

Estimating the Effects of COVID-19 on Health Service Utilization in Uganda

Using information available through routine health information systems (RHIS), Data for Impact (D4I) assessed the effects of COVID-19 on health service use in Uganda more than a year into the pandemic. The study examined national usage patterns for selected health services, before and during the COVID-19 pandemic. We used data from the pre-pandemic period to develop models to replicate the trajectories of total and average health service utilization over time. These models were then used to estimate what health service utilization would have been in the absence of COVID-19 during the full year and 3 months of the pandemic (from March 2020 to May 2021).

Methodology

We sought to investigate two key questions:

- 1) Did COVID-19 affect reporting of health service use over time?
- 2) Did COVID-19 affect the utilization of basic health services?

To answer these questions, we examined monthly district-level data from the District Health Information Software (DHIS2) information system, available from January 2017 to May 2021.

Using only data from January 2017 through February 2020, we developed national time trends models aiming to replicate observed trajectories before COVID-19, including seasonal (monthly) and annual controls. Using these models, we obtained predictions for the COVID-19 period to illustrate what levels would have been had COVID-19 not occurred from March 2020 onward. The difference between observed and predicted values is the estimated “COVID-19 effect.” Two types of outcomes were modelled for each service: 1) the national total number of service visits reported; and 2) the average number of visits per district.

We included the following services in this analysis: new outpatient attendances; outpatient re-attendances; first antenatal visit (ANC1); fourth antenatal visit (ANC4);

health facility births; postnatal care within six days (PNC); selected family planning, aggregated and by method; illnesses among children under five (diarrhea, malaria, pneumonia); polio vaccinations series (polio1, polio2, polio3); diphtheria, pertussis, and tetanus vaccination series (DPT1, DPT2, DPT3); vaccination for tuberculosis (Bacille Calmette-Guérin—BCG); and measles vaccinations. Note that due to changes in reporting system, we chose the main family planning methods used in Uganda that had consistent data over this time period. This included male condoms, female condoms, injectables, implants, and oral contraceptives. “Family planning visits” refers to any method in this list.

COVID-19 in Uganda

Uganda went on a national lockdown on March 18, 2020, before the first case was reported in the country on March 21, 2020. The initial lockdown focused on closing schools, banning religious and social gathering, restricting travel to high-risk countries, and quarantining travelers coming from other countries. After the first case was reported, additional measures included a curfew and restricting all travel into and out of the country. Several public health initiatives were also rolled out including surveillance, testing, and health messaging about COVID-19. On May 4, 2020, the government made mask wearing in public mandatory.

The Effects of COVID-19 on District-level Utilization of Health Services

District-Level Reporting of Health Services (Figure 1)

Reporting is quite stable at the district level in Uganda. Starting in 2018, almost all 136 districts consistently reported all services included in this analysis. The only exception was PNC, which wavered between 135 and 136 until January 2020. However, for all services, there was no COVID-19 effect on district-level reporting. All 136 districts reported all services during the pandemic period.



Outpatient Attendance (Figure 2, row 1)

During the pandemic, COVID-19 negatively affected outpatient attendance. In April and May 2020, new attendance and reattendance levels were respectively about 20 percent and 37 percent below predicted levels for both total and average per district models. Models showed general improvements, in that the gap between observed levels and predicted levels lessened by June 2020. However, the total models for both outpatient attendance types did not show consistent recovery by May 2021.

Maternal and Infant Health Services (Figure 2, row 2)

The effect of COVID-19 on maternal and infant health services varied by service type. Models showed significant negative COVID-19 effects on ANC services at the beginning of the pandemic. Observed values were significantly less than model predictions for average ANC1 (April and May 2020) and total ANC4 (March-May 2020). Starting in June 2020, both ANC1 and ANC4 periodically exceeded predictions, but ANC1 levels also fell below predictions on occasion. ANC4 showed evidence of at least full recovery, never falling below predicted levels after June 2020.

There were also negative COVID-19 effects on facility deliveries in March, April, and May 2020 for both average and total models. Facility deliveries recovered to predicted levels by June 2020, and then consistently exceeded both predicted average and total levels from February through May 2021. PNC visits never experienced negative COVID-19 effects, however, there was a delayed positive effect starting in June 2020 that was sustained throughout the rest of the pandemic.

