)	(0.08)	(0.07)	(0.06)
Mbeya - small	1.01	0.88	1.00	1.77**	0.98	0.98	0.07	0.12	-0.07	-0.11
	(0.94 - 1.08)	(0.72 - 1.09)	(0.85 - 1.17)	(1.21 - 2.58)	(0.78 - 1.23)	(0.62 - 1.54)	(0.15)	(0.08)	(0.08)	(0.06)
Mbeya - large	1.00	0.98	0.96	1.54**	1.14	0.88	0.23	0.18*	0.02	-0.04
	(0.94 - 1.07)	(0.84 - 1.14)	(0.83 - 1.10)	(1.15 - 2.06)	(0.92 - 1.40)	(0.57 - 1.35)	(0.13)	(0.07)	(0.08)	(0.06)
Constant							0.03	0.47	-0.01	0.07
							(0.57)	(0.32)	(0.33)	(0.26)
N	1,520	1,520	1,520	1,520	1,520	1,520	1,520	1,519	1,520	1,520
R^2							0.25	0.07	0.22	0.02

Heavy work for schoolchildren seemed relatively rare, however, since most respondents said the members of their households were trying to stay home and social distance during COVID-19. "A large percentage remained locked up in their homes," said one community member. An adolescent, speaking of his siblings, said, "Because we needed to protect them a lot they did not do any activities, they had to stay inside." Also, there were relatively few paid opportunities available for school-age children, given that so many adults had lost their jobs and were competing for any available work.

Material and financial barriers to school attendance/return
Almost all children and youth in the adolescents' households who were enrolled in school before the pandemic returned when schools reopened, according to respondents in community-level qualitative interviews. As one community leader reported, "There was also an effort to follow-up and make sure children returned to school. Therefore, there were not many cases of children not reporting to school...many reported because we took steps early." One adolescent interviewee discussed a case of a schoolgirl in his household becoming pregnant during COVID-19 (see Section 8 below for further discussion of adolescent pregnancy).

Despite this generally positive outcome, at SMS round 0 (Table 10), 12% of households reported that a lack of money prevented them from sending children to school in the past four weeks (among households with school-aged children). The percentages of households reporting lack of money as a barrier to sending children to school increased to 37% at SMS round 2, then decreased to 29% at SMS round 4 of household surveys. These results suggest that as the COVID-19 pandemic progressed, households were increasingly experiencing financial strains that prevented them from sending children to school. Though the percentages reduced between SMS rounds 2 and 4, there still remained approximately one in four households that could not send their children to school. Results of these outcomes among all households interviewed are shown in Appendix Table 9. The differences in qualitative and quantitative reports of effects on school attendance may be explained by the fact that households reported financial difficulties in affording school-related costs, while qualitative reports (among both community members and adolescents) reported that ultimately all or most children were able to return to school, including those where difficulties were addressed with community support. This is also shown in the reports of current school attendance by youth across all survey rounds (Figure 8 and Table 7). Despite high percentages of households reporting having financial troubles that prevented sending children to school (with percentages peaking at SMS round 2), youth reported a slight increase in school attendance over time (ranged from 25% at Round 1 to 29% at Round 4). This suggests that there were other factors (i.e., community support) that enabled youth to attend school in the face of household economic challenges.

In our quantitative adolescent/youth sample, the average age was 20 years and 22% were married, so most were not enrolled in school themselves. Just 14% were attending school prior to school closings in March 2020. The top three reasons for not attending school prior to March were not having money or fees for uniforms (41%), having failed the promotion exam (29%), or already having acquired all their desired education (20%). In regression analyses, there was no significant difference in school attendance, as compared to one year prior, in this sample (Table 8).

Figure 8. Mean reports of school attendance by youth, across SMS rounds 1-4 (N=169)

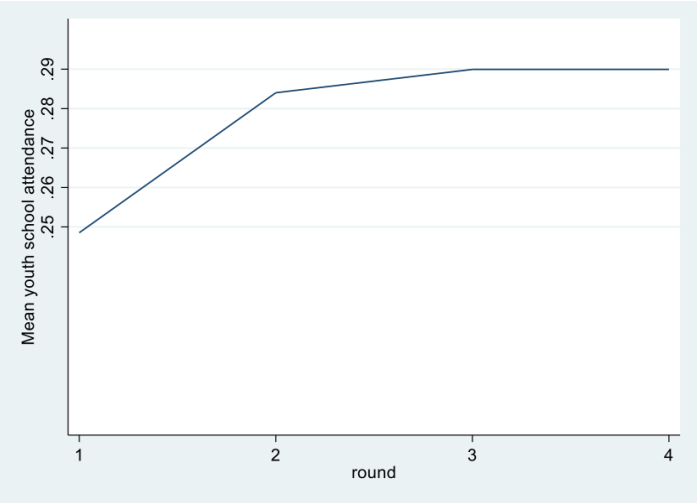


Table 9. Household economic situation means, Household SMS Round 0 Surveys (N=542)

	Percentage
Household member had to eat some foods they really did not want to eat because of a lack of resources - past month	39.48
Lack of money prevented any children in household from attending school - past month (N=504)	15.28
Standard of living compared to March 2020	
Getting worse	18.45
Getting better	22.32
Staying the same	59.23

Table 10. Summary of Outcomes for the Full Panel Sample of Households, by Round

	Round 0	Round 1	Round 2	Round 3	Round 4
District					
Mufindi/Mafinga	0.47	0.47	0.46	0.47	0.47
Rungwe/Busokelo	0.53	0.53	0.51	0.53	0.53
Household enrolled in Community Health Fund	0.28	0.52	-	-	-
Received TASAF payment	0.05	0.59	-	-	0.24
Household member ate unwanted foods	0.47	0.62	0.61	0.56	0.6
Lack of money prevented household from sending children to school	0.12	0.26	0.33	0.29	0.25
Lack of money prevented household from sending children to school (households with children only)	0.12 (N=90)	0.29 (N=87)	0.37 (N=84)	0.35 (N=79)	0.29 (N=82)
Standard of living					
Better	0.23	0.39	0.33	0.33	0.29
Worse	0.19	0.18	0.21	0.16	0.21
Same	0.58	0.43	0.46	0.52	0.49
N	95	95	95	95	95

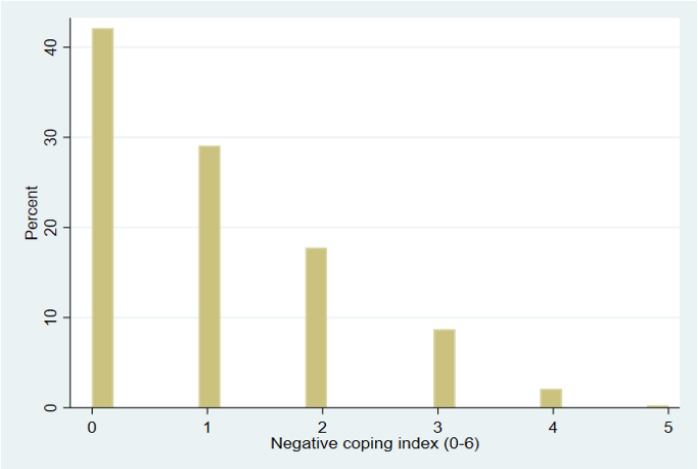
In the qualitative interviews, one adolescent mentioned a delay in a sibling's return to school due to financial constraints. Fees were due when schools reopened, and COVID-19's effects on the economy made this more difficult than usual. "He did not return immediately because he didn't have some of the requirements. How could he go to school without them? He had to wait until we got them… He returned to school after two weeks… Since there is no one to run to for help all I could do was to tell him to be patient, and God is great, I got the money and he returned to school." There were also isolated cases of delayed return due to financial pressures reported by community members. One said, "there is a child who said he did not report to school because he had no school materials. We had caught him at the bus station picking empty tins to sell, claiming he had no school materials." The community member assisted the child, who then returned to school.

