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The Impact of COVID-19 on Hospital Admissions for Twelve High-Burden Diseases and Five Common Procedures in the Philippines: A National Health Insurance Database Study 2019-2020

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Summary

Background The Philippines has the highest cumulative COVID-19 cases and deaths in the Western-Pacific. To explore the broader health impacts of the pandemic, we assessed the magnitude and duration of changes in hospital admissions for 12 high-burden diseases and the utilization of five common procedures by lockdown stringency, hospital level, and equity in patient access.

Methods Our analysis used Philippine social health insurance data filed by 1,295 hospitals in 2019 and 2020. We calculated three descriptive statistics of percent change comparing 2020 to the same periods in 2019: (1) year-on-year, (2) same-month-prior-year, and (3) lockdown periods.

Findings Disease admissions declined (-54%) while procedures increased (13%) in 2020 versus 2019. The increase in procedures was caused by hemodialysis surpassing its 2019 utilization levels in 2020 by 25%, overshadowing declines for C-section (-5%) and vaginal delivery (-18%). Comparing months in 2020 to the same months in 2019, the declines in admissions and procedures occurred at pandemic onset (March-April 2020), with some recovery starting May, but were generally not reversed by the end of 2020. Non-urgent procedures and respiratory diseases faced the largest declines in April 2020 versus April 2019 (range: -60% to -70%), followed by diseases requiring regular follow-up (-50% to -56%), then urgent conditions (-4% to -40%). During the strictest (April-May 2020) and relaxed (May-December 2020) lockdown periods compared to the same periods in 2019, the declines among the poorest (-21%, -39%) were three-times greater than in direct contributors (-7%, -12%) and two-times more in the south (-16%, -32%) than the richer north (-8%, -10%). Year-on-year admission declines across the 12 diseases and procedures (except for hemodialysis) was highest for level three hospitals. Compared to public hospitals, private hospitals had smaller year-on-year declines for procedures, because of increases in utilization in lower level private hospitals.

Interpretation COVID-19's prolonged impact on the utilization of hospital services in the Philippines suggests a looming public health crisis in countries with frail health systems. Through the periodic waves of COVID-19 and lockdowns, policymakers must employ a whole-of-health strategy considering all conditions, service delivery networks, and access for the most vulnerable.

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Introduction

Global numbers of coronavirus disease-19 (COVID-19) cases and deaths fail to capture broader pandemic health impacts on non-COVID-19 healthcare utilization. This is particularly true in many low-and-middle income countries (LMICs) where health information

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Research in context

Evidence before this study

Literature shows that the COVID-19 pandemic, which precipitated state-mandated lockdowns and various negative health system changes, decreased the utilization of essential non-COVID-19 healthcare, especially for vulnerable groups. A multi-country systematic review across 20 high income countries (HICs) reported a median 37% reduction in healthcare utilization during the pandemic. Our results on the magnitude of drops in hospital utilization is comparable for non-urgent and respiratory diseases in South Korea, dengue in China, diabetes in the USA, acute coronary syndromes in England, and stroke globally.

Added value of this study

Our study contributes to literature in three ways. First, we provide estimates for diseases and procedures not yet well-studied. Tuberculosis inpatient admissions declined by -62% at the height of the lockdown in April 2020 compared to April 2019. This trend continued until December 2020, facing -40% to -60% declines relative to the same periods in 2019. Chemotherapy utilization in the Philippines faced a modest drop of -30% in April 2020 versus April 2019, but steadily recovered in the succeeding months of 2020 to December 2019 levels. Remarkably, hemodialysis utilization for all months in 2020 were similar to their respective months in 2019, with growth starting in August 2020 (13%) to December 2020 (150%). This is attributable to an increase in social health insurance (SHI) coverage of hemodialysis from 90 to 144 sessions per year for 2020, since policymakers were concerned about the affordability of this life-saving procedure during the pandemic.

Second, we provide insight on equity in utilization by hospital characteristics cross-tabulated with conditions: Year-on-year declines in disease admissions were largest for Level 3 hospitals across diseases and sectors (public level 3 median: -49%, private level 3 median: -52%). Overall, for procedures, government hospitals suffered a slight decline (-6%) while private hospitals grew (20%), because declines in level 3 private hospitals were compensated through increases in utilization of chemotherapy, C-Section, and vaginal delivery in lower level private hospitals — a trend absent in public hospitals.