Child Illness Visits (Figure 2, row 3)

COVID-19 had significant effects on levels of service utilization among young children with diarrhea, malaria, and pneumonia. Levels of diarrhea cases among children fell significantly below predictions in April and May 2020 but then exceeded predictions starting in August 2020. The average model for child diarrhea cases indicated that these high levels were sustained through May 2021. Levels of child cases of malaria were also negatively affected by COVID-19 at the beginning of the pandemic, and the average model showed that such levels remained below predictions for most of the pandemic, despite improvement through December 2020. Cases of pneumonia among

young children were most effected by COVID-19 out of the three illness types. Significantly lower levels of pneumonia persisted from April through November 2020 for both average and total models. Pneumonia cases exceeded predicted levels in January 2021 but dropped below predictions again in April 2021. By both models, May 2021 levels of pneumonia were as predicted.

Family Planning Visits (Figure 3)

When aggregated, family planning visits were not immediately affected by COVID-19 at the beginning of the pandemic. Family planning was significantly higher than expected in October and November 2020. Disaggregating family planning by method showed that there were negative COVID-19 effects on levels of services for implants (April 2020) and oral contraceptives (April and May 2020). Additionally, injectables and implant-specific family planning services remained consistently high after May 2020 for most of the remaining months in the pandemic. Upon further inspection, the two-month increase in aggregated family planning was determined to be mostly a reflection of the one-month spike in demand for condoms that occurred in Kampala, coinciding with the generally higher-than-predicted national levels for injectables and implants.

Vaccinations (Figure 4)

Trajectories and COVID-19 effects for vaccinations had similar patterns, regardless of type. There were significant negative COVID-19 effects in March and April 2020 in all models for all vaccines. Vaccination levels completely recovered, if not exceed predictions, by June 2020. Trajectories hovered around predicted levels but had more oscillation patterns than what occurred before the pandemic. Particularly in the average models, most vaccines had months with levels falling significantly below predictions that were quickly followed by months that exceeded predictions and vice versa. These patterns might suggest that COVID-19 has caused medium-term instability in the utilization of vaccination services in Uganda.