Though most children returned to school, participants noted the negative impacts of lost time during the closures. During that time, students largely studied on their own, or with minimal support from siblings or adults in the household. "Studying alone and studying in a group [in school] is different," said one adolescent participant. One community member noted that students in this rural area were disadvantaged because they did not have access to the same resources as students in urban areas. "Their fellow children… those in town, the majority were listening…watching TV, following lessons on TV." Only one of the qualitative interview participants in this study mentioned the availability of educational media, via television and smartphones. Generally, reviewing textbooks was students' only educational activity during the school closures.

Negative coping strategies for dealing with the economic impact of COVID-19

Participants used a variety of coping strategies to address the financial challenges brought on by the COVID-19 pandemic. Seven of the 44 adolescent participants in the qualitative interviews reported selling livestock—chickens, pigs, and cows—or land. In four cases, participants said that they or someone else in their households had taken loans. In a few cases, participants changed to different businesses or became subsistence farmers, to ensure that the household would at least have food. There were barriers to changing economic activities, however. As one community member explained, "This created some difficulties, as you need to get used to the new activity that you are forced to do… This might require capital that you might not have." Three participants in the qualitative interviews reported transactional sexual relationships, though one of these relationships pre-existed COVID-19. Only 4% of females (n=15) in the quantitative surveys reported having started a sexual relationship with someone in the past 12 months for financial reasons (Table 11).

Figure 9. Index of negative coping strategies, youth quantitative sample (n=760)



We examined a variety of coping strategies that households employed to cope with the adverse economic conditions, and among these were six negative coping strategies (changed eating patterns, sold agricultural assets, sold durable goods, sold land, sold crop stocks, sold livestock). On average, households engaged in one negative coping strategy in the past six months (see Figure 9 and Table 6).

7. Mental health

During the COVID-19 pandemic, interview participants reported experiencing heightened fear and anxiety regarding their health as well as their ability to provide for themselves and their families. Fear was expressed by 25 of 44 adolescent participants and 15 of 16 community participants. One participant, a 20-year-old male, said, "When this disease started we were spending the day at home because we were afraid. We would watch the news, and it would be announced so many died here, a hundred there and a thousand in another place." Fear led participants to change their activities to protect themselves. A 19-year-old male reported, "Truly, difficulties were there because you know in the market there are crowds of people, so much that sometimes we miss something you need. You are forced to stay [home] because you are scared." A community leader said, "there was fear that spread all over the community."

Anxiety among household members was mentioned by 21 of 44 adolescent participants in qualitative interviews. Participants worried primarily about their health and that of their families. A 19-year-old male participant explained, "Because you get surprised when you have a cough, you find yourself starting to worry saying 'has this disease has got me or what' you start being anxious since you have suddenly started coughing, you say 'or this disease has caught up with me' Truly, a lot of anxiousness was there." Others, including a 20-year-old female participant, reported anxiety about people in the community not following prevention protocols. "For example you would go into a shop; you find there is no water for washing hands... it just caused us anxiety." Economic pressures also caused stress and anxiety during the COVID-19-related closures, as described in detail Section 6 above. The availability of food in local markets, the risk of going out to obtain it, and the household's ability to pay for it were all sources of anxiety.

Other responses related to mental health in the qualitative data included feeling isolated and frustration among students at having to stay home from school. A 20-year-old male participant who was unemployed and living with a friend expressed difficulty at having to stay home: "I used to mingle a lot with the community, I used much time even playing football." During COVID-19, he felt alone because he had to "spend my time seated idle at home." Another adolescent participant, a 24-year-old female, said of her younger siblings, "they were tired of staying at home since it was not a planned holiday." A 20-year-old male participant also spoke to his siblings' frustration at the extended break: "They were feeling very bad because they were at home and education is still waiting for them."

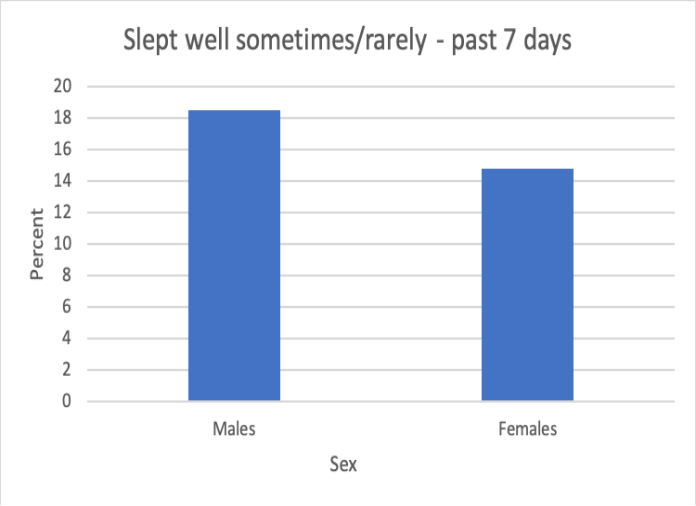
In our sample, 17% and 8% reported having trouble sleeping and being bothered by things that don't usually bother them, respectively (Table 11 and Figure 10). Males reported higher rates of both trouble sleeping and being bothered by things than females, but differences were not statistically significant. The percentage of youth interviewed in SMS round 1 who reported being bothered by things that don't usually bother them in the past 7 days increased to 11% (Table 7 and Appendix Table 10), indicating a slight increase in depressive symptoms.

Table 11. Mental health, violence, and Vulnerability outcome means, Youth Surveys (N=760)

	Pooled	Females	Males	p-value
Mental Health				
Slept well only rarely or sometimes - past 7 days	16.84	14.83	18.51	0.177
Bothered by things that don't usually bother them (most/all of the time) - past 7 days	8.03	7.56	8.41	0.666
Started a sexual relationship with someone in order to get things you need, such as money or gifts - past 12 months (N=343)	4.37			
Violence		(N=172/N=171)	(N=159)	
Experienced physical violence (N=331)	9.06	6.4	11.95	0.079
Experienced emotional violence (N=330)	11.82	7.6	16.35	0.014
Vulnerability index* (range 0 - 9) mean	3.99	4.19	3.82	0.143

*Vulnerability index includes measures related to mental health, violence, transactional sex, food security, and water insecurity

Figure 10. Percentages of youth who reported sometimes or rarely sleeping well in the past week (N=760), by sex



In regression analyses, controlling for age and other characteristics (Table 12), youth in this mobile survey round were less likely to report having trouble sleeping, as compared to one year prior, and there were no differences in reports of being bothered by things. The changes in sleep issues appears to be driven by females: females were significantly less likely to report poor sleep during the mobile surveys compared to one year prior, while males did not have significant differences in sleep problems (see Appendix Tables 3 and 5). Sleep problems and irritability were not spontaneously raised by participants in the qualitative interviews.

