Assessing the impact of the COVID-19 pandemic on maternal healthcare utilisation: Evidence from routine health data in Kenya and Ethiopia

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Short abstract:
COVID-19 and associated lockdowns pose potential threats to maternal healthcare access in sub-Saharan Africa, impacting progress toward Sustainable Development Goals (SDGs). We examined COVID-19's effects on antenatal care (ANC) and skilled birth attendance (SBA) at sub-national levels in Ethiopia and Kenya. Utilising monthly HMIS data, we applied interrupted time series and counterfactual analyses, identifying hotspots through geospatial mapping at the sub-national level. Kenyan counties experienced varied ANC trends during the pandemic, with disruptions in SBA observed in two counties. In Ethiopia, ANC declined in the North but remained steady in the South, with SBA improvements in the South and unchanged conditions in the North. The study underscores the vulnerability of sub-national health systems to disruptions, emphasising the imperative to fortify healthcare systems and enhance data quality for effective response to future outbreaks and improved maternal and child health outcomes.

Keywords: COVID-19, antenatal care, skilled birth attendance, sub-national

Extended abstract

Objective: Lockdowns and fear of COVID-19 may have reduced access to antenatal care (ANC) and skilled birth attendance (SBA) in sub-Saharan Africa, which could undermine progress towards maternal and child survival and Sustainable Development Goals. We analysed COVID-19's impact on maternal healthcare utilisation, focusing on sub-national levels to identify healthcare disruption hotspots that require targeted interventions and help policymakers prioritise resources to accelerate progress.

Methods and analysis: Using monthly HMIS data, we tracked changes in healthcare access at sub-national levels in Ethiopia and Kenya during the pandemic. We compared service utilisation before and during the pandemic, using interrupted time series and counterfactual analyses to evaluate the pandemic's impact on healthcare utilisation trends. We also performed geospatial mapping of affected regions to identify hotspots. We analysed and tested for mean differences (at a 5% significance level) for antenatal care fourth visit and skilled birth deliveries between pre-COVID-19 and reference COVID-19 periods to assess if there had been significant changes in service utilisation; thus, comparing recent monthly data in COVID-19 reference years (2020/2021) with monthly data from the pre-COVID-19 period (2018/2019). Aggregated annual proportions were used to create geospatial heat maps to visualise the sub-national ANC and SBA rates in the pre-COVID-19 and during COVID-19 periods separately and to show differences (no change, increase or decrease in utilisation) in ANC and SBA between the periods. Geospatial heat maps were generated to highlight if the differences obtained in the difference maps were statistically significant at the set 5 % significance level for each of the counties or regions.

Results: Our results show significant changes at sub-national levels. ANC declined in several Kenyan counties during the pandemic, with improvements observed in others. SBA disruptions were observed in at least two counties. In Ethiopia, ANC declined in the North but remained unchanged in the South,

with some improvements observed in the two regions. Southern regions showed resilience in SBA, experiencing gains, while northern regions showed no change. We outline the summarised results below.

Kenya
Antenatal care: At a national level, there has been a slight non-significant increase in ANC coverage from 49.6% in the pre-COVID-19 period to 51.4% in the COVID-19 period, representing a change of 1.8%, 95% CI: [-1.03, 4.5]. Overall, service utilisation slumped from around September 2020 to January 2021, and the lowest utilisation was recorded in December 2020, at the peak of the second wave of the COVID-19 pandemic. Sub-nationally, changes in coverage have been heterogeneous, with some counties experiencing significant decreases in ANC utilisation and others experiencing increases. Specifically, the counties of Kiambu, Kajiado, and Nairobi, among others, experienced higher ANC coverage proportions in the pre-COVID-19 period, but these declined during COVID-19 (**Figure 1**). The changes that occurred in ANC coverage during the COVID-19 reference period were significant for most of these counties, showing an increase or a decrease, but for some of the counties (i.e., West Pokot, Busia and Migori, among others), the changes in ANC coverage were not statistically different comparing pre-COVID-19 and COVID-19 periods.