Lastly, taking our results as a whole, we present an analysis that can inform a whole-of-system strategy. To our knowledge, there has been no low-and-middle income country (LMIC) in Southeast Asia with similar research on a national scale focusing on the country's top diseases and looking across lockdown policies over time, hospitals, and equity in patient access. For example, our results may, in part, reflect the effects of prolonged lockdowns without system-wide strategies to mitigate potential negative effects on non-COVID-19 inpatient utilization. The Philippines is unique in that varying degrees of lockdown have been the mainstay response to COVID-19 since March 2020. Contrary to

most literature, which identified a recovery period, medical admissions and procedures captured in the Philippine SHI database showed greater declines in utilization during the looser lockdown period (-61%) of May-December 2020 compared to the same period in 2019 than the more stringent period (-36%) of April-May 2020. Of course, apart from lockdowns, our results may also reflect intentional and unintentional changes in health system conditions caused by new national policies and the progression of the pandemic that must be considered more thoughtfully in a holistic strategy to control COVID-19. For instance, qualitative reports suggest COVID-19 has overwhelmed the public health system as limited government resources are siphoned to COVID-19 response.

Implications of all the available evidence

The declines in hospital utilization suggest a looming public health crisis for the Philippines and other LMICs with frail health systems. Foregone care for infectious and non-communicable diseases may lead to long-term increases pre-mature mortality and morbidity with expensive and impoverishing complications. A whole-of-health perspective considering all conditions and procedures, service delivery networks, and access for the most vulnerable through epidemic waves and lockdown restrictions is critical. To illustrate, lower-level hospitals may be capacitated and maximized to facilitate catch-up care. Focus for support and special protections can also be given to lower-level public hospitals, which may be the only hospitals accessible in poorer provinces or rural areas.

systems are weak and spillover effects of the pandemic may be difficult to measure.¹

The Philippines is an LMIC where COVID-19 remains a continuing public health crisis with over 2.4 million confirmed cases and 37 thousand deaths as of 22 September 2021 - the highest in the Western-Pacific region.² Evidence shows that the COVID-19 pandemic, which precipitated state-imposed lockdowns and negative health system changes in many countries, have led to declining use of essential healthcare and deteriorating population health-status and well-being.³⁻⁵ Better understanding of the indirect consequences of the pandemic in LMICs would assist global and local decision-makers in implementing a more holistic and calibrated response, particularly while LMICs continue to have limited access to effective vaccines and where their capacity for pandemic control has varied based on public trust, government resources, and health system weaknesses.⁶⁻⁸

To this end, we assessed the magnitude and duration of changes in hospital utilization in the Philippines for 12 diseases, which account for half the total disease burden in the country,⁹ and the five most-commonly utilized hospital procedures. In concern for a systems-

perspective that can inform operational strategy, we also look at these trends across Philippine lockdown policies over months in 2020, hospital levels, and equity in patient access.

Methods

Setting

The Philippine health system is decentralized across three island groups, 17 regions, and local governments units (LGUs), referring to 81 provinces and the municipalities and cities they encompass. The Department of Health (DOH) is the country's national health policy and regulatory body.¹⁰ While the DOH manages some tertiary and specialty hospitals, LGUs and the private sector are the main providers of healthcare. The Philippine Health Insurance Corporation (PhilHealth) institutes universal healthcare (UHC) through the national social health insurance (SHI) program.¹¹ Funded primarily through general taxation, PhilHealth, as the national purchaser of health services, pays accredited providers through fixed benefit packages and inpatient case rates.

Currently, 93% of hospitals are accredited by PhilHealth. All Filipino citizens are eligible to enroll in PhilHealth by the UHC Act of 2019, and 87% of 110-million Filipinos are registered in the national SHI database and pay premiums.^{11,12} There are two major membership categories: (1) Direct contributors are from formal- or informal-labor sectors, whose premiums are self-paid or covered by employers. (2) Indirect contributors include senior citizens and indigents, a category for the poor whose income is insufficient for subsistence. Indirect contributors cannot afford their premiums and rely on government or private entities to finance them. Unregistered members or failure to pay premiums does not prevent enjoyment of PhilHealth benefits. Unregistered patients are enrolled immediately at point-of-care. Indirect contributors can access PhilHealth benefits regardless of premium payments while direct contributors must first retroactively pay missed monthly premiums.

