Estimating National and Area-Specific COVID-19 Effects on Health Service Use in the Democratic Republic of the Congo

Using information available through routine health information systems (RHIS), Data for Impact (D4I) assessed the effects of COVID-19 on health service use in the Democratic Republic of the Congo (DRC) twelve months into the pandemic. The study examined national and area-specific usage patterns for selected basic 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, as well as the number of facilities reporting such services, over time. These models were then used to estimate what health service utilization would have been in the absence of COVID-19 during the first full year of the pandemic (from March 2020 to March 2021).

Methodology

The study 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 facility-level data from the District Health Information Software, version 2 (DHIS2) information system, available from January 2017 to March 2021.

Using data from January 2017 through February 2020, the team developed national time trends models aiming to replicate observed trajectories before COVID-19, including seasonal (monthly) and annual controls. We also examined if COVID-19's effects on service use varied by type of area. With that purpose, we estimated an additional set of models including interactions by area categories (Kinshasa, other urban, and rural).

Using these models, the team 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." Four types of outcomes were modelled for each service: 1) the number of facilities reporting; 2) the total number of service visits reported; 3) the adjusted visit total, accounting for COVID-19's effects on reporting; and 4) the average number of visits per facility. This analysis included the following services: all services (cases received), first antenatal visits (ANC1), fourth antenatal visits (ANC4), facility assisted births, family planning (FP), diarrhea cases, malaria cases, pneumonia cases, measles vaccinations, and pentavalent vaccinations.

Results: The COVID-19 Effects on Health Services

All Services (Figure 1)

At the national level, there were no COVID-19 effects on the number of facilities reporting any services in the DHIS2 during pandemic months. Similar patterns occurred in rural areas. However, in Kinshasa, there were several months where COVID-19 negatively affected reporting, in that observed levels fell significantly below the predictions. Conversely, in other urban areas, the observed number of facilities reporting was higher than predicted.

Nationally, the total number of visits from all services was largely unaffected by the pandemic, but there were slight negative COVID-19 effects on the average number of cases received per facility. There were also large and significant negative COVID-19 effects in Kinshasa. Observed levels of cases received were about 30 percent below predicted in April 2020 and have yet to recover by March 2021 for all three models. There were delayed COVID-19 effects in other urban areas, as observed values were consistently below predictions after October 2020 and August 2020 for the unadjusted total and average, respectively.

Maternal Health Services (Figure 2)

For facilities reporting ANC1, ANC4, and facility-assisted births, there were almost no significant COVID-19 effects on reporting nationally and in rural areas. However, there were many months after March

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2020 where the observed levels fell below the predictions in Kinshasa and exceeded predictions in other urban areas.

In terms of service use, nationally, COVID-19 did not affect ANC1 visits, but ANC4 visits generally exceeded predictions. For most of 2020, observed facility-assisted births were as predicted. However, in 2021, there were national negative COVID-19 effects on average facility births. In Kinshasa, there were some periodic significant negative COVID-19 effects on ANC1 and ANC4 totals, but no negative effects on per facility average ANC1 and ANC4 during the pandemic period. In Kinshasa, there were also delayed positive COVID-19 effects on ANC4 visits and facility-assisted births. ANC4 visits substantially exceeded predictions from July 2020 for all model types. Facility-assisted births exceeded predictions in January 2021 in all three models and extended through March 2021 for the average model. Rural and other urban area patterns were similar to those seen nationally.

Family Planning (Figure 3)
There was little COVID-19 effect on facilities reporting FP visits nationally, in Kinshasa, and in rural areas. In other urban areas, the number of facilities reporting generally exceeded predictions for the COVID-19 period.

Nationally, FP visits exceeded predictions in April, August, and September 2020 for all models. Still, there was geographic variation. In Kinshasa, FP visits exceeded predictions for all models only in April 2020, and periodically dipped below predictions throughout the remaining pandemic period. However, large differences between the observed and predicted values before COVID-19 suggest potential model instability. In other urban areas, FP visits sporadically exceeded predictions for all models in August 2020. In rural areas, FP visits exceeded predictions in the 2020 COVID-19 period, peaking in August, and returning to predicted levels in 2021.