Table 12: Associations between Mobile Wave versus Wave 3 and mental health outcomes in the past week, Youth surveys

	Bothered	Poor sleep
	(RR)	(RR)
Mobile Wave (reference = 2019)	0.91	0.73**
	(0.63 - 1.31)	(0.58 - 0.91)
Age (years)	1.08	1.07
	(0.95 - 1.22)	(0.99 - 1.14)
Female	1.27	0.83
	(0.87 - 1.84)	(0.66 - 1.03)
Iringa - large	1.20	0.70*
	(0.70 - 2.03)	(0.50 - 0.97)
Mbeya - small	1.56	0.93
	(0.90 - 2.71)	(0.60 - 1.44)
Mbeya - large	1.40	1.18
	(0.85 - 2.32)	(0.86 - 1.61)
N	1,520	1,520

* p<0.10; ** p<0.05; *** p<0.01; RR=risk ratio

8. Pregnancy, violence, and exploitation

Violence and exploitation experiences among youth remain stable

None of the adolescent or community member participants in the qualitative interviews discussed incidents of violence in homes or communities during the COVID-19 pandemic. In quantitative surveys, 9 and 12 percent of the sample reported physical and emotional violence in the past 12 months, respectively (Table 11). Males reported higher rates of emotional and physical violence than females.

When comparing to a year prior (pre-COVID) in multivariate regressions controlling for age and other characteristics, youth were not more likely to report either form of violence (Table 13), and results did not change when examining violence experiences separately by gender (Appendix Tables 3 and 5).

Table 13: Changes over time in violence and exploitation outcomes

	Hit with fist, kicked, beaten (RR)	Slapped or pushed (RR)	Emotional violence (RR)	Physical violence (RR)	Any violence (RR)	Transactional sex - females only (RR)
Mobile Wave (reference = 2019)	1.94	1.58	1.33	1.38	1.20	0.50*
	(0.65 - 5.83)	(0.91 - 2.74)	(0.85 - 2.09)	(0.82 - 2.33)	(0.82 - 1.76)	(0.25 - 1.00)
Age (years)	0.75	0.83	1.02	0.85	0.95	1.03
	(0.47 - 1.20)	(0.68 - 1.02)	(0.89 - 1.18)	(0.71 - 1.03)	(0.83 - 1.09)	(0.84 - 1.26)
Female	0.52	0.43**	0.43**	0.49**	0.51**	
	(0.19 - 1.44)	(0.24 - 0.76)	(0.26 - 0.72)	(0.29 - 0.81)	(0.35 - 0.74)	
Iringa - large	0.96	0.89	0.81	0.88	0.77	1.51
	(0.28 - 3.29)	(0.32 - 2.45)	(0.39 - 1.71)	(0.40 - 1.97)	(0.43 - 1.38)	(0.52 - 4.42)
Mbeya - small	1.81	1.45	1.23	1.51	1.24	2.37
	(0.47 - 7.04)	(0.52 - 3.99)	(0.53 - 2.84)	(0.65 - 3.51)	(0.67 - 2.30)	(0.73 - 7.75)
Mbeya - large	0.77	1.78	1.05	1.37	1.14	1.75
	(0.16 - 3.75)	(0.76 - 4.16)	(0.52 - 2.11)	(0.66 - 2.83)	(0.68 - 1.92)	(0.62 - 4.91)
N	667	667	666	667	667	688

*$p<0.10$; ** $p<0.05$; *** $p<0.01$.

In qualitative interviews, three participants, all 20-year-old females, reported transactional sexual relationships. The participants reported receiving food and small amounts of money from their partners. Only 4% of females (n=15) in the quantitative surveys reported having started a sexual relationship with someone in the past 12 months in order to get things that they needed, such as money or gifts. In multivariate regressions, females were less likely to report starting a sexual relationship for this reason as compared to one year prior (Table 13).

Taken together, these findings suggest that violence and exploitation did not increase among adolescents in this setting due to the pandemic. However, these sensitive outcomes often suffer from reporting bias, and there may be unreported cases of violence. Indeed, global studies have demonstrated that violence against women and children has increased due to the pandemic (42).

Reproductive health access, pregnancy and marriage during school closures

While re-enrolment in school was nearly universal among children and youth who were enrolled before the pandemic, participants noted that there were some children and youth in the community who did not return to school. Three respondents—two community members and one adolescent—discussed pregnancies among schoolgirls during school closures. A male community member said, "Immediately after the COVID-19 break, other children started leaving their neighbourhoods and going maybe to an uncle in another place... on the pretext of going to rest." He continued, "We got information after a follow-up that she would no longer continue with school due to pregnancy." There were no reported marriages of children and youth under 18 in the qualitative sample households.

In interviews with health service providers in the study areas, 30 percent of facilities reported attending fewer patients for regular services (including family planning) in the period since March 2020, for reasons related to having fewer staff, funding or supplies, or due to an increased caseload of COVID-19 patients (see Figure 4). This may have created additional barriers for adolescents to access family planning services to prevent unintended pregnancy, though we did not see direct evidence of increases in unplanned pregnancies in the qualitative or quantitative data. Nevertheless, as reported in Section 5 and shown in Table 7, 40% of adolescents did report not seeking care when needed in the past month, with females report higher (but not statistically different) rates of not seeking care than males. In the short-term we have not documented effects, but in the medium- and longer-term these individual-level barriers to health seeking combined with reduced capacity among health facilities to provide regular services, may lead to increases in rates of unintended pregnancies and other adverse health outcomes.

9. Conclusion

This study has provided real-time information on how COVID-19 is affecting economic security and well-being, including mental health, violence, exploitation, and general vulnerability among adolescents and youth in rural Tanzania and provided some additional information on health services utilization and health facilities' capacity to deliver health services.

Findings demonstrated that information about COVID-19 has reached the population examined. There was accurate knowledge of some symptoms of COVID-19; however only three symptoms were recognized by more than half the sample. Common sources of information included radio, television, friends and neighbours, and social media. Respondents did report implementing prevention measures, including washing hands, wearing a mask and social distancing. Recent relaxing of social distancing measures may be a result of messaging by the government, as President Magufuli declared Tanzania "Coronavirus free" in June 2020. Very few respondents reported not seeking care when needed in the past month. Among those who did report not seeking care when needed, lack of money was the most common reason. Females, on average, had lower levels of reported knowledge and prevention measures implemented than males. Females were also more likely to not seek care when needed. Enrolment in CHF, which can help alleviate the financial burden of seeking care, was reported by only one third of households in the sample, indicating the need to expand health insurance coverage among this population. However, this percentage did increase over time as reported by the panel of households interviewed, in the period after households received their PSSN payments. The surveyed households did report higher rates of CHF coverage than those nationally, and this may in part be explained by the fact that personnel implementing the PSSN encouraged households to use part of the cash transfer payments to enrol in CHF. Nevertheless, use of PSSN payments for enrolment in CHF is not a sustainable solution for healthcare coverage among poor households. Despite the sample of youth generally not reporting difficulties accessing care when needed, staff at almost one-third of health facilities did report a reduction in the ability to provide general services, compared to the period before March 2020. Reasons indicated for this reduction in regular services related to increased COVID-19 caseload and having fewer resources, staff, or supplies. This suggests that COVID-19 has had an adverse impact on the delivery of health care services, and this may have medium- and longer-term effects on unintended pregnancy, nutrition, and lower vaccination rates, among others.

Economic impacts were the main impacts for the sample—over health or other concerns. Food insecurity was prevalent, and respondents reported rising prices for food and difficulties obtaining items needed. In addition, some households reported water insecurity, with implications for proper sanitation and COVID-19 prevention. In response to this economic insecurity, one in three youth in the sample reported that their households engaged in negative coping strategies in the previous six months. Moreover, youth engaged in more labour and increased time spent in domestic chores. However, it appears this was limited to older youth, and younger children in the households were spared increased labour activities in an effort to protect them from COVID-19 exposure, as reported in qualitative interviews. Qualitative findings indicate increased stress and anxiety as a result of the decreased economic security created by the pandemic; however, these findings were not confirmed in quantitative analyses, possibly due to more limited measures included in the quantitative survey.