Data

Our analysis was based on PhilHealth inpatient claims for 12 high-burden diseases and procedural claims for the five common procedures filed by 1,295 accredited hospitals from 2019 to 2020. The diseases were: (1) acute gastroenteritis (AGE), (2) asthma, (3) chronic kidney disease (CKD), (4) chronic obstructive pulmonary disease (COPD), (5) cancer, (6) dengue, (7) diabetes, (8) hypertension, (9) ischemic heart disease (IHD), (10) pneumonia, (11) stroke, and (12) tuberculosis. The procedures were: (1) cataract surgery, (2) chemotherapy, (3) cesarean section (C-section), (4) hemodialysis, (5) vaginal delivery. PhilHealth has limited outpatient- and

primary care benefits; thus our data represent only disease admissions and procedures done in hospitals. Except for cancer, chemotherapy, C-section, and acute or severe events for the listed diseases and procedures, prevention and follow-up care may be done at the primary care level or an out-patient basis — both of which were not captured by our data. See supplementary Table 1 for specific conditions under each disease and the list of disease ICD-10 codes and procedure Relative Value Scale (RVS) codes.

Data were extracted by PhilHealth on 21 April 2021 and claims that were “returned to hospitals” for incomplete documentation and “denied” due to non-compliance or non-compensable reasons were excluded (see Supplementary Table 2). Returned and denied claims can be refiled or contested, so their exclusion avoids the possibility of double-counting. The final sample includes 4,488,370 claims from 2019 and 3,663,292 claims from 2020. These claims may be “paid”, “approved for payment”, or “in-process.” Because PhilHealth policy delineates case rates for multiple conditions, only the ICD-10 or RVS code in the primary position was used.¹³ Thus, a claim may reasonably be assumed to represent one discrete event of service utilization.

PhilHealth data included admission year and month, hospital characteristics (i.e., level, ownership, province of location), and patient membership type. Hospitals were categorized by capacity: Level 1 hospitals provide emergency and ancillary care; Level 2 hospitals, in addition, are departmentalized and have intensive care units and clinical laboratories; Level 3 hospitals are considered end-referral hospitals.¹⁰

To supplement our analyses, we used province income-class data from the Philippine Statistics Authority to compare the utilization among hospitals in poorer and richer provinces.¹⁴ Income-class is based on average annual provincial income from local taxes and revenues over the past four years. First class provinces maintain an average annual income of at least PHP 400 million (USD 8 million); second class, PHP 320 million (USD 6.4 million); third class, PHP 240 million (USD 4.8 million); fourth class, PHP 160 million (USD 3.2 million); and fifth class, PHP 80 million (USD 1.6 million).¹⁵

Finally, we juxtaposed the stringency of lockdowns in 2020 to PhilHealth claims using admission or procedure month. We focused on three distinct periods: “Pre-lockdown” (January-February 2020), “Enhanced Community Quarantine (ECQ)” [March-April 2020], and “Modified or General Community Quarantine (M/GCQ)” [May-December 2020]. Lockdowns enforced by the Philippine government are classified into four with decreasing strictness: (1) ECQ - entire population except essential industries under stay-at-home orders, public transportation and mass gatherings prohibited; (2) MECQ - limited number of businesses open,

restaurants for-delivery, and individual outdoor excise permitted; (3) GCQ - government offices may operate at full capacity, 25%-50% venue capacity for public gatherings, recreational facilities, and restaurants; and (4) M/GCQ - public gatherings at 50%-75% venue capacity, and restaurants and gyms fully operational.¹⁶ From mid-March 2020, when lockdowns were initially implemented, until the end of April, the country was under ECQ. In May, nearly all provinces had transitioned to GCQ, and by June, most of the country remained under M/GCQ until December 2020.¹⁷ Stricter lockdowns were sometimes employed in select provinces or smaller administrative units for short periods of high local transmission.