Diarrhea, Malaria and Pneumonia (Figure 4)
COVID-19 did not affect the number of facilities reporting diarrhea cases nationally. National facility reporting of malaria for March, April, and June 2020 exceeded predictions. Occasionally, pneumonia and malaria reporting fell below predicted values during the pandemic. This is similar to what was seen in rural areas as well. Kinshasa experienced significantly lower facility reporting for all three illnesses, the most drastic

of which occurred for pneumonia. In other urban areas, particularly at the beginning of the pandemic, facilities reporting diarrhea exceeded expectations for several months. The number of facilities reporting malaria exceeded predictions for the entire pandemic period. Facilities reporting pneumonia were as predicted.

Nationally, diarrhea cases only exceeded predictions for July-September 2020. There were negative COVID-19 effects on malaria and pneumonia cases for most of the pandemic period with all three models. In all area types, there were significant negative effects on malaria during the COVID-19 period that did not recover by March 2021. For pneumonia and diarrhea, rural areas reflected national patterns. In Kinshasa, COVID-19 negatively affected all three illnesses according to the adjusted total and average models. In other urban areas, the total models showed diarrhea cases exceeding predictions for the majority of the pandemic. All three models also indicated delayed effects on pneumonia, with cases falling below predictions starting in October 2020.

Vaccinations (Figure 5)
There was almost no effect of COVID-19 on facilities reporting either measles or pentavalent vaccinations nationally or in rural areas. Facility reporting of both vaccinations was sporadically higher than predicted in Kinshasa and consistently higher than predicted in other urban areas.

Nationally and in rural areas, there were no COVID-19 effects on vaccination levels. However, in Kinshasa, all three models showed that COVID-19 negatively affected pentavalent. There were negative effects on total measles vaccinations as well, but not on the average per facility. In other urban areas, only the adjusted total models showed positive COVID-19 effects for both vaccinations.

Conclusions
In the year following the start of pandemic, COVID-19 had a variety of effects on health service utilization and reporting in the DRC. These effects differed greatly by service, timing, and area type. The greatest impact of COVID-19 was on pneumonia and malaria services. In Kinshasa, COVID-19 effects were more immediate and severe across all services. Other urban areas also experienced negative effects that tended to be delayed. In contrast, national patterns were driven largely by rural areas which were less effected by COVID-19.