Skilled birth attendance: Since 2016, SBA rates have been increasing before post-election violence, starting around August 2017, which led to disruptions in 2017. Nationally, SBA utilisation increased from 64.8% in the 2018-19 period to 76.0% in the 2020-21 period (MD: 11.20%, 95% CI: [8.69, 13.75]); this is, nonetheless, below the 90% coverage recommended by WHO. The top ten (10) counties that saw increasing SBA rates include Kericho, Trans Nzoia, Siaya, Nandi, Mandera, Makueni, Kirinyaga, Nakuru, Tharaka Nithi, Nyamira, Bomet, and Uasin Gishu, among others. It is evident that almost all counties experienced a sharp decline around December 2020, when the second wave of SARS-CoV-2 reached its peak; however, health campaigns encouraging the population to continue using health services during the pandemic led to increased SBA service utilisation despite the ongoing pandemic, leading to immediate improvements during the pandemic. Despite the reported national-level increase in SBA utilisation, sub-national disparities exist. Some counties experienced declines in utilisation rates during the same period, i.e., Turkana (MD: -14.9%, 95% CI: [-19.18, -10.54]), Marsabit (MD: -3.3%, 95% CI: [-7.55, 0.86]) and Embu (MD: -2.80%, 95% CI: [-7.64, 2.08]) counties.

Ethiopia
Antenatal care: We observe mixed results when comparing mean ANC rates for Ethiopia's pre- and during COVID-19 periods, with no real change registered nationally. ANC utilisation rates declined from 17.6% to 13.5% in Gambela (MD: -4.1%, 95% CI: [-7.19, -0.92]), Afar from 52.66% to 48.52% (MD: -4.1%, 95% CI: [-6.14, -2.12]), and SNNP(Southern Nations, Nationalities, and People' region) from 85.3% to 79.7% (MD: -5.6%, 95% CI: [-8.01, -3.29]) region, with the Gambela region performing the worst even before the COVID-19 pandemic. A few areas have experienced increases in ANC utilisation during this period, namely Sidama (MD: 16.4%, 95% CI: [9.65, 23.23]) and Somali (MD: 9.6%, 95% CI: [3.32, 15.93]). Data for the Tigray region from October 2020 were unavailable due to the ongoing conflict. The capital, Addis Ababa, hardly experienced any changes before and during COVID-19; however, this needs to be interpreted cautiously, as it could be an artefact of the population from outside the region (i.e., Oromia region) that come to seek care in facilities within the Addis Ababa region. This could inflate observed counts relative to the population in the Addis Ababa region. Overall, ANC utilisation averaged 60.3% before the COVID-19 pandemic, which increased to 61.8% in the 2020-21 COVID-19 period.
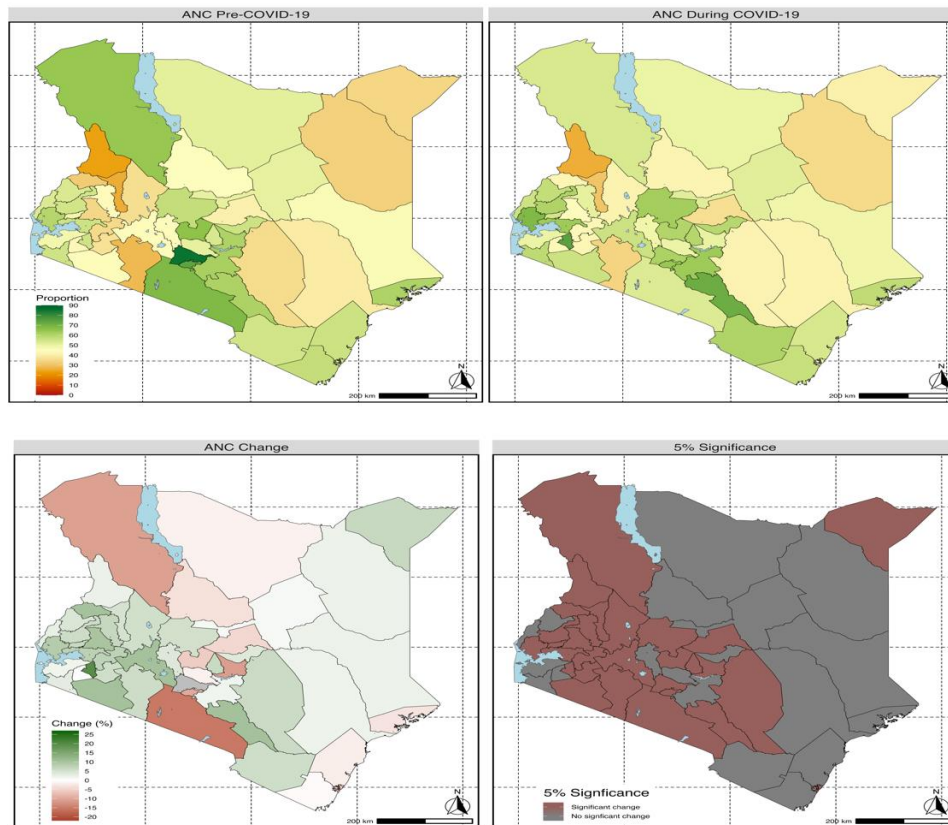
Figure 1: Top panel: ANC coverage (%) for Kenya in the pre-COVID-19 period 2018-19 (left) and during the COVID-19 period 2020-21 (right); (Green = high ANC coverage rates or increase in coverage; Red = low ANC coverage rates or decrease in coverage). Bottom panel: Difference in ANC Coverage between pre- and during-COVID-19 years (left) (Green = increase in ANC in coverage rate, Red = reduction in ANC coverage rates, White = no change); and its statistical significance (right). **Data Source**: Kenya HMIS**.**