Figure 1. COVID-19 effects: Number of districts reporting over time by service

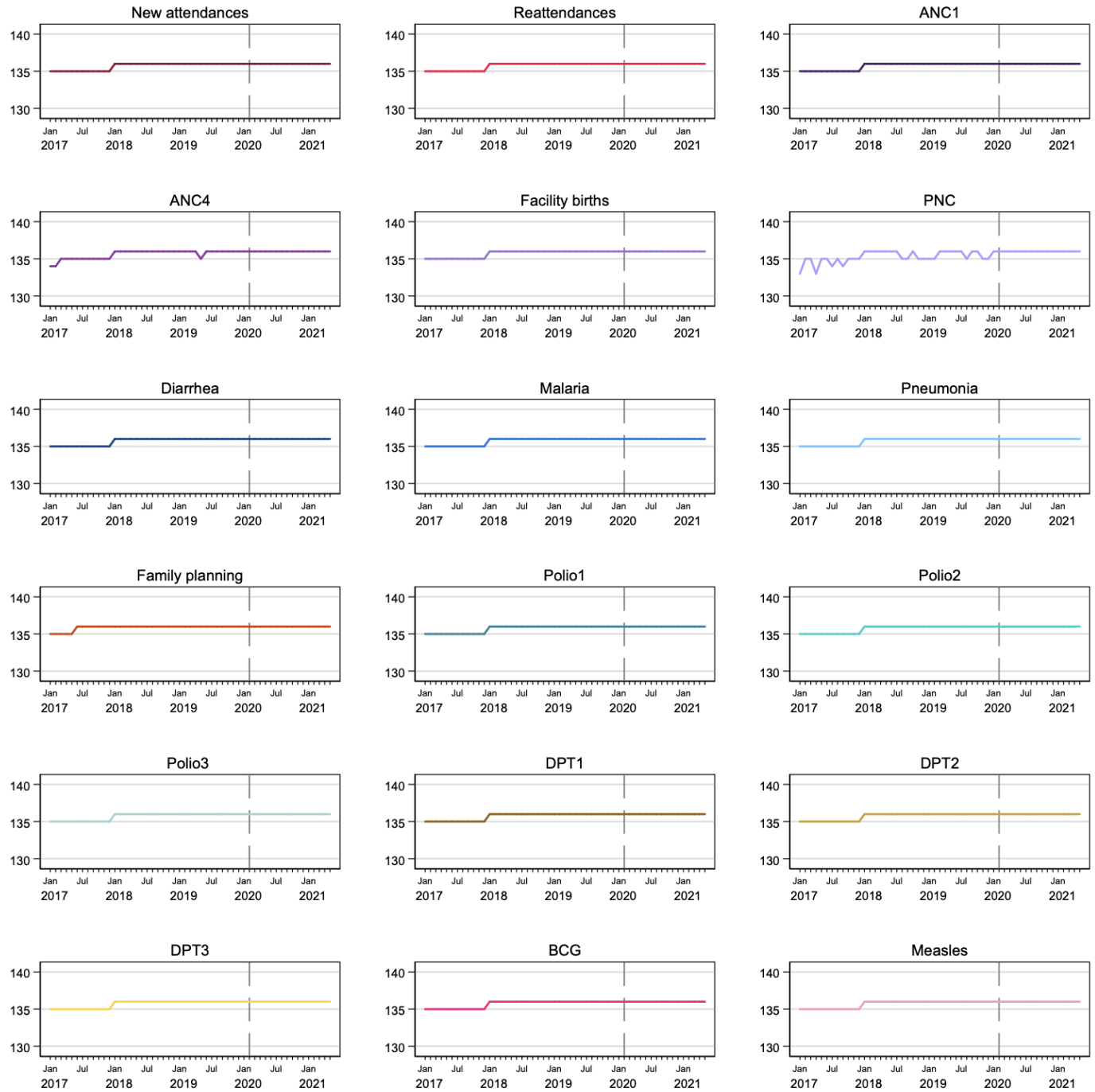
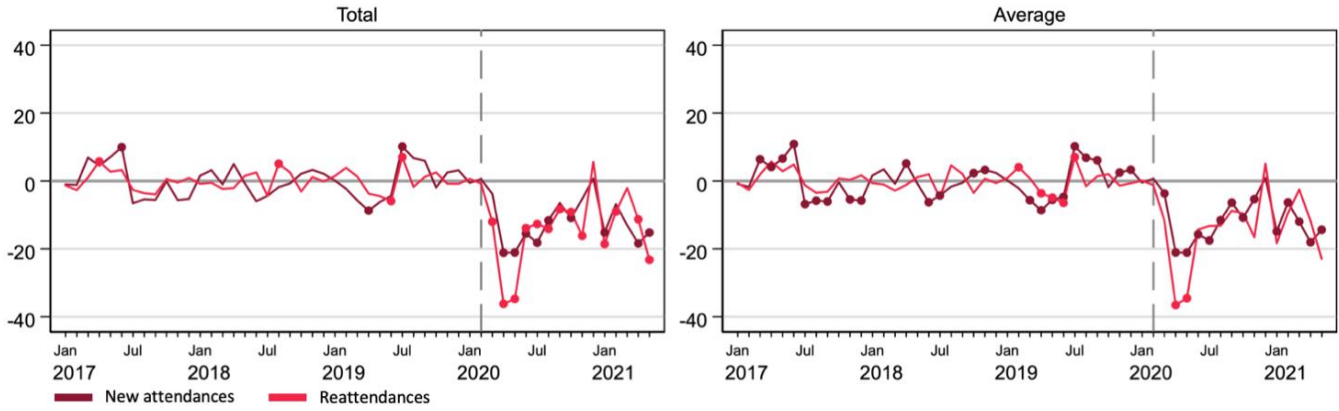


