

Continuity of essential health services amidst COVID-19 pandemic in Tanzania: a pre and post implementation support assessment

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Abstract

Background The COVID-19 pandemic has potentially caused disruptions in provision of routine, regular essential health services in different ways; through overwhelming the health system in responding to COVID-19; some of the intervention used to slow transmission of COVID-19 may inhibit access to essential services; and through supplies of medicine being interrupted. In Tanzania, unlike many other countries, which did not follow strict lockdown measures, disruption of access to and utilization of EHS due to anxiety and fear of contact with the infection while seeking medical care was observed.

Method This was a cross-section study conducted in October 2022 to evaluate trends of utilizing essential health services before and after implantation of continued essential services (CES) project among 297 Amref supported facilities from Mainland Tanzania and Zanzibar. It involved the use of secondary data from the district health information system 2 (DHIS2), and extracted variable included; facility type and name, number of individuals using the antenatal, post-natal, immunization and delivery services. Through using STATA version 14, the data was cleaned, and quarterly and yearly average number of clients using either of the services was computed for the period between 2019 and 2021. Findings were presented in form of graphs, and comparison were made for the period before and after the implementation of the project.

Results It was found that all key indicators that were assessed were maintained following the implementation of the project interventions that aimed at maintaining EHS during the COVID-19 pandemic.

Conclusion The study found that project interventions have remained relevant to the needs of communities as demonstrated by the maintenance of the essential MNCH services, as seen in a number of the key EHS indicators which were tracked. This calls for joint efforts between the government and partners on resource mobilization for scale-up so that the EHS is maintained and the country is prepared for these pandemics.

1 Introduction

Countries worldwide are facing many challenges as they strive to ensure that health systems maintain essential health services (EHS) as they respond to the coronavirus disease of 2019 (COVID-19) pandemic [1]. EHS have experienced widespread disruption due to pandemic-related social restrictions, high patient caseloads, under resourced health facility infrastructures, and shortages of medical equipment, medicines, diagnostics and staff, with health care workers (HCWs)

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placed under enormous strain [2]. A World Health Organization (WHO) survey found that 90% of countries reported some negative effect on EHS since the beginning of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a virus that caused the COVID-19 pandemic, whereby more disruption was conveyed from low- and middle-income countries. Another pulse survey by WHO rounds 1–3 implemented during the COVID-19 pandemic 2020–2021 reported that substantial disruptions continued to affect EHS. Resource limitations (e.g., staff shortages, personal protective equipment (PPE) shortages, limited infrastructure), public health and public hesitancy to attend appointments affect EHS during pandemics [1, 3]. Studies show that COVID-19-related disruptions could leave many women and children without access to EHS, such as vaccination, maternal health services, and neonatal services, and result in increased maternal and child morbidity and mortality [2]. Additionally, a study in Addis Ababa and Dessie Referral Hospital showed a decrease in antenatal care (ANC) at the 1st visit by 12% and 50%, respectively, during the COVID-19 pandemic [3]. Also, Evidence from four Low- and Mid-Income Countries (LMICs) with poor MNCH indices suggests that coronavirus pandemic focused approach could lead to more than 30% additional maternal and newborn deaths due to reduced access to relevant essential services such as family planning, antenatal care (ANC) and adequately supervised community and facility-based deliveries [21]. Another study based on data from other 118 LMICs estimated that the disruption in utilization of MNHC services from the pandemic might increase under-5 mortalities by 9.8–44.7% and maternal mortality by 8.3–38.6% per month, depending on the degree of disruption [22]. Furthermore, the meta-analysis was conducted on twenty-four articles, including 1100 pregnancies, were selected. The pooled prevalence of pneumonia was found to be 89% (95% CI 70–100), while the prevalence of women admitted to the intensive care unit was 8% (95% CI 1–20). Three stillbirths and five maternal deaths were reported. A pooled prevalence of 85% (95% CI 72–94) was observed for caesarean deliveries. There were three neonatal deaths. The prevalence of COVID-19-related admission to the neonatal intensive care unit was 2% (95% CI 0–6). Nineteen out of 444 neonates were positive for SARS-CoV-2 RNA at birth. Elevated levels of IgM and IgG Serum antibodies were reported in one case, but negative swab [23]. This further shakes the health system being overwhelmed not only by the pandemic but also by people seeking health care when it is too late, hence requiring longer and more expensive hospital stays [4]. Tanzania, unlike many other countries, did not follow strict lockdown measures; nevertheless, disruption of access to and utilization of health care services primarily due to anxiety and fear of contact with the infection while seeking medical care was observed. Redistribution of HCWs for a dedicated team allocated in the treatment sites and isolation sites further strained the available shortage of human resources for health [5].