Figure 1. COVID-19 effects: Percent difference gap between reported and predicted levels for all services during 2017-2021 ([view larger image](#))
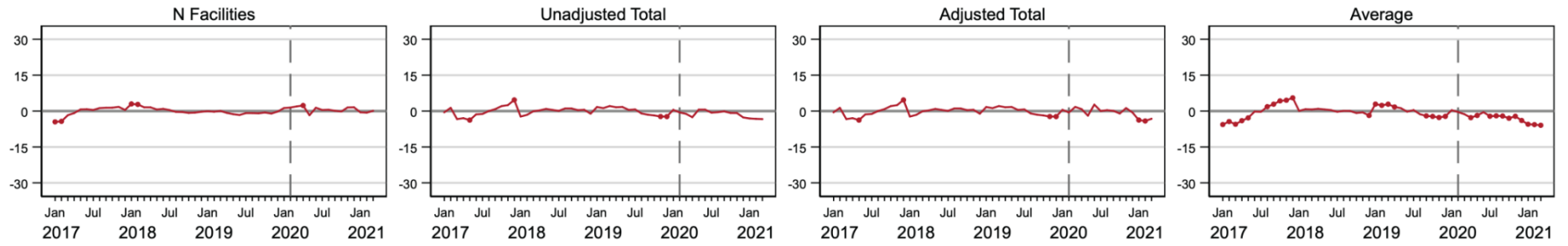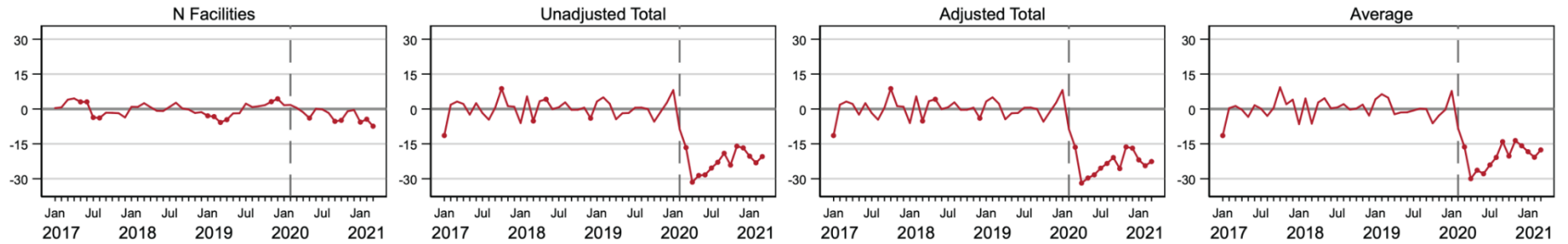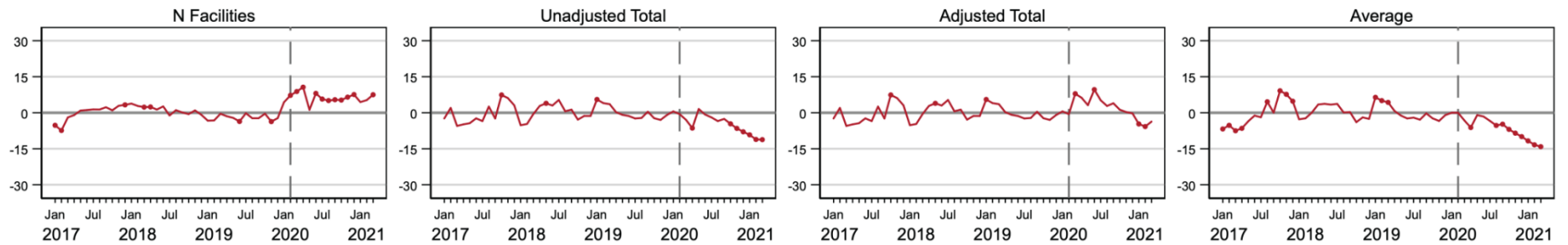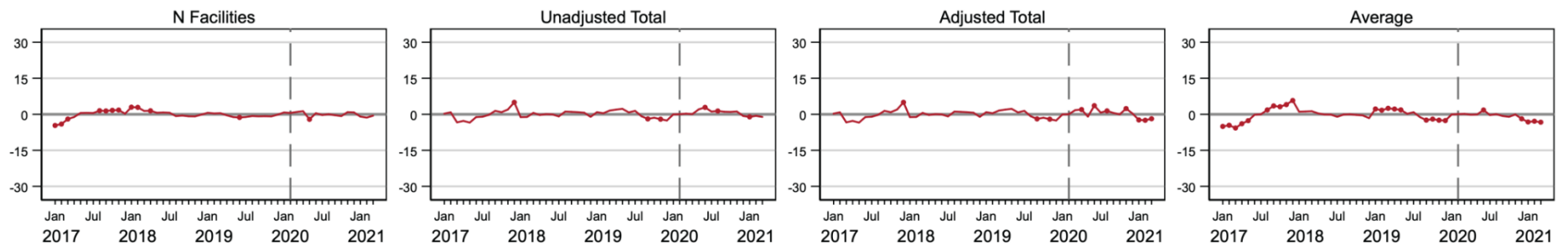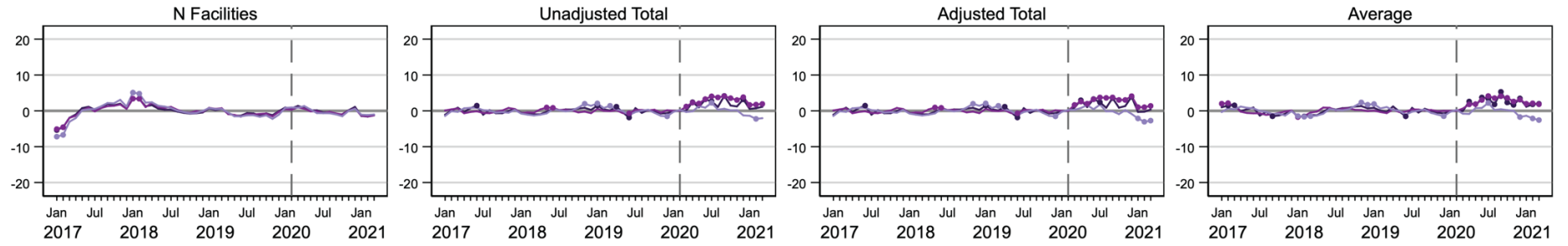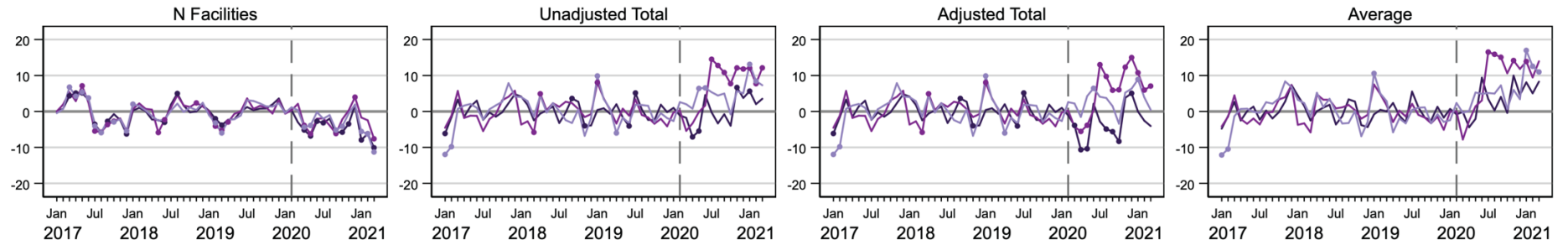