While community leaders reported that all children went back to school, some households reported delays in children returning to school due to economic difficulties. PSSN payments resumed in September 2020 after a delay of 18 months (one payment was made in the interim), and this may help mitigate economic insecurity. The amounts of these payments are conditional on school attendance for school-age children (starting with the December 2020 payment cycle, as conditions were waived for payments received in September/October 2020), which may mean that some households struggling to afford items necessary to send children to school (books, uniforms, informal fees, etc.) may receive lower PSSN payments, further making it difficult to send their children to school, in a reinforcing cycle.

The pandemic does not seem to have exacerbated violence and exploitation risks in this population, despite reports and warnings to the contrary in other settings. Moreover, transactional sex does not appear to have increased among females in this population, despite increases in economic insecurity, a risk factor. The qualitative findings around increases in pregnancies during school closures are supported by evidence from the Ebola epidemic in West Africa from 2014-2016.

Some limitations of these analyses of youths' vulnerability are that, due to the mobile nature of the surveys and time constraints this imposed, we asked a limited set of questions – instead of implementing full scales, we included selected items from various scales- as compared to what is generally asked in face-to-face settings. In addition, some adverse outcomes such as violence and transactional sex may be underreported due to the sensitive nature of the topics. In terms of health outcomes, another limitation relates to the fact that we leveraged an existing sample comprised of adolescents and youth, who tend to be healthier, on average, than other segments of the population. Thus, in terms of direct health impacts of COVID-19 infection, adolescents and young adults might be among the least vulnerable. Nevertheless, social distancing, school closures, and reduced capacity at health facilities may have adverse impacts on adolescents' mental health, pregnancy and birth spacing, and these outcomes might take longer to materialize. Thus, further research on this topic is warranted. Another limitation is that these findings are not generalizable to all youth in Tanzania. The sample is primarily rural and drawn from households participating in a national social protection program. Thus, they are among the poorest and most vulnerable households in Tanzania. This population is vulnerable to health impacts of macroeconomic conditions, and their health and ability to access services may be adversely affected through more

economic channels.

Despite the limitations of this study, there are many strengths. We utilized a combination of quantitative and qualitative surveys and gathered information at multiple levels, including from youth, households, communities, and health facilities. The sample is representative of households participating in the PSSN who have adolescents residing in them. Participants have been part of an on-going study for over three years, and thus they are comfortable sharing information with the study team. An additional strength is the inclusion of both males and females, as many adolescent-focused studies tend to include females only. Based on the findings of the study, we provide a set of recommendations below.

Recommendations

In order to mitigate adverse impacts of the COVID-19 pandemic on vulnerable youth, government, development partners, and civil society can advocate for and implement the following measures:

1. **Continue health communication and improve information channels**: Qualitative findings suggested that people in the targeted communities are beginning to relax their COVID-19 prevention practices, including social distancing and mask wearing. Therefore, we recommend continued focus on these practices in all ongoing projects. While most participants had some degree of knowledge about COVID-19 symptoms, there were gaps in knowledge. This suggests that more work needs to be done to understand the information that Tanzanians are receiving about COVID-19 and how this information delivery can be improved.
2. **Strengthen health services:** Support could be given to health facilities in terms of reinforced staffing and financial support to ensure smooth delivery of services, including those related to COVID-19 but also regular services during this time of increased demand. Moreover, efforts should be made to ensure that adolescent-friendly access to health services, including sexual and reproductive health services, continue to be available to adolescents.
3. **Expand and adapt social protection**: Some households who did not meet eligibility criteria during previous programme roll-out periods may subsequently have been impoverished due to the recent crisis, and thus additional targeting and horizontal programme expansion should be considered. Moreover, efforts should be made to expand coverage of social health protection, including enrolment in the Community Health Fund. Currently, enrolees, including those from poor households in the PSSN, have to pay annual premiums for coverage. Initiatives could be designed by the government and development partners, whereby premiums for these households below the extreme poverty line are covered by alternative sources of funding, instead of by households. Changes of this manner would require higher-level coordination of government entities, beyond TASAF, the PSSN implementing agency.
4. **Scale up other economic strengthening**: The most common source of anxiety and worry in this study was economic-related and reported barriers to seeking care often were demand-side barriers related to poverty. Thus, various economic strengthening initiatives can mitigate these adverse impacts. Initiatives may include scaling up agricultural extension programming to promote resiliency and increased productivity of crop production and livestock keeping. Other initiatives might include grants to support small businesses. These, in turn, can help mitigate negative coping strategies such as selling of agricultural assets and livestock, forcing children to drop out of school, or marrying off adolescent girls.
5. **Modify school policies and implement monitoring of children's**

school attendance: Waive requirements around school dress codes regarding shoes and uniforms, which incur additional costs to households during emergency periods (for example, pandemics, recessions, or severe food shortages). Most of the children in this study's households who had been enrolled prior to the pandemic returned to school, partly due to close monitoring by schools and communities and efforts to meet children's school supply and uniform needs. These efforts must be continued, as economic challenges from COVID-19 may have lingering effects on households that impact children in the future.

6. **Strengthen food and nutrition surveillance and referral systems**: Most of the participants in the current study were living in PSSN households, meaning that young children are being monitored for nutrition and growth as part of PSSN programme conditions. Additional strengthening of these surveillance systems can help identify nutrition crises in a timely manner, especially in the context of populations recovering from the COVID-19 pandemic and expected food shortages predicted in early 2021.
7. **Implement water, sanitation, and hygiene programming**: Efforts could be increased in communities examined to alleviate water insecurity, prevent transmission of infectious diseases including COVID-19, and reduce gendered domestic chore burdens.
8. **Scale up community-based mental health programmin**g: In this setting, with limited capacity in terms of professionally trained psychologists, psychiatrists, clinical social workers, and other mental health professionals, community-based interventions are a promising strategy to respond to mental health needs, which are exacerbated by poverty.