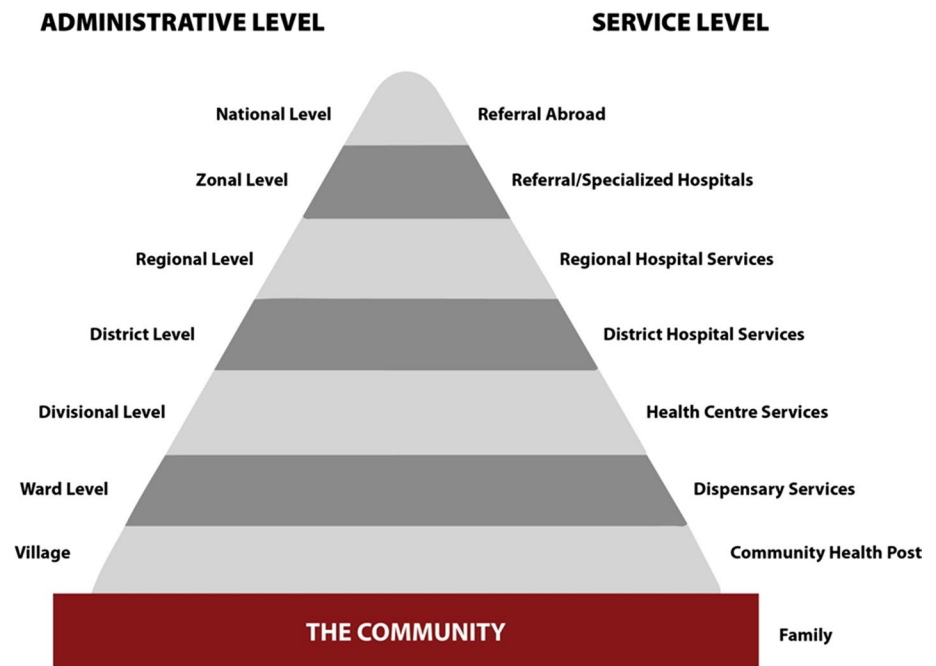
1.1 Tanzania health system

The Tanzania health system's structure starts from the community to the national level. Figure 1 below shows a clear Tanzania health system structure with administrative and service levels that need continuity if all factors remain constant [6]. However, during the COVID-19 pandemic, the system was interrupted as described in the introduction section at various levels. Thus, there is a need to support the continuity of essential health services (CESs) during the COVID-19 pandemic.

1.2 Support to foster the continuation of health services

The Government of Tanzania in collaboration with Amref Health Africa Tanzania under the support of UNICEF implemented several interventions to foster CES in 297 health facilities (264 in Mainland and 33 in Zanzibar). Interventions focused on strengthening infection prevention and control (IPC) practices together with addressing challenges related to limited resources due to pandemic response efforts, such as staff shortages, PPE shortages, and unresponsive infrastructure to comply with public health restrictions [7]. Thus, the CES project had two key areas of focus: (i) capacity strengthening to health facilities (HFs) on IPC and (ii) strengthening of triage areas to decongest highly populated HFs through minor renovation, provision of Water, Sanitation and Hygiene (WASH) and emergence medical equipment support. Four key indicators, as advised by the WHO [8], were tracked to learn about status before and after the project: trends in the utilization of institutional delivery services; trends in the utilization of ANC services; trends in the utilization of postnatal care (PNC) services; and the number of children immunized with diphtheria-tetanus-pertussis (DPT3)/Measles 2 Vaccination.

This study therefore aimed to assess the continuity in utilization of maternal and child health (MCH) services pre- and post-implementation of interventions geared to foster CES in 17 regions of Tanzania during the COVID-19 pandemic.