Statistical analysis

We retrospectively analyzed PhilHealth claims to derive total monthly medical admissions and procedure utilization, disaggregated by hospital characteristics, PhilHealth membership type, and disease or procedure. We calculated three descriptive statistics of percent change comparing 2020 to the same periods in 2019: (1) year-on-year, (2) same-month-prior-year, and (3) lockdown periods. STATA v17.0 was used for all data processing and analyses.

To account for the change over time between 2019 and 2020 had the pandemic not occurred, we normalized the monthly totals in 2020 using the method of Birkmeyer et al.¹⁸ Furthermore, since disease incidence and health care utilization were more prevalent during certain periods in the year,¹⁹ we treated corresponding time periods in 2019 as controls. Our steps were as follows: We first created a baseline adjustment factor by calculating the ratio of average claims in January and February 2019 and the average claims for the same months in 2020, as these together represent the pre-pandemic period (Equation 1). Next, to calculate an adjusted same-month-prior-year ratio, we multiplied the baseline adjustment factor with the ratio of 2020 and 2019 admissions or procedure totals for each month. Adjusted month-on-month percent change is then given by 1 minus the adjusted same-month-prior-year ratio, multiplied by 100. Finally, adjusted monthly totals for 2020 were calculated by multiplying the adjusted ratio with the 2019 monthly claims. These steps were repeated within all strata of disaggregation.

Equation 1: Seasonality Adjusted same – month – prior – year % Change

$$= [1 - (\text{Baseline Adjustment Factor} * \text{same – month – prior – year Ratio})]$$

$$= \left[1 - \left(\frac{\text{Average claims in January and February 2019}}{\text{Average claims in January and February 2020}} \times \frac{\text{Claims for month in 2020}}{\text{Claims for month in 2019}} \right) \right]$$

For adjusted percent change in lockdown periods, 2019 claims, and 2020 adjusted claims were first aggregated up according to Pre-lockdown (January-February), ECQ (March-April), and M/GCQ (May-December) periods then compared. Analyses for year-on-year total claims for 2019 and 2020 were not seasonally adjusted, as they already accounted for aggregate seasonal fluctuations in the data.

Ethics approval

Institutional review board approval was deemed unnecessary as all administrative data used here may be obtained from government websites (see Data Availability).

Role of the funding source

The funders of the study did not have any role in study design, data collection, analysis, interpretation, or writing of the manuscript.

Results

Majority of PhilHealth-accredited hospitals were Level 1 (65%) and Level 2 (27%) (Table 1). Around 66% were privately-owned, 86% concentrated in the first-class provinces of the country, and 45% were located in the three contiguous regions of the National Capital Region, Region III, and Region IVa. These regions are considered the epicenter of economic activity, accounting for about 60% of the country's gross domestic product.²²

Comparing 2020 to 2019 in aggregate, we observed a large decline in total admissions for the 12 diseases (-54%) and a small increase in utilization (13%) for the five procedures (Table 1). The year-on-year decline in medical admissions was similar across hospital level, ownership, location, and province income class. For procedures, changes in utilization showed some heterogeneity: While Level 3 hospitals showed slight decrease in procedures (-4%), Level 1 (16%), and Level 2 hospitals (26%) recorded modest growth. Government hospitals suffered a slight decline in procedures (-6%) while private hospitals grew (20%). In terms of hospital location, Visayas had the highest recorded growth (21%) in procedures; hospitals in fourth- (3%) and fifth-class (-12%)

	Hospitals (N=1,295)		Medical Admissions (12 diseases)			Procedures (5 procedures)		
	n	%	2019	2020	% Change	2019	2020	% Change
Total	-	-	2,102,510	962,770	-54	2,385,860	2,700,522	13
Hospital Level								
Level 1	832	64.2	1,014,939	464,921	-54	439,072	509,565	16
Level 2	344	26.6	674,156	313,258	-54	1,066,003	1,347,035	26
Level 3	119	9.2	413,415	184,591	-55	880,785	843,922	-4
Ownership								
Government	440	34.0	960,684	428,882	-55	648,438	608,215	-6
Private	855	66.0	1,141,826	533,888	-53	1,737,422	2,092,307	20
Location								
National Capital Region, Region III, Region IVa*	564	43.6	695,786	295,034	-58	1,254,598	1,383,907	10
Luzon	258	19.9	352,176	211,046	-40	352,176	401,145	14
Visayas	178	13.7	392,804	214,565	-45	422,449	511,918	21
Mindanao	295	22.8	590,851	242,125	-59	356,637	403,552	13
Province Income Class								
First	1,107	85.5	1,786,460	806,795	-55	2,160,210	2,442,067	13
Second	121	9.3	224,045	111,084	-50	171,435	197,728	15
Third and Below	55	4.2	74,887	35,995	-52	45,845	52,205	14
Fourth	9	0.7	13,540	6,736	-50	7,918	8,125	3
Fifth	3	0.2	3,578	2,160	-40	452	397	-12