Skilled birth attendance: Nationally, there has been minimal change in SBA utilisation at the national level, increasing from 41.8% in the 2018-19 period to 45.4% in the 2020-21 period, which falls short of the WHO-recommended 90% coverage. However, at a sub-national level, we saw declining SBA rates in the northern regions of Afar (MD: -2.4%, 95% CI: [-4.16, -0.54]), Addis Ababa (MD: -3.9%, 95% CI: [-8.87, 1.14]) and Amhara (MD: -0.5%, 95% CI: [-2.34, 1.42]). Gambela and Benishangul-Gumuz regions in the West traditionally have poor SBA utilisation, and the changes observed in these regions were not statistically significant (**Figure 2**). It is worth noting that during this period, a good number in the Southern and Eastern areas of Oromia, SNNP, Sidama, Somali and Harari (**Figure 2**) experienced improvements in SBA service utilisation following health campaigns implemented by the Federal Ministry of Health in Ethiopia.

Counterfactual analysis to assess the impact of COVID-19 on health utilisation

Antenatal care utilisation in Kenya experienced considerable disruptions compared to Ethiopia. **Figure 3 (left)** presents counterfactual ANC utilisation for Embu County, which was projected to increase to about 75% (95% CI: [55%, 97%]); however, the observed utilisation slumped to below 50% in the pandemic period. Ethiopia, however, demonstrated minimal disruptions to health utilisation; for example, a counterfactual analysis of use trends in the Dire-Dawa region showed that observed and counterfactual usage were in agreement, confirming that the pandemic has had minimal disruptions to healthcare usage (**Figure 3 (right)**).