Fig. 1 Tanzania Health Systems Structure [6]

2 Methodology

The CES project was implemented for 1 year from October 2020 to September 2021, whereby capacity strengthening to HCWs and strengthening of triage areas through minor renovation and equipment support was implemented. A cascade blended model of training was used to train HCWs. A total of 1174 facility-based trainers of trainers (TOTs) were trained by the project in 297 HFs who then trained a total of 8881 (130%) medical HCWs and 2734 (133%) nonmedical workers. We used the TOT approach based on its potential to facilitate the cascade of training to other HCWs and ensure the sustainability of the interventions after the end of the project [9, 10, 20]. Additionally, the project supported minor renovation of triage areas and procurement and distribution of triage medical emergency equipment, supplies and WASH facilities to 20 HFs (12 HFs in Mainland and 8 HFs in Zanzibar).

This was a cross-sectional study design conducted using secondary data to assess pattern in utilization of essential health services from selected facilities in Mainland Tanzania and Zanzibar. The services of interests in this study included, ANC, PNC, Institutional deliveries and vaccination.

As per National regulations, facilities are mandated to provide the regulatory authorities with updated information on services they provide. These are in turn utilized for research, policy and planning. District Health Informa System (DHIS) is a government owned and managed information system that captures data on various health indicators including those related to the services that are the focus on this study.

A total of 297 facilities that were supported in 17 Mainland Tanzania and Zanzibar regions were included in the study. The study team extracted from the database the number of clients receiving care/attended at each facility on quarterly basis for a period of 2019 to 2021. This period covered pre-pandemic and during pandemic, pre- and post- project implementation periods. Additional variables that were extracted included, name and level of the health facility, regions and districts where facilities were located. The database lacks information on variables such as clients' demographic variables such as sex, age.

Facilities data were merged in excel and exported to STATA Version 14.0 for analysis. Data were checked for completeness and validity. Facilities registries were used to supplement some missing information and those data that were still invalid or incomplete even after this, were dropped from the final analysis.

During the analysis, the team computed, for each quarter and year, the total and average number of clients who utilized the selected services at the given intervals. A comparison of the pattern in utilization was made based on facility type.

3 Results

3.1 Trend in the utilization of institutional delivery services

Utilization of institutional delivery services was one of the key indicators to assess the performance of the CES project. Trend analysis on the number of institutional deliveries during the pre- and post-project implementation periods shows that the number of women who delivered at health facilities in project-supported health facilities during post-project implementation increased compared to pre-project implementation trends in both Mainland and Zanzibar. The results show that in mainland China, 53% were recorded before project implementation, while 61% were recorded after project implementation, which is an increase of 8% [11]. The picture was similar in Zanzibar regarding the increase in deliveries, as shown in Fig. 2.

3.2 Trends in utilization of ANC Service

The WHO recommends that a pregnant woman should attend her first ANC once she misses her menses and undertake at least four ANC visits [12]. Comparing pre- and post-project implementation results, the total number of women who reported attending 4 or more ANC visits for their most recent birth increased from 46 to 53% at post-project implementation, which is an increase of 7%. In Zanzibar, 48% was recorded in pre-project implementation, while 52% was recorded in post-project implementation.

3.3 Trends in the utilization of PNC services

According to the WHO, the PNC should be provided in the first 24 h to all mothers and newborn babies, healthy women and their newborns should stay at the health facility at least 24 h before being discharged early, and all mothers and babies need at least four postnatal checkups in the first 6 weeks [13]. The analysis shows an increase in the utilization of PNC services in both Mainland and Zanzibar. In the Mainland, an upward trend from 48 to 51% was observed post-implementation of the project.

3.4 Trends in coverage of DPT3/measles 2 vaccination

The project tracked the trend in children immunized using the measles second dose as a means to monitor the utilization of essential services by children. The findings revealed that the number of children immunized with DPT3/Measles 2 increased steadily from 41%, which was recorded during the pre-project implementation, to 59% during post-project implementation, which is an increase of 18%. In Zanzibar, the change was noted from 49% recorded during reimplementation to 56% during post implementation. For more information, see Figs. 2 and 3 below.