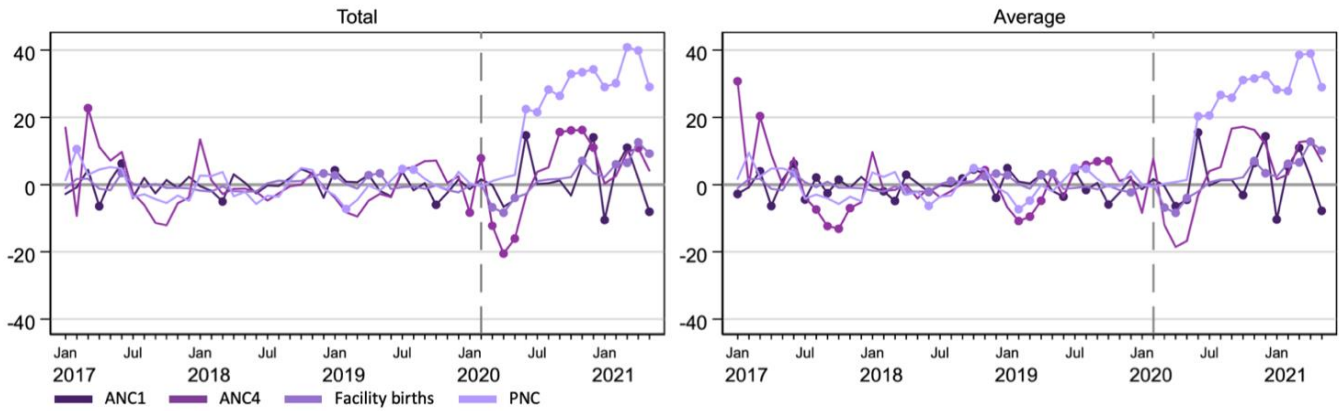


Figure 2. COVID-19 effects: Percent difference gap between reported and predicted levels for outpatient attendances, maternal and infant health services, and child illness cases during 2017-2021

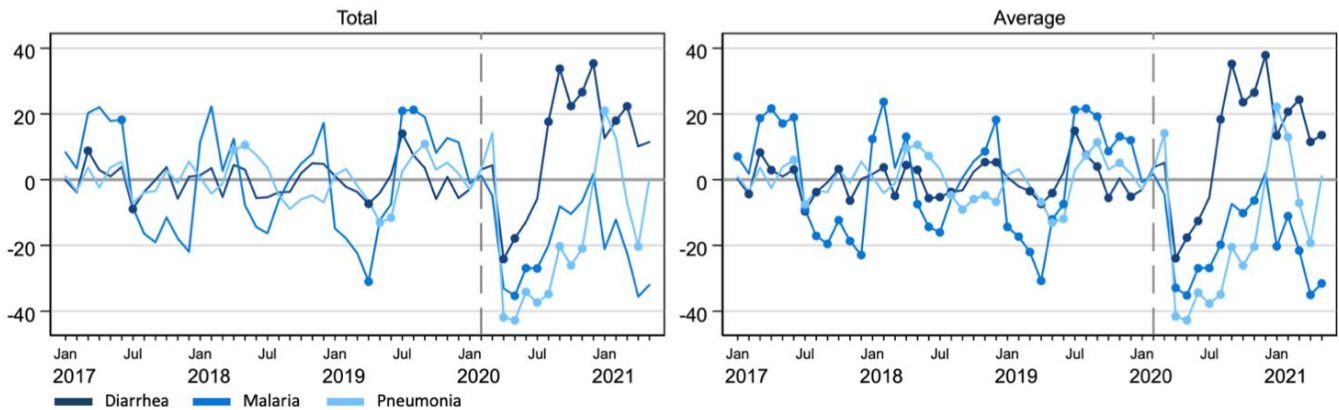
Outpatient attendance



Maternal and infant health services



Child illness cases

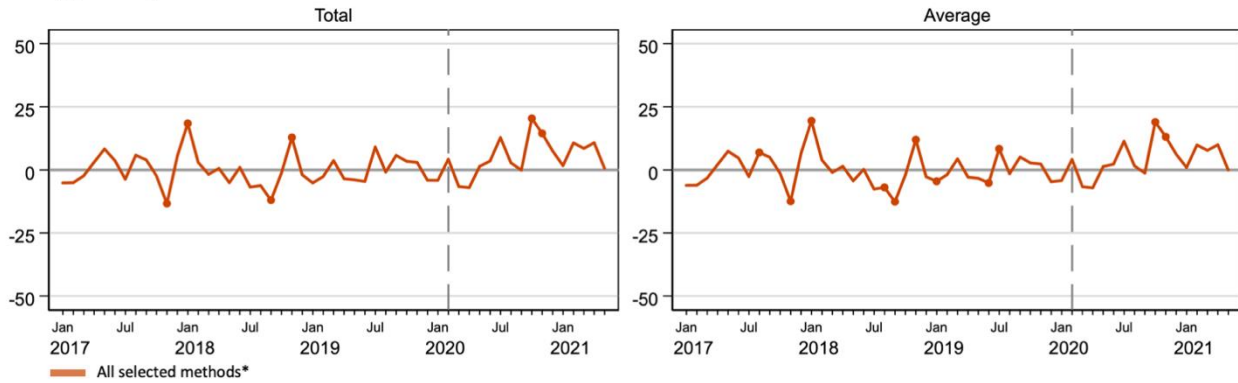


Solid circles on graphs indicate months where the observed value is significantly different from the predicted value at $p < 0.05$.