Solid circles in the graphs indicate months where the observed value is significantly different from the predicted value at p<0.05.

Figure 2. COVID-19 effects: Percent difference gap between reported and predicted levels for maternal health services during 2017-2021 ([view larger image](#))
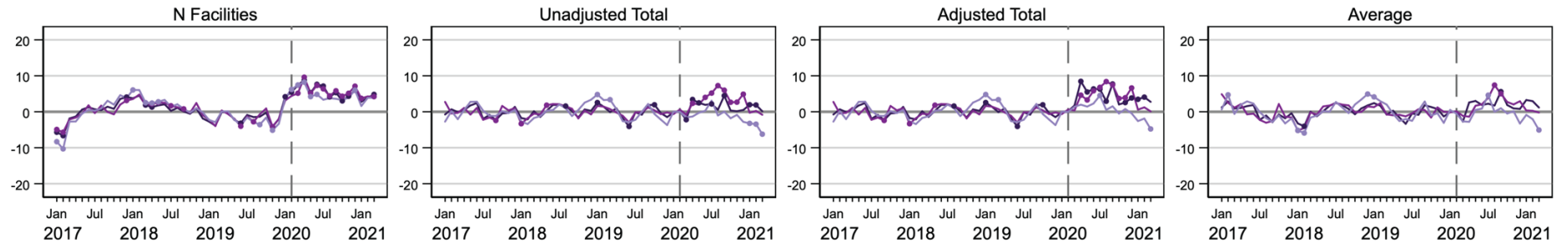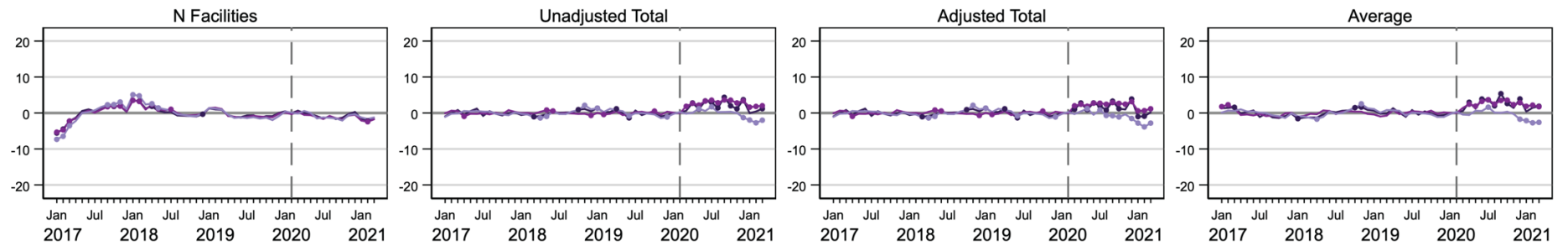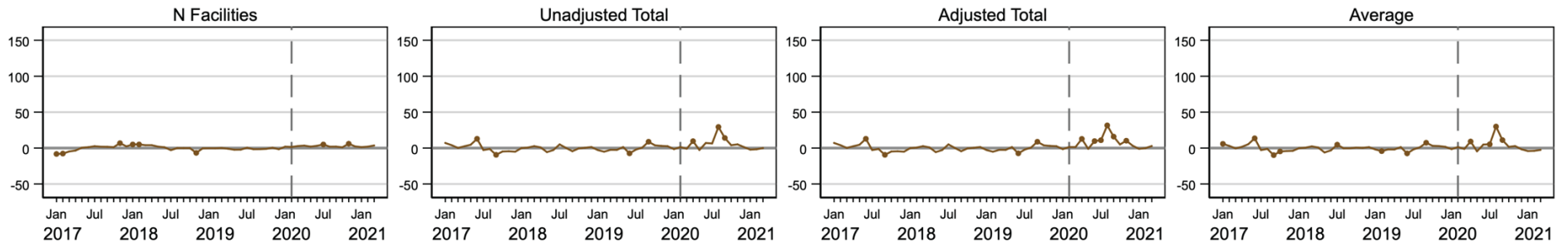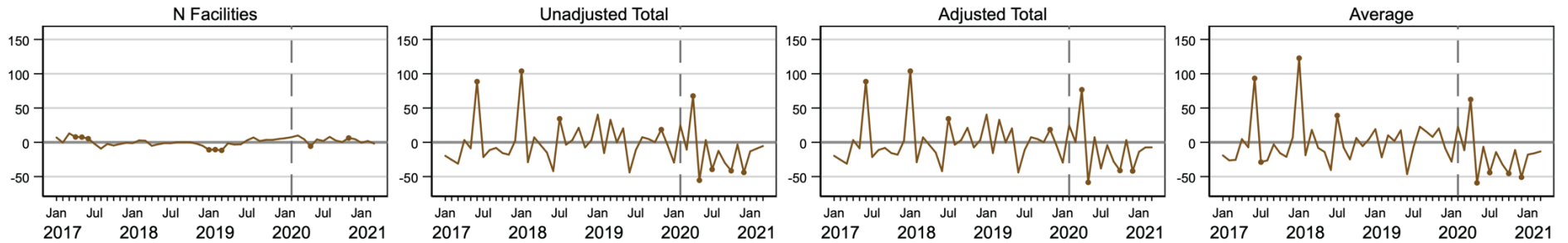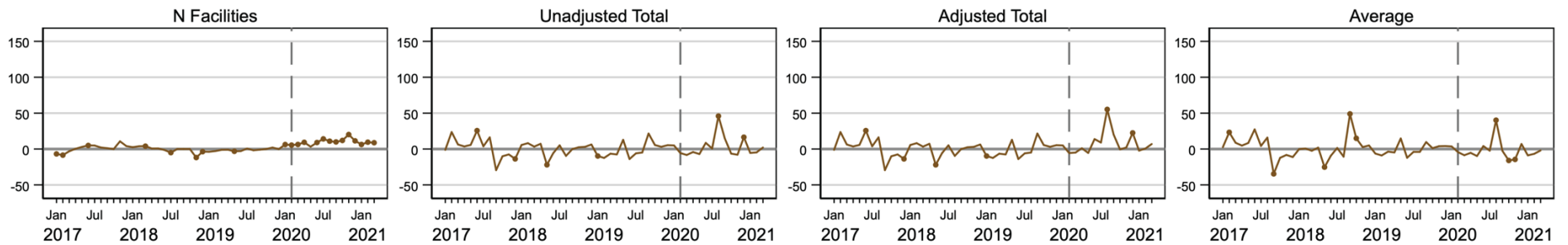