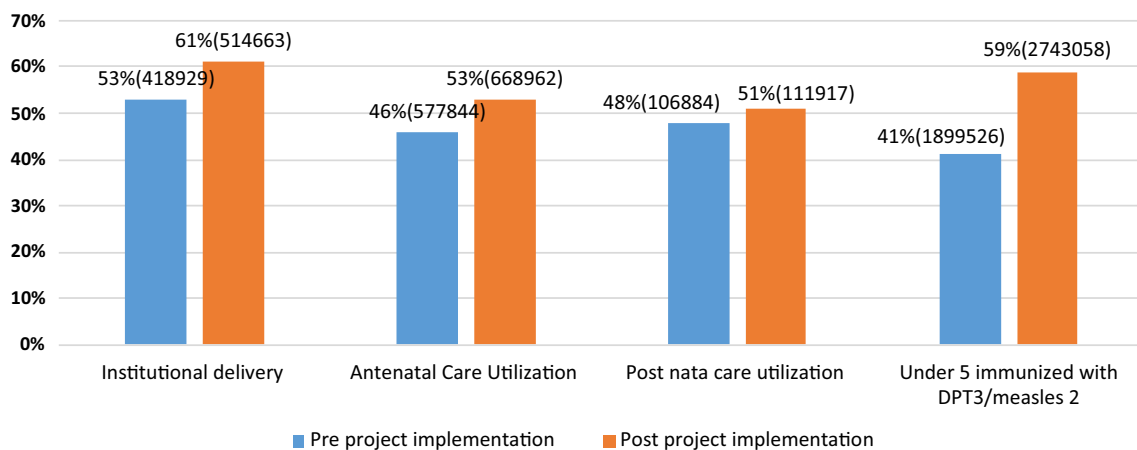


Fig. 2 Trend in utilization of Institution delivery, ANC, PNC and Coverage of DPT3/Measles 2 Vaccination in Tanzania Mainland

4 Discussion

It was found that all key indicators that were assessed were maintained following the implementation of the CES project interventions that aimed at maintaining EHS during the COVID-19 pandemic. This has been contributed by the project interventions that were implemented, including HCWs training on IPC, distribution of the IPC reference documents including IPC guidelines and SOPs, provision of WASH and emergence medical equipment together with ring fencing to health facilities. The same findings were obtained by a study in Ethiopia whereby most of the EHS for MCH (deliveries, postnatal and immunizations) were maintained following interventions on IPC and ring fencing [14]. Therefore, this implies that active government involvement and political will are key to ensuring that all key factors/ingredients needed to maintain EHS, such as strengthening of health facilities (including HCWs' capacity strengthening, distribution of information, education and communication (IEC) materials, and renovation of highly congested triage areas), if implemented during pandemics, can lead to undisrupted EHS.

While we have limited studies on pre-post project implementation work on maintaining EHS due to COVID-19 effects, a pre-post project implementation work by the WHO whose goal was to ensure that during the response to COVID-19, actions would be taken to mitigate effects on reproductive, maternal, newborn, child and adolescent health (RMNCAH) due to disruptions to EHS provision and use in 9 countries has shown different results across countries on the key RMNCAH EHS indicators [15].

4.1 Antenatal care (ANC) contacts

In 9 countries for which data were available, the numbers of reported ANC contacts provided through public sector facilities in 2020 varied. In some countries, such as Ethiopia, there was minimal change between 2019 and 2020. During part of 2020, these numbers were higher than for corresponding months in 2019 in some places, such as the Democratic Republic of the Congo, South Africa and Uganda. In other countries, such as Nigeria and Pakistan, the number of ANC contacts in public facilities showed an initial decrease in comparison to 2019; however, these numbers increased over the course of 2020. In Sudan and Yemen, the number of ANC contacts in 2020 did not return to the 2019 level even towards the end of 2020 [15]. The same results were obtained in our study, where the ANC trend was observed to increase by the end of the implementation of our project for both mainland Tanzania and Zanzibar.

4.2 Health facility deliveries

In 9 countries, the changes in the number of births in public facilities in 2020 in comparison to 2019 reported through the HMIS varied. Some countries, such as Cameroon, the Democratic Republic of the Congo, Ethiopia, South Africa and Uganda, reported little to no change in the number of facility births throughout 2020, with some even showing a slight increase in numbers compared to the corresponding months of 2019. Other countries, such as Pakistan and Yemen,