10. References

1. World Health Organization. Coronavirus disease (COVID-19) pandemic: Numbers at a glance 2020 [Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019.
2. World Health Organization. WHO Coronavirus Disease (COVID-19) Dashboard 2020 Geneva: WHO; 2020 [Available from: https://covid19.who.int/.
3. Johns Hopkins Coronavirus Resource Center. Mortality Analyses 2020 [Available from: https://coronavirus.jhu.edu/data/mortality.
4. Centers for Disease Control and Prevention. Scientific Brief: SARS-CoV-2 and Potential Airborne Transmission. CDC; 2020.
5. World Health Organization. Coronavirus: Symptoms 2020 [Available from: https://www.who.int/health-topics/coronavirus#tab=tab_3.
6. Izvorski I, Mahajan S, Moorty L, Vincelette G. A policy framework for mitigating the economic impact of COVID-19. Brookings. 2020.
7. WFP and FAO. FAO-WFP early warning analysis of acute food insecurity hotspots: October 2020. Rome. Rome: World Food Programme and Food and Agricultural Organization; 2020.
8. Lakner C, Yonzan N, Gerszon Mahler D, Castaneda Aguilar R, Wu H, Fleury M. Updated estimates of the impact of COVID-19 on global poverty: The effect of new data Washington, DC: World Bank Group; 2020 [Available from: https://blogs.worldbank.org/opendata/updated-estimates-impact-covid-19-global-poverty-effect-new-data?token=d3c7288f257b662e819adb237c06033e.
9. Jayaram K, Leke A, Ooko-Ombaka A, Sun Y. Finding Africa's path: Shaping bold solutions to save lives and livelihoods in the COVID-19 crisis2020 October 2020. Available from: https://www.mckinsey.com/featured-insights/middle-east-and-africa/finding-africas-path-shaping-bold-solutions-to-save-lives-and-livelihoods-in-the-covid-19-crisis#.
10. KASI. Staying Ahead of the Curve: How Brands Can Leverage Insights to Win in Times of Crisis. Nairobi: KASI; 2020 October 2020.
11. Dahir A. Tanzania's President Says Country Is Virus Free. Others Warn of Disaster. The New York Times. 2020.
12. Zanzibar: A Pathway to Tourism for All Integrated Strategic Action Plan Zanzibar2019 [Available from: http://documents1.worldbank.org/curated/pt/993701565250577192/pdf/Zanzibar-A-Pathway-to-Tourism-for-All-Integrated-Strategic-Action-Plan.pdf.
13. US Embassy in Tanzania. Health Alert: U.S. Embassy Dar es Salaam Dar es Salaam: US Embassy in Tanzania; 2020 [Available from: https://tz.usembassy.gov/health-alert-u-s-embassy-dar-es-salaam-may-13-2020/#:~:text=Many%20hospitals%20in%20Dar%20es,for%20those%20with%20COVID%2D19.
14. Dahir A. Tanzania's President Says Country Is Virus Free. Others Warn of Disaster 2020 [Available from: https://www.nytimes.com/2020/08/04/world/africa/tanzanias-coronavirus-president.html.
15. Gentilini U, Almenfi M, Dale P. Social Protection and Jobs Responses to COVID-19: A Real-Time Review of Country Measures. December 2020.
16. Patton GC, Ross DA, Santelli JS, Sawyer SM, Viner RM, Kleinert S. Next steps for adolescent health: a Lancet Commission. The Lancet. 2014;383(9915):385-6.
17. Patton GC, Coffey C, Cappa C, Currie D, Riley L, Gore F, et al. Health of the world's adolescents: a synthesis of internationally comparable data. The Lancet. 2012;379(9826):1665-75.
18. Saurav A, Kusek P, Kuo R, Viney B. The impact of COVID-19 on foreign investors: Evidence from the second round of a global pulse survey Washington, DC: World Bank; 2020 [Available from:

https://blogs.worldbank.org/psd/impact-covid-19-foreign-investors-evidence-second-round-global-pulse-survey.

19. Tanzania: Low Oil Prices to Lessen Pandemic Impact On Economy- BoT. Tanzania Daily News. 2020.
20. Blanke J. Economic impact of COVID-19: Protecting Africa's food systems from farm to fork2020. Available from: https://www.brookings.edu/blog/africa-in-focus/2020/06/19/economic-impact-of-covid-19-protecting-africas-food-systems-from-farm-to-fork/.
21. Headey D, Ruel MT. The COVID-19 nutrition crisis: What to expect and how to protect Washington, DC: International Food Policy Research Institute; 2020 [Available from: https://www.ifpri.org/blog/covid-19-nutrition-crisis-what-expect-and-how-protect.
22. UNICEF. WASH in Schools New York: UNICEF; 2020 [Available from: https://www.unicef.org/wash/schools/.
23. Ministry of Health CD, Gender, Elderly and Children, Ministry of Health, National Bureau of Statistics, [Zanzibar] OoCGS. Tanzania Demographic and Health Survey and Malaria Indicator Survey 2015-2016. Dar es Salaam and Rockville, MD: MoHCDGEC, MOH, National Bureau of Statistics and ICF; 2016.
24. Human Rights Watch. Africa: Covid-19 Exposes Healthcare Shortfalls. 2020.
25. Menéndez C, Lucas A, Munguambe K, Langer A. Ebola crisis: the unequal impact on women and children's health. The Lancet Global Health. 2015;3(3):e130.
26. Sochas L, Channon AA, Nam S. Counting indirect crisis-related deaths in the context of a low-resilience health system: the case of maternal and neonatal health during the Ebola epidemic in Sierra Leone. Health policy and planning. 2017;32(suppl_3):iii32-iii9.
27. Taylor R, Elizabeth S, Zara A, Ann B. Estimates of the Potential Impact of the COVID-19 Pandemic on Sexual and Reproductive Health In Low- and Middle-Income Countries. International perspectives on sexual and reproductive health. 2020;46:73-6.
28. Cleland J, Conde-Agudelo A, Peterson H, Ross J, Tsui A. Contraception and health. The Lancet. 2012;380(9837):149-56.
29. Briggs H, Haberland N, Desai S, De Hoop T, Ngo T. The Impact of COVID-19 on Opportunities for Adolescent Girls and the Role of Girls' Groups. Washington, DC and New York: American Institutes for Research and Population Council; 2020.
30. Roberton T, Carter ED, Chou VB, Stegmuller AR, Jackson BD, Tam Y, et al. Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study. The Lancet Global Health. 2020.
31. WHO. WHO: access to HIV medicines severely impacted by COVID-19 as AIDS response stalls Geneva: World Health Organization; 2020 [Available from: https://www.who.int/news/item/06-07-2020-who-access-to-hiv-medicines-severely-impacted-by-covid-19-as-aids-response-stalls.
32. Czeisler M, Marynak K, Clarke K, Salah Z, Shakya I, Thierry J, et al. Delay or Avoidance of Medical Care Because of COVID-19–Related Concerns — United States, June 2020. Centers for Disease Control and Prevention; 2020.
33. Wong LE, Hawkins JE, Langness S, Murrell KL, Iris P, Amanda Sammann. Where Are All the Patients? Addressing Covid-19 Fear to Encourage Sick Patients to Seek Emergency Care 2020 [Available from: https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0193.
34. Panchal N, Kamal R, Orgera K, Cox C, Garfield R, Hamel L, et al. The implications of COVID-19 for mental health and substance use. Kaiser Family Foundation. 2020.
35. World Health Organization. Mental health & COVID-19 2020 [Available from: https://www.who.int/teams/mental-health-and-substance-use/covid-19.