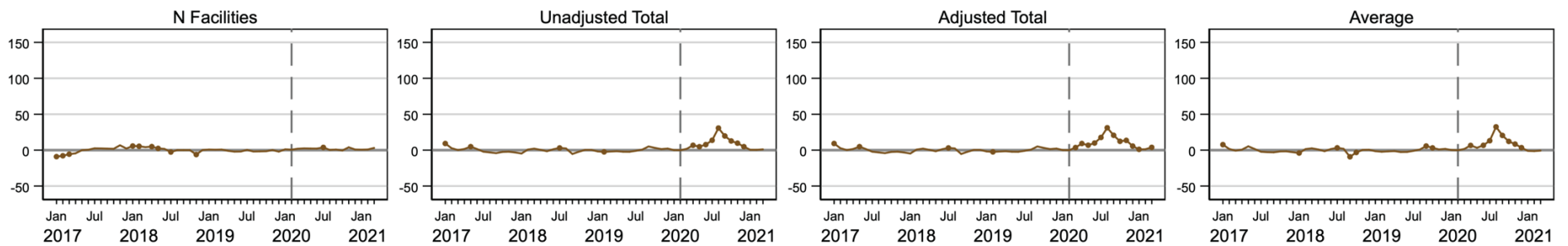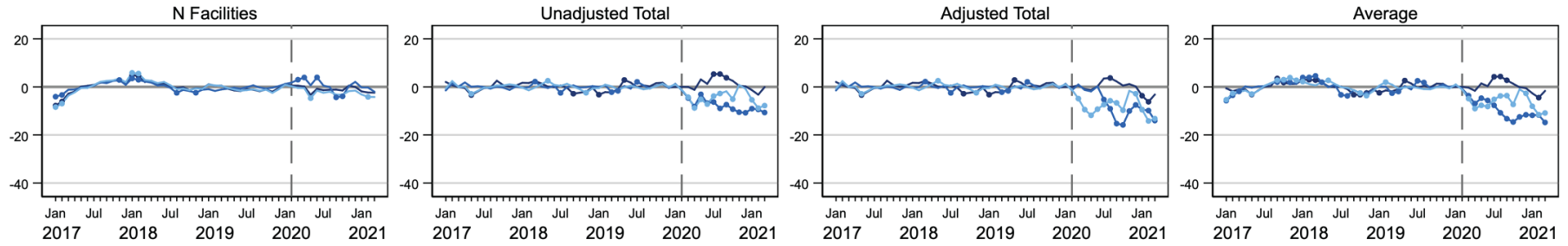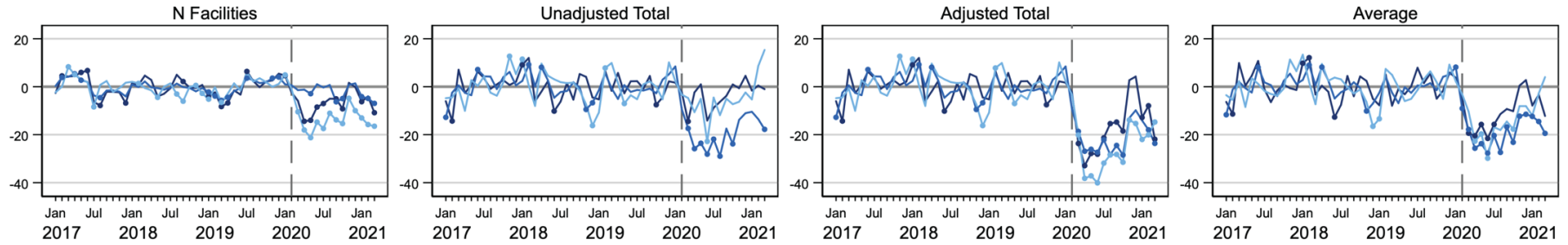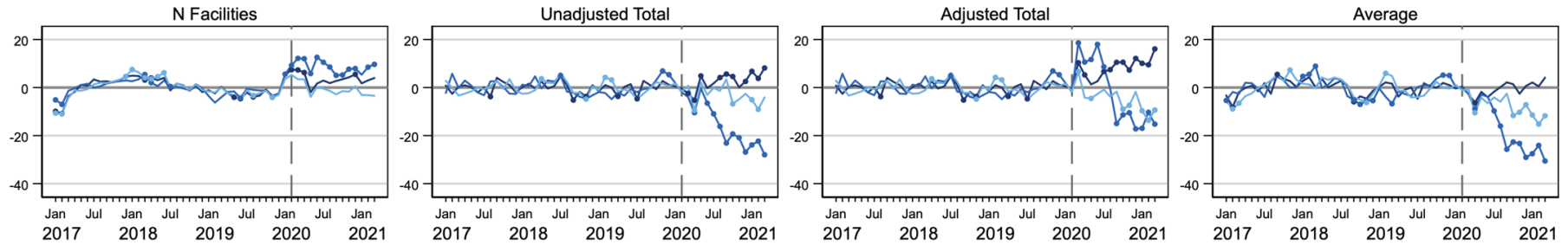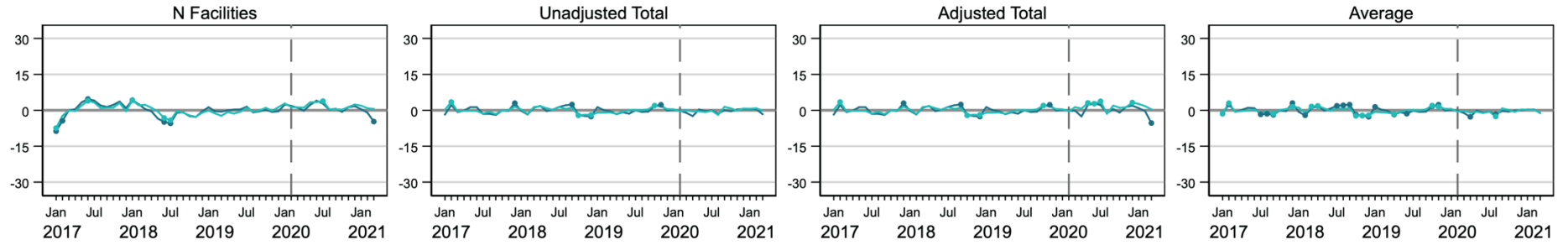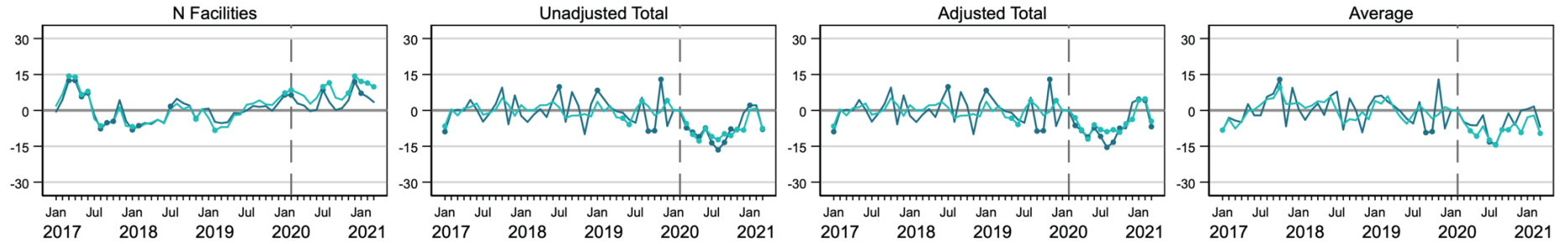