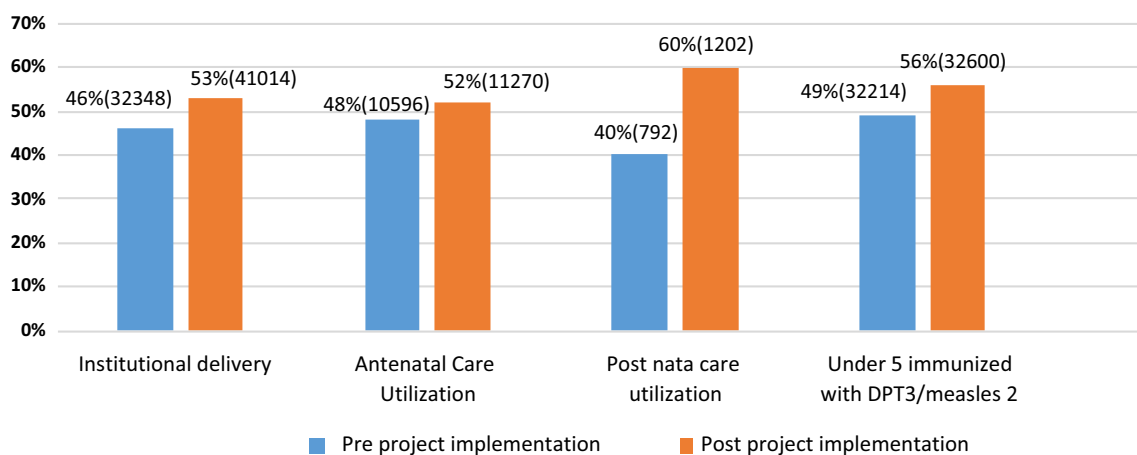


Fig. 3 Trend in utilization of Institution delivery, ANC, PNC and Coverage of DPT3/Measles 2 Vaccination in Zanzibar

reported decreases in the numbers of facility births during 2020 but showed a return to 2019 levels by the end of the year, contrary to our study results. In Nigeria and Sudan, these decreases had not returned to 2019 levels by the end of 2020; rather, they were increased (15), similar to what was found in our study in Tanzania. Experience from some facilities in Haiti, Lesotho, Liberia, Mexico and Sierra Leone from March to December 2020 showed a significant decrease in facility-based deliveries, hence necessitating the development of interventions that are suited to the local context in each country [16].

4.3 Child health and immunization

In Ethiopia, DRC, and Nigeria, the reported number of children less than 1 year of age receiving the third dose of the DPT vaccine was higher in 2020 than in the corresponding months of 2019. In Pakistan and Yemen, the number of child immunizations was the same pre- and post-implementation, contrary to our study, i.e., there was a drop in the reported number of children less than 1 year of age receiving the third dose of DPT or pentavalent vaccine in 2020 starting in March, with the lowest dip in the second quarter of the year. However, the number of children receiving this vaccination returned to levels similar to those in 2019 by the end of the year. In Sudan, the results were different, where the number of children immunized was reported to be low post implementation [15]. A study that analyzed the linkage between universal health coverage (UHC) and the delivery of services before and during the COVID-19 pandemic focusing on childhood immunization coverage showed that countries that have made more progress towards the attainment of UHC experienced less of a decrease in childhood immunization coverage [17]. In this regard, Tanzania needs to speed up its efforts towards UHC as a strategic effort that may ensure CES in future pandemics.

4.4 Number of women receiving PNC within the first 24 h of birth

In countries such as Ethiopia and South Africa, the number of women receiving PNC was higher in 2020 than in 2019. This was similar to what our study found in mainland Tanzania and Zanzibar. In Pakistan, the reported number of women and newborns receiving PNC was lower from April to August 2020 compared to the corresponding months in 2019 but returned to similar levels by the end of 2020, similar to what this study in Tanzania found, and contrary to Sudan, where the numbers reported were low [15].

5 Study limitation

There was no community study to accurately back up the assumption that, fear/hesitancy really hindered people from seeking care during the COVID-19 pandemic.

6 Conclusion and recommendations

Maintaining EHS during a pandemic is of paramount importance because it puts a country ready for preparedness and response in times of pandemic, such as COVID-19 [18]. This will only be achieved if the key factors contributing to CES, such as skilled HCWs, medical equipment and supplies, reference documents and supportive infrastructure, are sufficient(5). If all these are available, therefore, it will foster health-seeking behavior toward HFs by the population. EHS during a crisis should be approached using multiple methods, strategically distributing medical commodities and strengthening community-based services. Crisis responses should not completely rely on partner organizations and donors; rather, governments should be at the top level in providing guidance and jointly implementing the developed strategies.