36. Bruneir A, Drysdale C. COVID-19 disrupting mental health services in most countries, WHO survey2020. Available from: https://www.who.int/news/item/05-10-2020-covid-19-disrupting-mental-health-services-in-most-countries-who-survey.
37. The Lancet Infectious Diseases. The intersection of COVID-19 and mental health. The Lancet Infectious Diseases. 2020;20(11):P1217.
38. UNICEF and IRC. COVID-19-GBV Risks to Adolescent Girls and Interventions to Protect and Empower Them. New York: UNICEF and IRC; 2020.
39. Bhalla N. Tanzania lets pregnant girls attend school with World Bank project: Reuters; 2020 [Available from: Tanzania lets pregnant girls attend school with World Bank project.
40. Evans ML, Lindauer M, Farrell ME. A Pandemic within a Pandemic—Intimate Partner Violence during Covid-19. New England journal of medicine. 2020.
41. Peterman A, Potts A, O'Donnell M, Thompson K, Shah N, Oertelt-Prigione S, et al. Pandemics and violence against women and children. Center for Global Development working paper. 2020;528.
42. Peterman A, O'Donnell M. COVID-19 and Violence against Women and Children: A Second Research Round Up Washington, DC: Center for Global Development; 2020 [cited 2020 November 24]. Available from: https://www.cgdev.org/publication/covid-19-and-violence-against-women-and-children-second-research-round.
43. UN Women. The Shadow Pandemic: Violence against women during COVID-19 2020 [Available from: https://www.unwomen.org/en/news/in-focus/in-focus-gender-equality-in-covid-19-response/violence-against-women-during-covid-19.
44. Wamoyi J, Ranganathan M, Kyegombe N, Stoebenau K. Improving the measurement of transactional sex in Sub-Saharan Africa: a critical review. Journal of acquired immune deficiency syndromes (1999). 2019;80(4):367.
45. Stoebenau K, Heise L, Wamoyi J, Bobrova N. Revisiting the understanding of "transactional sex" in sub-Saharan Africa: A review and synthesis of the literature. Social Science & Medicine. 2016;168:186-97.
46. Dunkle KL, Jewkes R, Nduna M, Jama N, Levin J, Sikweyiya Y, et al. Transactional sex with casual and main partners among young South African men in the rural Eastern Cape: Prevalence, predictors, and associations with gender-based violence. Social Science & Medicine. 2007;65(6):1235-48.
47. Hidrobo M, Kumar N, Palermo T, Peterman A, Roy S. Why gender-sensitive social protection is critical to the COVID-19 response in low- and middle-income countries. In: Swinnen J, McDermott J, editors. COVID-19 and Global Food Security. Washington, DC: International Food Policy Research Institute; 2020.
48. United Nations. Policy Brief: The Impact of COVID-19 on Women. New York: United Nations; 2020.
49. Buvinic M, Noe L, Swanson E. Understanding Women's and Girls' Vulnerabilities to the COVID-19 Pandemic: A Gender Analysis and Data Dashboard of Low- and Lower-Middle Income Countries. Washington, DC: Data2x and Open Data Watch; 2020.
50. de Paz C, Muller M, Munoz Boudet A, Gaddis I. Gender dimensions of the COVID-19 pandemic. Washington, DC: World Bank Group; 2020.
51. Girl Effect, Vodafone Foundation. Real girls, real lives, connected. 2018.
52. UNICEF. Child Marriage: Progress New York, NY: UNICEF; 2011 [Available from: http://www.childinfo.org/marriage_progress.html.
53. Palermo T. Social Protection and Child Marriage:

Evidence, Practice and Opportunities: socialprotection.org; 2020 [Available from: https://www.youtube.com/watch?v=mdYruiQyfS0.

54. United Nations Population Fund (UNFPA). Impact of the COVID-19 pandemic on family planning and ending gender-based violence, female genital mutilation and child marriage New York, NY: UNFPA; 2020 [Available from: https://www.unfpa.org/sites/default/files/resource-pdf/COVID-19_impact_brief_for_UNFPA_24_April_2020_1.pdf.

55. ILO. World Social Protection Report: Universal Social Protection to Achieve the Sustainable Development Goals. Geneva: International Labour Organization; 2017.

56. Tanzania Cash Plus Evaluation Team. A Cash Plus Model for Safe Transitions to a Healthy and Productive Adulthood: Round 3 Report. 2021.

57. Tanzania PSSN Youth Study Evaluation Team. Tanzania Youth Study of the Productive Social Safety Net (PSSN) Impact Evaluation: Endline Report. 2018.

58. Coates J, Swindale A, Bilinsky P. Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide: version 3. 2007.

59. Young SL, Boateng GO, Jamaluddine Z, Miller JD, Frongillo EA, Neilands TB, et al. The Household Water InSecurity Experiences (HWISE) Scale: development and validation of a household water insecurity measure for low-income and middle-income countries. BMJ global health. 2019;4(5):e001750.

60. Household Water Insecurity Experiences (HWISE) Scale Evanston, IL: Northestern University; 2020 [Available from: https://sites.northwestern.edu/hwise/study-forms-manual/.

61.Radloff LS. The CES-D scale: A self-report depression scale for research in the general population. Applied psychological measurement. 1977;1(3):385-401.

62. Garcia-Moreno C, Jansen H, Ellsberg M, Heise L, Watts C. Prevalence of intimate partner violence: findings from the WHO multi-country study on women's health and domestic violence. Lancet. 2006;368(9543):1260-9.

63. Straus MA, Hamby SL, Boney-McCoy S, Sugarman DB. The revised conflict tactics scales (CTS2) development and preliminary psychometric data. Journal of family issues. 1996;17(3):283-316.

64. Birks M, Chapman Y, Francis K. Memoing in qualitative research: Probing data and processes. Journal of research in nursing. 2008;13(1):68-75.

65. Corbin J, Strauss A. Basics of qualitative research: Techniques and procedures for developing grounded theory: Sage publications; 2014.

66. Ministry of Health CD, Gender, Elderly and Children (MoHCDGEC) [Tanzania Mainland], Ministry of Health (MoH) [Zanzibar], National Bureau of Statistics (NBS), Office of the Chief Government Statistician (OCGS), and ICF,. Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS) 2015-16. Dar es Salaam, Tanzania, and Rockville, Maryland, USA: MoHCDGEC, MoH, NBS, OCGS, and ICF; 2016.

67. Sanga HH. Bridging the gap between gendered access and completion: The educational exclusion experiences of girls in rural Tanzania. 2016.

68. Obafunso AA. Looking beyond Human Rights and Culture Debates: The Girls Accounts of Main Obstacles Against Girls Access to Education in Northern Nigeria. Social Justice Perspectives (SJP) Retrieved from http://hdl handle net/2105/17376. 2014.

69. Budlender D. The Political and Social Economy of Care: Tanzania Research Report 2. March Geneva: United Nations Research Institute for Social Development (UNRISD). 2008.

70. Wyche S, Olson J. Gender, Mobile, and Mobile Internet| Kenyan Women's Rural Realities, Mobile Internet Access, and "Africa

Rising". Information Technologies & International Development. 2018;14:15.

71. Burrell J. Evaluating Shared Access: social equality and the circulation of mobile phones in rural Uganda. Journal of computer-mediated communication. 2010;15(2):230-50.

72. Mathauer I, Mathivet B, Kutzin J. Community Based Health Insurance: How Can it Contribute to Progress Towards UHC? Geneva: World Health Organization; 2017. Contract No.: WHO/HIS/HGF/PolicyBrief/17.3.

73. Shapira G, Ahmed T, Drouard SHP, Fernandez PA, Kandpal E, Nzelu C, et al. Disruptions in Essential Health Services During the First Five Months of COVID-19: Analysis of Facility-Reported Service Volumes in Eight Sub-Saharan African Countries. 2020.

