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Estimating the effect of COVID-19 on utilization of health services in the DRC and Bangladesh

Technical note

Using information available through routine health information systems (RHIS), Data for Impact (D4I) conducted a study to examine the effects of COVID-19 on the utilization of health services in the Democratic Republic of the Congo (DRC) and Bangladesh. The study sought to examine patterns for the use of selected non-COVID-19 related health services, including maternal and child health (MCH), family planning (FP), outpatient visits, and immunizations, before and during the COVID-19 pandemic in both countries. We used routine data from the pre-pandemic period to develop models to replicate the average and total 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 months of the pandemic (since March 2020).

The study aimed to investigate two key questions:

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

Data sources

For the DRC, health facility-level data came from the District Health Information Software 2 (DHIS2) information system. For Bangladesh, the analysis used upazila-level (subcounty) data from the Management Information System (MIS) 3 of the Directorate General of Family Planning (DGFP) and the Expanded Program on Immunization (EPI) system. Monthly data were available for both countries from January 2017 until August/September 2020.

Prior to analysis, the data underwent a specific cleaning process, beginning with graphing the number of facilities/upazilas reporting over time for each service. Extreme values were also identified using time series line graphs for each facility/upazila, which helped to visualize outliers. However, had a general rule been applied for identifying outliers, such as values that were 3-5 standard deviations above the mean, this practice would have penalized facilities and areas with high volumes of services, even if those levels were relatively stable over time. Therefore, outliers were removed using facility-/upazila-specific rules, such as changing all time points above 6 standard deviations of the mean for that facility/upazila to be missing. This process was conducted for each service included in the analysis.

Methods

1) Did COVID-19 affect reporting of health service delivery over time?

To answer the first study question, we examined the number of facilities and upazilas reporting across the study period for each service indicator. Examining reporting over time was important for understanding reporting seasonality and changes to the health information systems relative to potential changes due to COVID-19. In Bangladesh, initially the number of upazilas reporting MIS 3 indicators varied over time, but all upazilas started reporting after the implementation of the updated MIS 3 form in January 2019. The number of upazilas reporting MIS 3 indicators was not affected during the COVID-19 months (March–August 2020), with all upazilas continuing to report all service indicators. Before March 2020, the number of upazila health complexes reporting EPI indicators also remained fairly stable over time, except for the second dose of the measles rubella vaccine. During the COVID-19 months, the number of upazila health complexes reporting tuberculosis vaccinations (BCG) and the third pentavalent vaccine dose decreased by 5.9% between March and May 2020. There were no observed decreases in EPI indicator reporting in the period from June through September 2020. In the DRC, there was general growth in the number of facilities reporting each indicator across the study period and some seasonal patterns emerged. In general, COVID-19 did not affect reporting, but there was a decline of 3.4% in the number of facilities reporting to the system in May 2020. Reporting for pneumonia, malaria, and diarrhea declined in similar small percentages in May 2020.

2) Did COVID-19 affect the utilization of basic health services?

To answer this question, we first sought to find a time trends model that best replicated the observed trajectories of service use during the pre-COVID-19 period. The second step was to use that model to predict the service use level that would have been observed had COVID-19 not occurred during the COVID-19 months.

In the first step, using the pre-COVID-19 data, we assessed a set of potential linear, quadratic, and cubic time trends specifications using Lasso, autoregressive, fixed effects, random effects, and simple ordinary least squares (OLS) models, adjusting for seasonality (monthly or quarterly) and yearly changes. Models for average service use also adjusted the standard errors for clustering at the facility/upazila-level. Models for total service use included an additional variable for the number of facilities/upazilas reporting. In the DRC, we also included interaction terms to estimate location-specific predictions for urban Kinshasa, other urban, and rural areas. We chose the model that most closely replicated the observed trajectories during the pre-COVID-19 period across all indicators within each country. Quadratic OLS were used for the final total models in the DRC and Bangladesh, as well as the final average model in the DRC. Quadratic fixed-effects were used for the final average models in Bangladesh. All models used monthly seasonality controls.

In the second step, we predicted service utilization levels from March 2020 onward. We then compared the predictions to the reported actual service utilization. The difference is the "COVID-19 effect" (COVID-19 effect = reported use [with COVID-19] – predicted use [without COVID-19]).

Results

COVID-19 had a statistically significant negative effect on the utilization of maternal health, FP, outpatient, and childhood vaccination services in Bangladesh. The declines in national service use totals were most pronounced between March and May 2020, during the height of the lockdown period. Vaccination services were the first to recover and exceeded pre-pandemic estimate levels by July 2020.

Nationally, in the DRC, there were significant negative COVID-19 effects on total malaria and pneumonia visits. In Kinshasa, there were significant COVID-19 effects on total cases received, diarrhea and malaria visits, and pentavalent vaccinations. There was also a single one-month drop in family planning-related visits in May 2020. All of these services had fully recovered by August 2020. Some MCH services in the DRC showed persistent significantly greater total levels of utilization in the COVID-19 period, such as antenatal care and facility births.

Lessons learned

There were several key limitations and lessons learned from this study. Some of these challenges were specific to the country and respective information system. In Bangladesh, there were sudden increases in reporting, so there were several upazilas with incomplete time series. These upazilas have incomplete data, as they were not included in the information system until 2019. Additionally, the changes to the information system, combined with unavailability of facility-specific data in Bangladesh, also meant that it was not possible to account for geographic differences like we did in the DRC model.

In the DRC, the original DHIS2 data had more extreme values compared to the data from Bangladesh. Another challenge in the DRC pertains to changes in the number of facilities reporting due to COVID-19. The total service use models use the number of facilities reporting as a predictor, but this does not completely reflect the situation of "without COVID" in the COVID-19 months, since some indicators showed temporary declines in reporting, such as for malaria and pneumonia. In the future, a similar model might be developed to predict the number of facilities reporting as well.

For more information:

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