Despite commendable achievements in maintaining several of the EHS by strengthening the capacity of HFs in terms of IPC during the COVID-19 pandemic, human resources for health shortages, equipment shortages and unsupportive infrastructure affected the performance of the IPC standards. The project was established at the right time when Tanzania was fighting the COVID-19 pandemic and the capacity of most health facilities to practice IPC procedures and strengthen triage areas. The study found that the project interventions have remained relevant to the needs of communities, i.e., mothers and children under 5 years, as demonstrated by increased uptake of essential RMNCAH services, as seen in the analysis performed from baseline to end-line in a number of the key project indicators: institutional deliveries, ANC, PNC

and immunization, which were tracked. This calls for joint efforts between the government and partners on resource mobilization for scale-up so that the EHS is maintained and the country is prepared for these pandemics. It will also help to make the Tanzania health system better prepared for future pandemics given that COVID-19 found the health systems in Africa unprepared [19].

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Author contributions JCH wrote the zero draft, AGK wrote draft 1, ACN & DEA worked on the data and data analysis, and DMK, ESE, RKM and EK contributed to revising the manuscript. All authors read and approved the final manuscript.

Funding The CES project was just a vertical project with specified duration of 12 months under the funding support from United Nations Children's Fund (UNICEF) to sustain EHS. Amref Health Africa Tanzania in collaboration with the Ministry of Health implemented the study. A total amount 1,988,106\$ funding was used for capacity strengthening of health care workers on Infection, Prevention and Control (IPC) and monitoring of adherence to COVID 19 preventive measures, IPC and WASH practices to 6,835 medical and 2,025 non-medical employees from 297 health facilities (HFs) in 17 regions of Tanzania mainland (12) and Zanzibar (5) focusing on reproductive and maternal child health services. Additionally, the funding supported the minor renovation and equipping them with medical equipment, supplies and WASH facilities to 20 HFs from mainland (12) and Zanzibar (8) to triage areas to decongest the entry points of clients and enable IPC practices as per the national and WHO guidelines. We thus suggest this sort of funding for the country to be able to respond to emerging and re-emerging pandemics.

Data availability All sources of information used have been acknowledged.

Code availability Data can't be made publicly available since contain some indicators that are tracked by MoH on monthly basis from individual health facilities in the country. However, a strong request can be submitted to MoH Tanzania for data accessibility.

Declarations

Ethics approval and consent to participate The permission to publish these findings is granted by the University Senate on recommendations of the Senate Research and Publications Committee meeting in accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research at Muhimbili University of Health and Allied Sciences (MUHAS). The ethical clearance number is MUHAS-REC-11-2022-1461.

Competing interests The authors declare that this manuscript is our original work that has never been submitted to any other journal for publication and will not be submitted to any other journal for similar purposes.

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References

1. World Health Organization. Second round of the national pulse survey on continuity of essential health services during the COVID-19 pandemic: January–March 2021. *World Health Organ.* 2021;1–102. <https://www.who.int/publications/i/item/WHO-2019-nCoV-EHS-continuity-survey-2021>.
2. Organização Mundial de Saúde. World health statistics 2022 (monitoring health of the SDGs). 2022;1–131. <http://apps.who.int/bookorders>.
3. Desta AA, Woldearegay TW, Gebremeskel E, Alemayehu M, Getachew T, Gebregzabihier G, et al. Impacts of COVID-19 on essential health services in Tigray, Northern Ethiopia: A prepost study. *PLoS One.* 2021;16:1–17. <https://doi.org/10.1371/journal.pone.0256330>.
4. Mochache T, Momanyi M, Mzozo T, Bekele H, Ameda I, Gohar F, et al. Essay Continuity of essential health services in the context of COVID-19: the Eastern and Southern Africa Regional continuity of essential services sub-working group. *Pan Afr Med J.* 2022;41(Supp 2):1–6.
5. World Health Organization. Strategic preparedness and response plan. World Health Organization. 2020;(February):7. <https://www.who.int/publications/i/item/strategic-preparedness-and-response-plan-for-the-new-coronavirus>.
6. Kwesigabo G, Mwangi MA, Kakoko DC, Warriner I, Mkony CA, Killewo J, et al. Tanzania's health system and workforce crisis. *J Public Health Policy.* 2012;33(1):35.
7. Sell H, Assi A, Driedger SM, Dubé É, Gagneur A, Meyer SB, et al. Continuity of routine immunization programs in Canada during the COVID-19 pandemic. *Vaccine.* 2021;39(39):5532–7. <https://doi.org/10.1016/j.vaccine.2021.08.044>.