11. Appendices

Appendix Table 1. Mean Characteristics of Eligible and Interviewed samples

	Full Cohort in 2019 (N=2191)	Eligible Sample (N=1,727)	p-value (Full cohort v. eligible)*	Mobile Sample (N=760)	p-value (eligible v. mobile)*
Iringa	0.51	0.51	0.976	0.52	<0.001
Mbeya	0.49	0.49	0.998	0.48	<0.001
Age	18.11	18.73	<0.001	18.84	0.013
Attends School	0.33	0.23	<0.001	0.21	0.105
Highest Grade Completed	7.85	7.93	<0.001	8.16	0.003
Any Economic Activities	0.81	0.83	0.001	0.84	0.313
Farm work	0.54	0.55	0.356	0.54	0.539
Livestock work	0.51	0.50	0.361	0.50	0.703
Fishing for household	0.03	0.02	0.184	0.03	0.796
Household business	0.16	0.17	<0.001	0.19	0.139
Paid work	0.26	0.29	<0.001	0.31	0.297
Any chores	0.88	0.88	0.321	0.89	0.447
Collecting water	0.71	0.70	0.026	0.70	0.743
Collecting firewood	0.29	0.29	0.732	0.27	0.102
Gathering nuts	0.07	0.07	0.748	0.05	0.030
Taking care of children	0.70	0.70	0.725	0.71	0.485
Taking care of elderly or sick	0.17	0.17	0.489	0.16	0.311
Depressed (CESD=>10)	0.23	0.24	0.013	0.24	0.777
Well-being Stress	2.75	2.90	<0.001	2.77	0.128
Risk-related Stress	0.37	0.37	0.638	0.33	0.161
Relationship Stress	0.42	0.45	0.031	0.37	0.028
Quality of Life	4.82	4.75	0.010	4.73	0.759
Tested for HIV (past year)	0.46	0.50	<0.001	0.50	0.829
Sought SRH services	0.26	0.30	<0.001	0.31	0.480
Single	0.92	0.90	<0.001	0.91	0.684
Married	0.07	0.09	<0.001	0.09	0.928
Separated	0.01	0.01	<0.001	0.01	0.196
N	2,191	1,727		760	
Looking for job	0.14	0.17	<0.001	0.18	0.675
N	1,096	773		338	
Locus of Control	3.29	3.31	<0.001	3.31	0.983
Self-Esteem	3.82	3.80	0.194	3.78	0.338
Social Support	3.92	3.92	0.827	3.91	0.810
N	2,190	1,726		760	
Ever pregnant	0.30	0.40	<0.001	0.37	0.178
N	1,001	753		344	
Ever impregnated a female	0.04	0.05	<0.001	0.04	0.645

N	1,190	974		416	
Emotional Violence	0.09	0.10	0.105	0.09	0.353
Physical Violence	0.11	0.09	0.004	0.08	0.178
Any Violence	0.18	0.16	0.138	0.14	0.127
N	1,033	805		336	

*p-values determined by regressions comparing wave 3 to eligible sample and eligible sample to mobile sample while controlling for district and size dummy variables and clustering standard errors at the village level. Farming, livestock, fishing, family business, paid work, and job hunting refer to the past 7 days. Any chores, collecting water, firewood, nut, and providing care (children or elderly) refer the past 24 hours

Experiences of violence (emotional, physical) are in reference to the past year

Appendix Table 2. Summary of Health Facility Outcomes, by SMS Round

	Round 0	Round 1	Round 2	Round 3	Round 4
District					
Mufindi/Mafinga	0.51	0.49	0.49	0.47	0.44
Rungwe/Busokelo	0.49	0.51	0.51	0.53	0.56
Caseload					
Increased	0.29	0.35	0.53	0.39	0.29
Decreased	0.37	0.22	0.13	0.29	0.33
Unchanged	0.34	0.43	0.34	0.33	0.38
Ability to provide regular services changed	0.29	0.43	0.4	0.43	0.49
Less funding, staffing, resources	0.11	0.38 (N=26)	0.57 (N=24)	0.29 (N=21)	0.32 (N=22)
Due to increased caseload from COVID-19	0.18	0.08 (N=26)	-	-	-
Witnessed increases in patients' difficulty paying	0.46	0.48	0.42	0.31	0.29
N	83	60	53	49	45

Note: "Regular services" include well-baby check-ups, vaccinations, maternal health, family planning, etc.
Reference period for change was prior to March 2020 for Rounds 0-1 and compared to the previous month for Rounds 3-4.

Appendix Table 3: Associations between Mobile Wave versus 2019 and outcomes in mental health[a] and violence[b] among males

	Bothered	Poor sleep	Hit with fist, kicked, beaten	Slapped or pushed	Emotional violence	Physical violence	Any violence
Mobile Wave (reference = 2019)	1.39	0.77	2.10	1.59	1.33	1.47	1.26
	(0.81 - 2.39)	(0.54 - 1.09)	(0.76 - 5.81)	(0.90 - 2.82)	(0.81 - 2.18)	(0.83 - 2.59)	(0.85 - 1.88)
Age (years)	1.01	1.03	0.58	0.82	0.99	0.78	0.88
	(0.84 - 1.21)	(0.94 - 1.13)	(0.31 - 1.07)	(0.63 - 1.07)	(0.84 - 1.16)	(0.60 - 1.00)	(0.75 - 1.04)
District (ref: Iringa-small)							
Iringa - large	0.90	0.69	2.58	1.08	1.02	1.48	1.09
	(0.46 - 1.76)	(0.46 - 1.05)	(0.42 - 16.00)	(0.30 - 3.83)	(0.39 - 2.65)	(0.49 - 4.46)	(0.48 - 2.48)
Mbeya - small	1.25	1.09	2.70	2.25	1.42	2.44	1.65
	(0.63 - 2.48)	(0.65 - 1.84)	(0.36 - 20.32)	(0.66 - 7.74)	(0.47 - 4.27)	(0.74 - 8.00)	(0.71 - 3.79)
Mbeya - large	0.74	1.41	1.42	2.08	1.16	2.10	1.44
	(0.35 - 1.58)	(0.97 - 2.06)	(0.14 - 14.39)	(0.75 - 5.76)	(0.45 - 2.97)	(0.76 - 5.78)	(0.68 - 3.03)
N	832	832	319	319	319	319	319

* p<0.10; ** p<0.05; *** p<0.01. [a]Within the past week. [b]Within the past 12 months.

Appendix Table 4: Associations between 2020 versus 2019 outcomes in time use[a] among males

	Any work	Farm work	Livestock Work	Household business work	Paid work	Attends School
Mobile Wave (reference = 2019)	1.02	1.18**	1.19**	1.64**	1.46**	1.03
	(0.98 - 1.06)	(1.06 - 1.32)	(1.06 - 1.35)	(1.25 - 2.15)	(1.26 - 1.68)	(0.78 - 1.37)
Age (years)	1.02	0.95	0.90**	1.02	1.06*	0.63**
	(1.00 - 1.03)	(0.91 - 1.00)	(0.86 - 0.95)	(0.95 - 1.11)	(1.01 - 1.11)	(0.52 - 0.75)
District (ref: Iringa-small)						
Iringa - large	1.06	1.08	1.04	1.50	1.10	0.71
	(0.98 - 1.16)	(0.88 - 1.32)	(0.86 - 1.26)	(0.99 - 2.27)	(0.88 - 1.38)	(0.45 - 1.12)
Mbeya - small	1.04	0.95	1.13	1.90*	1.15	0.59
	(0.95 - 1.14)	(0.76 - 1.20)	(0.90 - 1.43)	(1.10 - 3.28)	(0.90 - 1.47)	(0.31 - 1.10)
Mbeya - large	1.04	1.13	1.19	1.73**	1.23	0.68
	(0.96 - 1.13)	(0.91 - 1.39)	(0.99 - 1.42)	(1.14 - 2.63)	(0.97 - 1.55)	(0.39 - 1.19)
N	832	832	832	832	832	832

* p<0.10; ** p<0.05; *** p<0.01. [a]Within the past week.