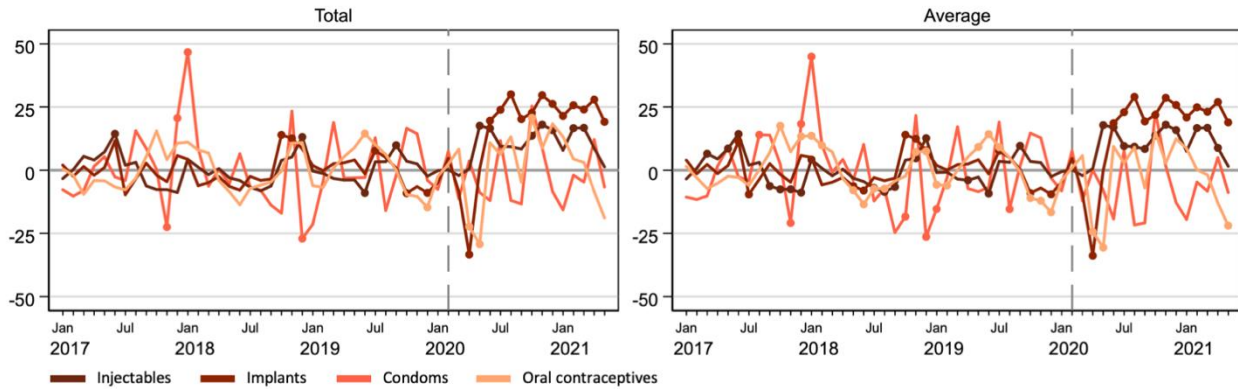


Figure 3. COVID-19 effects: Percent difference gap between reported and predicted levels for family planning service utilization during 2017-2021

Family planning visits



Family planning visits by method type



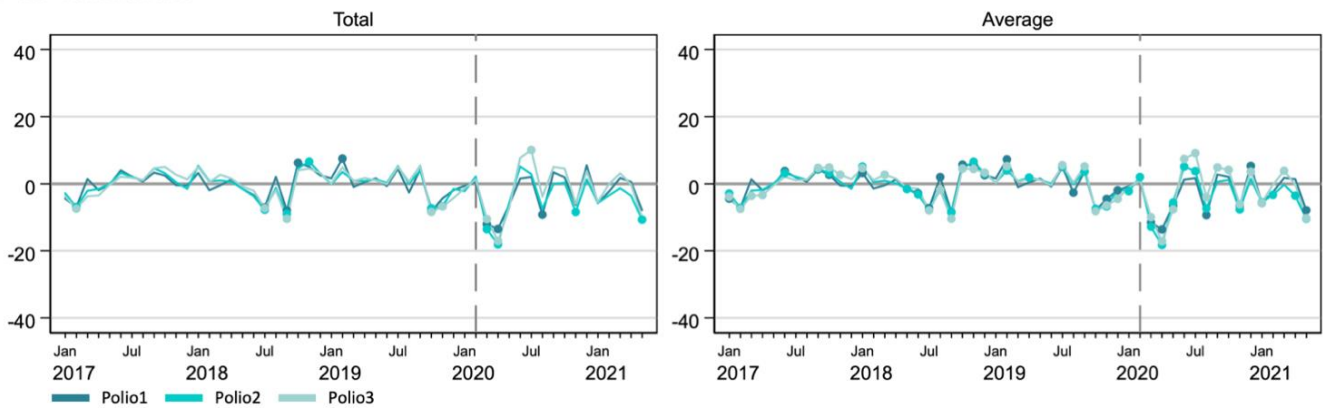
Solid circles on graphs indicate months where the observed value is significantly different from the predicted value at $p < 0.05$.

*Selected methods only include visits for injectables, implants, condoms, and oral contraceptive.