Table 1: Characteristics of PhilHealth-accredited hospitals and year-on-year changes in medical admissions and procedures by hospital characteristics, 2019-2020

*Three contiguous regions considered the epicenter of economic activity in the Philippines.

provinces also had lower growth compared to those from richer provinces.

Figure 1 shows the monthly number of medical admissions and procedures for 2019 and 2020 overlaid with Philippines' lockdown periods. A large decline in medical admissions began in March 2020, coinciding with the start of national lockdown (Figure 1A). The lowest number of admissions was recorded in April 2020. There was a slight recovery in the absolute number of admissions in May 2020, but this stagnated until December 2020. Relative to the same months in 2019, the ECQ period reflected a 36% decline in admissions while the May-December 2020 M/GCQ period recorded a 61% decline (Table 2). For procedures, utilization numbers were stable, with only a very slight decline in April 2020 and even growth in the last quarter of 2020 (Figure 1A). Comparing the ECQ and M/GCQ periods in 2020 with the same months in 2019, procedures reflected a 1% decline and 10% increase, respectively (Table 2).

Equity-wise, utilization declines for both periods were largest in Visayas (-17%, -31%) and Mindanao (-16%, -32%) compared to NCR and Luzon (-8%, -14%). Among types of PhilHealth members, direct-formal contributors (-11%, -28%) and the poorest indirect-indigent or sponsored members (-21%, 39%) also suffered

the largest declines in admissions and procedures for both periods (Table 2).

Figure 2 summarizes the same-month-prior-year change in healthcare utilization for 2020 relative to 2019 by disease and procedure. Except for hemodialysis, which recorded large growths in the third quarter of 2020 (Figure 2A), utilization for all diseases and procedures actually declined for every month. The magnitude of decline, however, varied by disease or procedure (Figure 2B). Comparing April 2020 with 2019, same-month-prior-year declines for the non-urgent and respiratory diseases like AGE, asthma, COPD, dengue, pneumonia, and cataract surgery were the largest (range: -60% to -70%). For diabetes, hypertension, IHD, and tuberculosis or diseases that require regular maintenance consultation or medicines, declines were more modest (-50% to -56%). The lowest declines were seen in urgent or non-elective care, including CKD, cancer, chemotherapy, stroke, c-section, and vaginal delivery (-4% to -40%).

Table 3 presents year-on-year changes comparing 2020 to 2019 for diseases and procedures by hospital ownership and level. Disease admissions declined most in Level 3 hospitals (public median: -49; private median: -52), followed by Level 2 hospitals (public median: -43; private median: -42). Compared to public hospitals,