Solid circles in the graphs indicate months where the observed value is significantly different from the predicted value at p<0.05.

Figure 3. COVID-19 effects: Percent difference gap between reported and predicted levels for family planning visits during 2017-2021 ([view larger image](#))
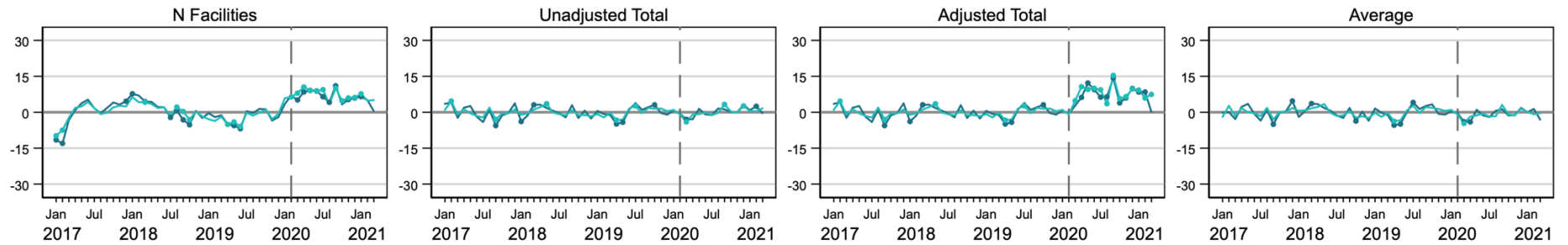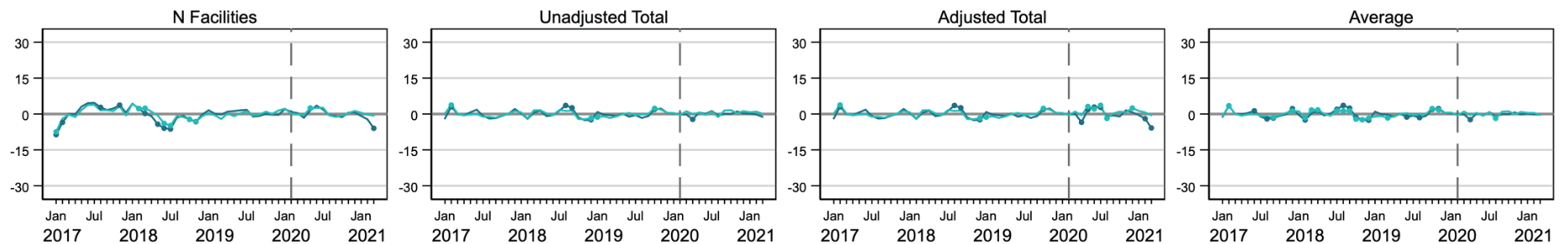