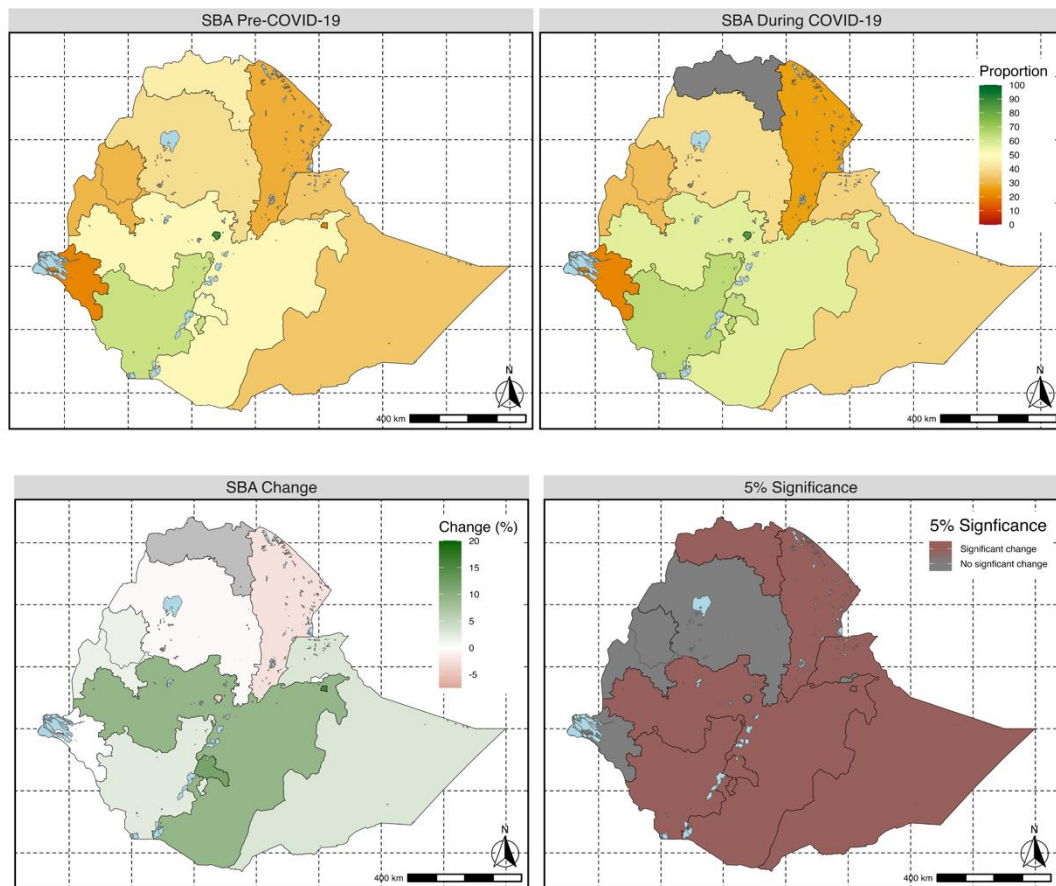
Figure 2: Top panel SBA coverage (%) for Ethiopia in the pre-COVID-19 period 2018-19 (left) and during the COVID-19 period 2020-21 (right); (Green = high SBA coverage rates or increase in coverage; Red = low SBA coverage rates or decrease in coverage). Bottom panel Difference in SBA Coverage between pre- and during- COVID-19 years (left) (Green = increase in SBA in coverage rate, Red = reduction in SBA coverage rates, White = no change); and its statistical significance (right). **Data Source**: Ethiopia HMIS.
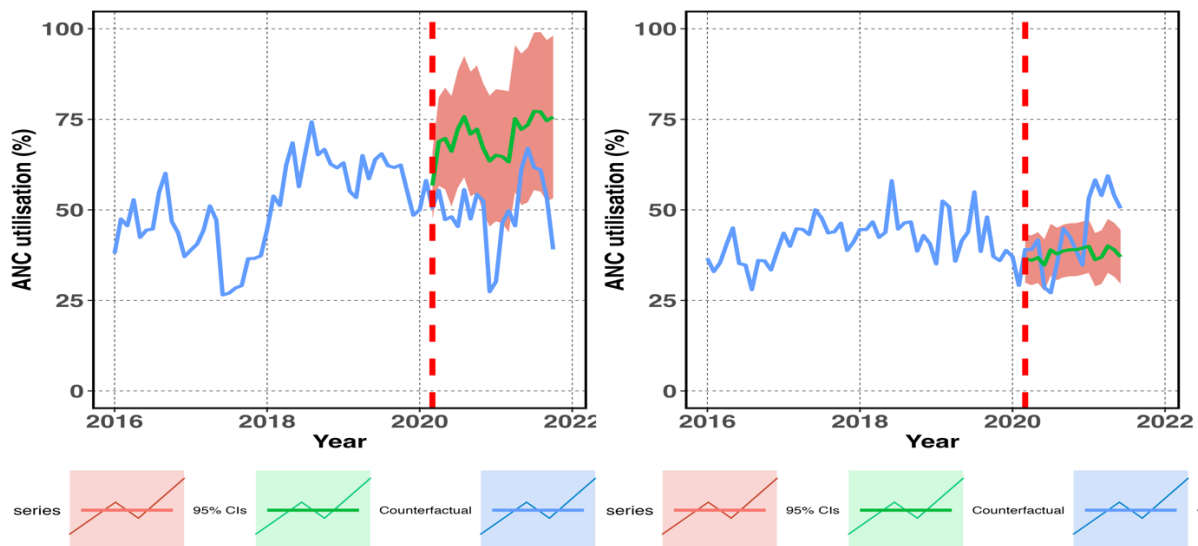

Figure 3: Counterfactual ANC utilisation in Embu County, Kenya (left) and Dire-Dawa region, Ethiopia (right). The blue trend denotes the observed ANC utilisation from 2016 to 2021. The green line indicates projected utilisation given the data in the pre-pandemic period. The red vertical line represents the time point (month) when the first cases of COVID-19 were observed in Kenya and Ethiopia.

Conclusion: Future disease outbreaks may continue to cause further disruptions to health service delivery, affecting maternal and child health outcomes. Our analysis highlights the low resilience of sub-national health systems to shocks, underscoring the need to strengthen healthcare systems and HMIS data capturing for better data quality. Evidence-based research is essential in identifying hotspots and supporting targeted interventions to achieve SDGs and improve maternal and child health outcomes.