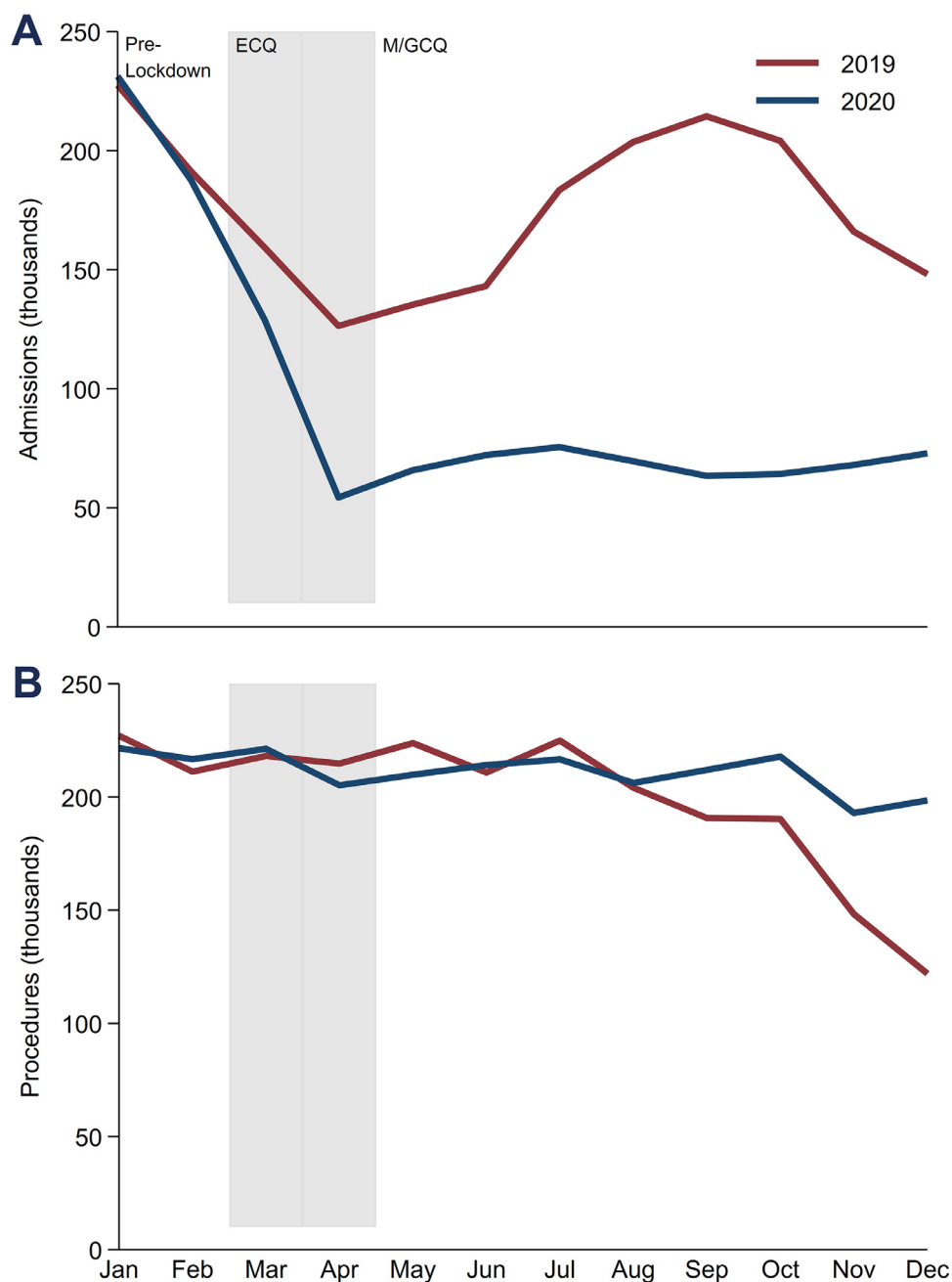


Figure 1. Monthly number of medical admissions and procedures in PhilHealth-accredited hospitals, 2019-2020

private hospitals had smaller declines in the procedures of cataract surgery, chemotherapy, C-section, and vaginal delivery. The decline for these procedures in private Level 3 hospitals was compensated by increases in utilization in private Level 1 and Level 2 hospitals.

As additional information to strengthen our analysis, we compared data from 2018 and 2019 year-on-year: disease admissions increased by 5% and procedures by 7% (Supplementary Table 4). Looking at each disease and procedure, there were increases in admissions for

Dengue (34%) and Pneumonia (14%) from 2018 to 2019 in contrast to their significant decline for 2019 to 2020 (Table 3). Otherwise, absolute utilization numbers for 2019 were generally within $\pm 9\%$ of 2018 levels.