Appendix Table 5: Associations between Mobile Wave versus 2019 and outcomes in mental health[a] and violence[b] among females

	Bothered	Poor sleep	Hit with fist, kicked, beaten	Slapped or pushed	Emotional violence	Physical violence	Any violence
Mobile Wave (reference = 2019)	0.59	0.69*	1.87	1.46	1.33	1.23	1.10
	(0.34 - 1.02)	(0.50 - 0.94)	(0.19 - 18.63)	(0.43 - 4.91)	(0.54 - 3.23)	(0.42 - 3.60)	(0.50 - 2.41)
Age (years)	1.16*	1.09	1.07	0.90	1.11	1.01	1.08
District (ref: Iringa – small)	(1.00 - 1.34)	(1.00 - 1.20)	(0.62 - 1.84)	(0.67 - 1.22)	(0.87 - 1.41)	(0.80 - 1.28)	(0.89 - 1.31)
Iringa - large	2.12	0.68	0.00**	0.62	0.46	0.35	0.38*
	(0.73 - 6.21)	(0.40 - 1.14)	(0.00 - 0.00)	(0.12 - 3.26)	(0.13 - 1.66)	(0.09 - 1.35)	(0.17 - 0.88)
Mbeya - small	2.54	0.69	1.09	0.36	0.90	0.65	0.73
	(0.81 - 7.94)	(0.34 - 1.40)	(0.17 - 7.23)	(0.04 - 3.64)	(0.27 - 3.07)	(0.17 - 2.46)	(0.28 - 1.92)
Mbeya - large	3.33*	0.91	0.49	1.36	0.91	0.86	0.88
	(1.19 - 9.33)	(0.56 - 1.49)	(0.06 - 3.82)	(0.36 - 5.22)	(0.31 - 2.70)	(0.33 - 2.22)	(0.44 - 1.77)
N	688	688	348	348	347	348	348

* p<0.10; ** p<0.05; *** p<0.01. [a]Within the past week. [b]Within the past 12 months.

Appendix Table 6: Associations between Mobile Wave versus 2019 and outcomes in time use[a] among females

	Any work	Farm work	Livestock Work	Household business work	Paid work	Attends School	Transactional sex - females only
Mobile Wave (reference = 2019)	1.08*	1.27**	1.25**	1.24	1.17	1.20	0.50*
	(1.00 - 1.17)	(1.11 - 1.46)	(1.08 - 1.45)	(0.93 - 1.65)	(0.85 - 1.60)	(0.97 - 1.48)	(0.25 - 1.00)
Age (years)	1.03**	1.03	1.02	1.13**	1.06	0.58**	1.03
District (ref: Iringa – small)	(1.01 - 1.05)	(0.99 - 1.07)	(0.98 - 1.07)	(1.04 - 1.23)	(0.99 - 1.14)	(0.50 - 0.69)	(0.84 - 1.26)
Iringa - large	0.95	0.88	0.71**	0.59*	0.96	1.43	1.51
	(0.87 - 1.04)	(0.74 - 1.06)	(0.59 - 0.87)	(0.37 - 0.94)	(0.62 - 1.49)	(0.75 - 2.73)	(0.52 - 4.42)
Mbeya - small	0.97	0.78	0.82	1.58*	0.61*	1.82	2.37
	(0.87 - 1.09)	(0.56 - 1.08)	(0.66 - 1.03)	(1.02 - 2.46)	(0.38 - 0.97)	(0.93 - 3.53)	(0.73 - 7.75)
Mbeya - large	0.95	0.84	0.76**	1.31	0.94	1.28	1.75
	(0.86 - 1.06)	(0.69 - 1.03)	(0.63 - 0.93)	(0.83 - 2.08)	(0.60 - 1.49)	(0.66 - 2.48)	(0.62 - 4.91)
N	688	688	688	688	688	688	688

* p<0.10; ** p<0.05; *** p<0.01. [a]Within the past week.

Appendix Table 7: Change over time (2019 v. 2020) in hours dedicated to chores[a] among males

	Hours cooking	Hours caring for elderly	Hours gathering firewood	Hours gathering nuts
Time=2020 (ref=2019)	0.37**	0.21**	0.65**	0.10*
	(0.08)	(0.06)	(0.06)	(0.05)
Age (years)	-0.06*	-0.01	-0.03	-0.02
District (ref: Iringa-small)	(0.02)	(0.02)	(0.02)	(0.01)
Iringa - large	0.10	0.10	0.01	-0.11
	(0.12)	(0.10)	(0.09)	(0.09)
Mbeya - small	-0.40**	0.06	-0.10	-0.15
	(0.11)	(0.07)	(0.09)	(0.09)
Mbeya - large	-0.25*	0.09	-0.09	-0.15
	(0.10)	(0.08)	(0.08)	(0.08)
Constant	1.77**	0.27	0.80*	0.56
	(0.44)	(0.32)	(0.35)	(0.30)
R^2	0.07	0.02	0.19	0.02
N	832	832	832	832

* p<0.10; ** p<0.05; *** p<0.01. [a]Yesterday.

Appendix Table 8: Change over time (2019 v. 2020) in hours dedicated to chores[a] among females

	Hours cooking	Hours caring for elderly	Hours gathering firewood	Hours gathering nuts
Time=2020 (ref=2019)	-0.38	0.65**	1.02**	0.22**
	(0.22)	(0.12)	(0.09)	(0.05)
Age (years)	0.15**	-0.03	0.06*	0.03
	(0.05)	(0.03)	(0.03)	(0.02)
District (ref: Iringa – small)				
Iringa - large	0.16	-0.17	-0.19	-0.14
	(0.23)	(0.14)	(0.11)	(0.07)
Mbeya - small	0.71*	0.21	-0.05	-0.05
	(0.30)	(0.19)	(0.13)	(0.08)
Mbeya - large	0.90**	0.27	0.18	0.11
	(0.27)	(0.17)	(0.12)	(0.10)
Constant	-0.41	0.79	-0.67	-0.53
	(1.03)	(0.54)	(0.50)	(0.40)
R^2	0.04	0.08	0.23	0.06
N	688	687	688	688

* p<0.10; ** p<0.05; *** p<0.01. [a]Yesterday.

Appendix Table 9. Summary of Household Outcomes for SMS rounds 0-4, by Round

	Round 0	Round 1	Round 2	Round 3	Round 4
District					
Mufindi/Mafinga	0.53	0.56	0.56	0.56	0.52
Rungwe/Busokelo	0.47	0.44	0.43	0.44	0.48
Household enrolled in Community Health Fund	0.31	0.59	-	-	-
Received TASAF payment	0.06	0.54	-	-	0.23
Household member ate unwanted foods	0.39	0.58	0.65	0.58	0.59
Lack of money prevented household from sending children to school	0.14	0.28	0.35	0.34	0.3
Lack of money prevented household from sending children to school (households with children only)	0.15 (N=504)	0.31 (N=213)	0.42 (N=191)	0.41 (N=186)	0.35 (N=136)
Standard of living					
Better	0.22	0.31	0.24	0.24	0.33
Worse	0.18	0.2	0.22	0.2	0.2
Same	0.59	0.5	0.54	0.56	0.47
N	542	243	228	229	155

Appendix Table 10. Summary of youth outcomes for SMS rounds 1-4, by round

	Round 1	Round 2	Round 3	Round 4
District				
Mufindi/Mafinga	0.59	0.57	0.55	0.53
Rungwe/Busokelo	0.41	0.43	0.45	0.47
Attends School	0.24	0.3	0.28	0.27
Hours spent in farming, tending livestock, or fishing				
Increased	0.43	-	-	0.4
Decreased	0.2	-	-	0.25
Same	0.37	-	-	0.35
Ate unwanted foods due to limited resources	0.53	-	0.59	0.61
Felt bothered by things that don't typically bother	0.11	-	-	-
Did not seek health care when needed	-	0.38	0.38	-
N	473	399	369	387