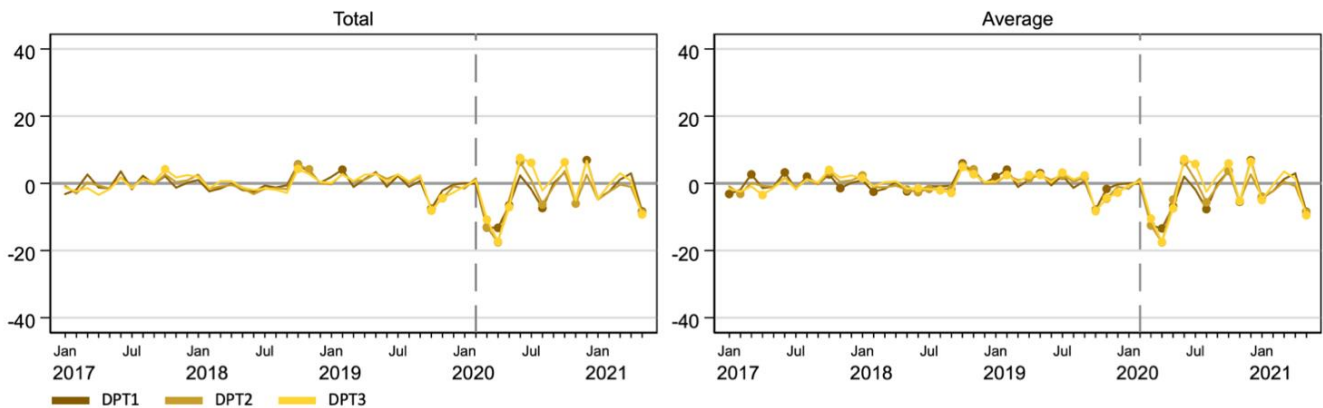


Figure 4. COVID-19 effects: Percent difference gap between reported and predicted levels for vaccinations during 2017-2021

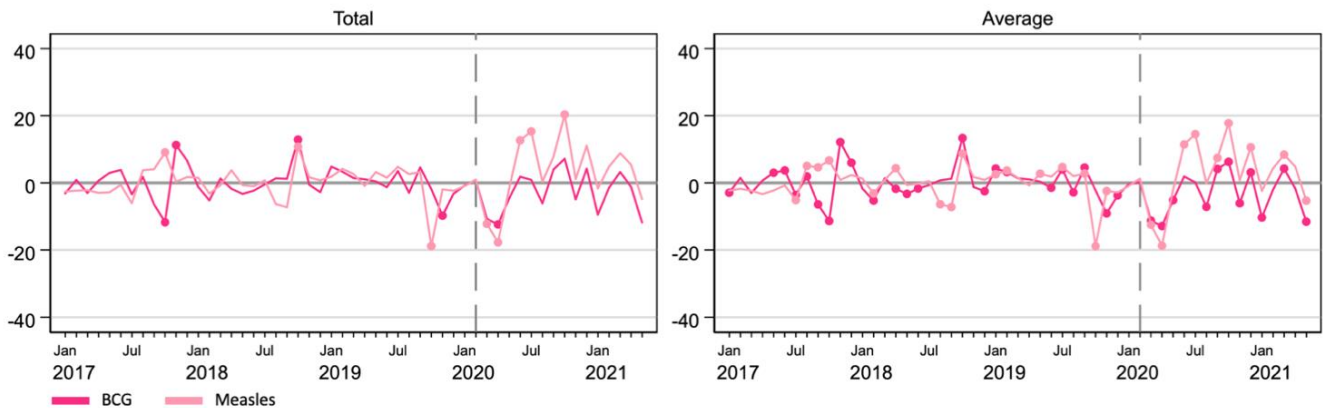
Polio vaccinations



DPT vaccinations



BCG and measles vaccinations



Solid circles on graphs indicate months where the observed value is significantly different from the predicted value at $p < 0.05$.



Conclusions

In Uganda, The COVID-19 pandemic did not have an impact on district reporting in the DHIS2 system. Most of the negative COVID-19 effects on health service utilization occurred in the beginning of the pandemic, from March through May 2020. The most severe negative COVID-19 effects during this time were on outpatient attendance, child illness visits, and some specific family planning services such as those providing injectables and oral contraceptives. Vaccination-related services also experienced some initial negative COVID-19 effects, but these were relatively small in comparison to the other services. Alternatively, there may have been some delayed positive COVID-19 effects for some services. These include most ANC4, facility births, diarrhea, and family planning, both as an aggregate and

for most methods separately. And finally, some services did not seem to completely recover to predicted levels by May 2021. These include overall outpatient attendance as well as malaria and pneumonia visits among children. Therefore, the COVID-19 pandemic had a range of effects on service utilization that varied greatly by service type.

[Access supplemental figures for the Kampala metropolitan area.](#)

We are grateful to Bill Weiss at USAID for providing valuable suggestions and support to this activity.

For more information

D4I supports countries to realize the power of data as actionable evidence that can improve programs, policies, and—ultimately—health outcomes. We strengthen the technical and organizational capacity of local partners to collect, analyze, and use data to support their move to self-reliance. For more information, visit <https://www.data4impactproject.org/>