Discussion

COVID-19 has had a considerable and prolonged impact on the utilization of non-COVID-19 inpatient services in the Philippines. Comparing 2020 to 2019,

	Strict Lockdown - "ECQ" (March-April)		Easing of Lockdown - "M/GCQ" (May-Dec)	
	2019	% Change 2020	2019	% Change 2020
Total Claims	718,493	-11	2,912,914	-19
Claim Type				
Medical Claims	285,648	-36	1,398,129	-61
Procedural Claims	432,845	-1	1,514,785	10
Hospital Location				
National Capital Region, Region III, Region IVa	322,077	-8	1,243,449	-10
Luzon	122,091	-8	502,420	-14
Visayas	127,943	-17	540,551	-31
Mindanao	146,382	-16	626,494	-32
PhilHealth Membership Type				
Direct Contributors	350,785	-7	1,389,567	-12
Formal	128,850	-11	580,566	-28
Informal	158,849	-6	597,081	-3
Lifetime Paid	63,086	-5	211,920	1
Indirect Contributors	367,708	-16	1,523,347	-26
Indigent or Poorest	177,299	-21	843,301	-39
Senior Citizen	190,409	-11	680,046	-10

Table 2: Year-on-year percent changes in medical admissions and procedures in PhilHealth-accredited hospitals across time periods by hospital location and patient insurance membership type, 2019-2020

we found a large decrease in disease admissions and a small increase in procedure utilization. The overall increase for procedures was due to a rise in hemodialysis utilization surpassing its levels in 2019, overshadowing the decline in for the two non-elective procedures of C-section and vaginal delivery. Comparing the months in 2020 to the same months in 2019, the precipitous drop in inpatient admissions and procedures occurred at the onset of the pandemic, during the strictest lockdown period in March to April 2020. There was some recovery in May 2020, but the trend was generally not reversed for the rest of 2020. Non-urgent and respiratory diseases faced the largest declines, followed by diseases requiring maintenance, then urgent and non-elective with the least. Observed declines were generally larger for (1) Level 3 hospitals, (2) the poorest patients, and (3) hospitals in the south relative to the richer capital and north. Specifically for procedures, private hospitals saw smaller declines, and even some growth, compared to public hospitals.

Our results are broadly consistent with published evidence in HICs and other LMICs that the pandemic decreased utilization of essential non-COVID-19 healthcare: A multi-country systematic review reported a median 37% (Interquartile range: -51% to -20%) reduction in healthcare utilization.³ The magnitude of drops in healthcare utilization are comparable for non-urgent and respiratory diseases in South Korea,²⁰ dengue in China,²¹ diabetes in USA,¹⁸ acute coronary syndromes in England,²² and stroke in 187 centers from 40 countries.²³

In line with international literature,^{6,18} hospital admissions decreased more steeply in vulnerable

groups. In our data, the declines in utilization were three-times greater among indigent insurance members compared to direct contributors and two-times more among the southern islands compared to the richer northern capital where COVID-19 was largely concentrated at the start of the pandemic. Various reasons, all of which may affect the poor more than the rich, could explain the large and sustained declines in hospital utilization during the pandemic. First, patients may have avoided going to hospitals out of fear as a national survey reported that 89% of the population were afraid of being infected.²⁴ Second, public transportation restrictions could have hindered access to hospitals. At the start of the pandemic especially, strict border controls and may have inhibited travel to hospitals in different locales. Public transportation in mega-cities was shut down from March to April 2020 under ECQ, and as of writing, allowed operating capacities for public transportation are still below pre-pandemic levels.²⁵ Third, rapid decline in income could have reduced household purchasing power and demand for healthcare. The country's economy shrank by almost 10% in 2020 and unemployment rates reached 17% and 10% in April and July 2020.²⁶

Limitations

Our study has several limitations. First, the pandemic may have affected the timeliness and completeness of hospital claims in 2020. However, the data was extracted in April 2021, and four months would have allowed hospitals to complete their claims filing. We