Solid circles in the graphs indicate months where the observed value is significantly different from the predicted value at p<0.05.

Figure 4. COVID-19 effects: Percent difference gap between reported and predicted levels for diarrhea, malaria, and pneumonia visits during 2017-2021 ([view larger image](#))
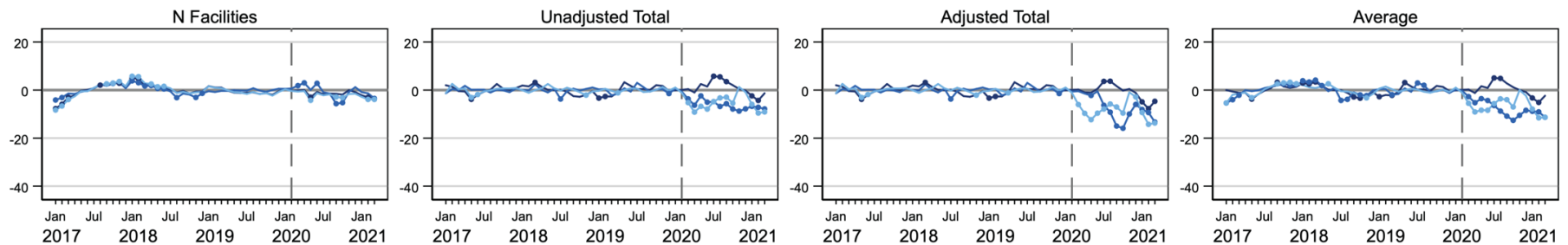
Solid circles in the graphs indicate months where the observed value is significantly different from the predicted value at p<0.05.

Figure 5. COVID-19 effects: Percent difference gap between reported and predicted levels for vaccinations during 2017-2021 ([view larger image](#))

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

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/