8. World Health Organization (WHO). Postnatal care of the mother and newborn 2013. World Health Organization. 2013; 1–72. http://apps.who.int/iris/bitstream/10665/97603/1/9789241506649_eng.pdf.
9. Thorndyke LE, Gusic ME, Milner RJ. Functional mentoring: a practical approach with multilevel outcomes. *J Contin Educ Health Prof.* 2008;28(3):157–64.
10. Mormina M, Pinder S. A conceptual framework for training of trainers (ToT) interventions in global health. *Global Health.* 2018;14(1):1–11.
11. Barasa E, Kazungu J, Orangi S, Kabia E, Ogero M, Kasera K. Indirect health effects of the COVID-19 pandemic in Kenya: a mixed methods assessment. *BMC Health Serv Res.* 2021;21(1):1–16.
12. Kearns AD, Caglia JM, Ten Hoop-Bender P, Langer A. Antenatal and postnatal care: a review of innovative models for improving availability, accessibility, acceptability and quality of services in low-resource settings. *BJOG An Int J Obstet Gynaecol.* 2016;123(4):540–8.
13. Larsen A, Cheyip M, Aynalem G, Dinh TH, Jackson D, Ngandu N, et al. Uptake and predictors of early postnatal follow-up care amongst mother-baby pairs in South Africa: results from three population-based surveys, 2010–2013. *J Glob Health.* 2017;7(2): 021001.
14. Shuka Z, Mebratie A, Alemu G, Rieger M, Bedi AS. Use of healthcare services during the COVID-19 pandemic in urban Ethiopia: evidence from retrospective health facility survey data. *BMJ Open.* 2022;12(2): e056745.
15. World Health Organization. Maintaining essential MNCH services during COVID-19 pandemic. Lessons learned from 19 countries.
16. Aranda Z, Binde T, Tashman K, TadiKonda A, Mawindo B, Maweu D, et al. Disruptions in maternal health service use during the COVID-19 pandemic in 2020: Experiences from 37 health facilities in low-income and middle-income countries. *BMJ Glob Health.* 2022;7(1):1–10.
17. Kim S, Headley TY, Tozan Y. Universal healthcare coverage and health service delivery before and during the COVID-19 pandemic: a difference-in-difference study of childhood immunization coverage from 195 countries. *PLoS Med.* 2022;19(8):1–18. <https://doi.org/10.1371/journal.pmed.1004060>.
18. Interim Guidance. Operational guidance for maintaining essential health services during an outbreak. World Health Organization. 2020:1–10. <https://www.who.int/publications-detail/covid-19-operational-guidance-for-maintaining-essential-health-services-during-an-outbreak>.
19. Tessema GA, Kinfu Y, Dachew BA, Tesema AG, Assefa Y, Alene KA, et al. The COVID-19 pandemic and healthcare systems in Africa: a scoping review of preparedness, impact and response. *BMJ Glob Heal.* 2021;6(12):1–14.
20. Poitras ME, Bélanger E, Vaillancourt VT, Kienlin S, Körner M, Godbout I, Bernard-Hamel J, O'Connor S, Blanchette P, Khadhraoui L, Sawadogo J, Massougbodji J, Zomahoun HTV, Gallani MC, Stacey D, Légaré F. Interventions to improve trainers' learning and behaviors for educating health care professionals using train-the-trainer method: a systematic review and meta-analysis. *J Contin Educ Health Prof.* 2021;41(3):202–9. <https://doi.org/10.1097/CEH.0000000000000375>.
21. Robertson 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. *Lancet Glob Health.* 2020;8(7): e901.
22. Popay J. Understanding and tackling social exclusion. *J Res Nurs.* 2010;15(4):295–7. <https://doi.org/10.1177/1744987110370529>.
23. Di Toro F, Gjoka M, Di Lorenzo G, De Santo D, De Seta F, Maso G, Risso FM, Romano F, Wiesenfeld U, Levi-D'Ancona R, Ronfani L. Impact of COVID-19 on maternal and neonatal outcomes: a systematic review and meta-analysis. *Clin Microbiol Infect.* 2021. <https://doi.org/10.1016/j.cmi.2020.10.007>.

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