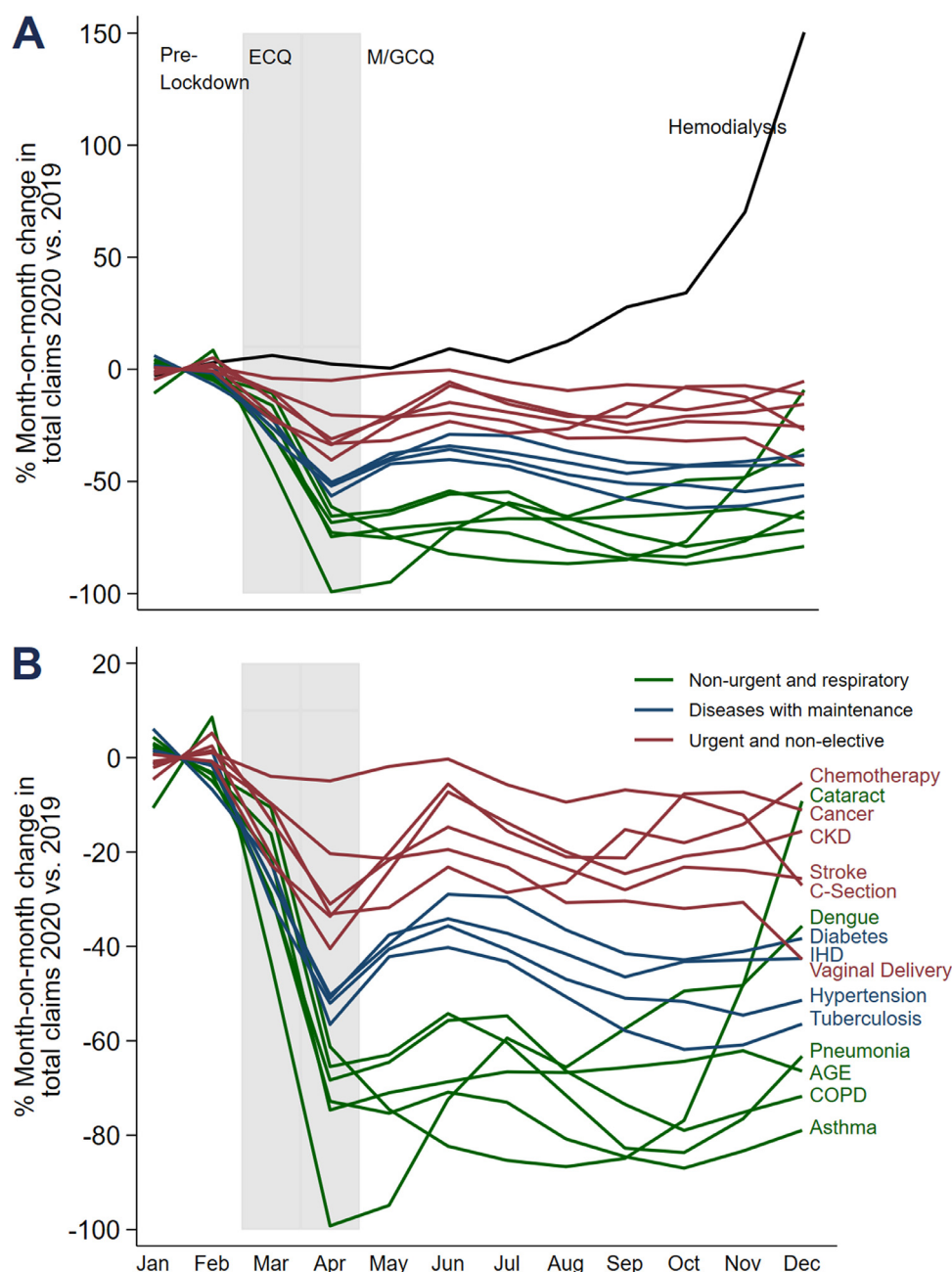


Figure 2. Same-month-prior-year percent changes in healthcare utilization by disease and procedure in PhilHealth-accredited hospitals, 2019-2020

further mitigated this by counting in-process claims. Majority of the in-process claims were from October to December 2020 (see Supplementary Table 3). The fact our results observed a dramatic rise in claims for hemodialysis in the last months of 2020 may be further evidence that majority of the hospital claims for 2020 had been filed.

Second, insurance claims do not necessarily reflect actual need for healthcare. For example, declines in

admissions for respiratory and infectious diseases may be due to true reductions in disease incidence caused by non-pharmaceutical interventions (e.g., masks, social distancing, handwashing) that decrease population exposure to air pollution, pathogens, and vectors. Even so, the decline in utilization for life-threatening diseases (e.g., cancer, CKD) and diseases that require follow-up (e.g., diabetes, hypertension), especially in public hospitals, strengthens our argument that the

	All Hospitals		Public Hospitals				Private Hospitals			
	2019	% Change 2020	All	Level 1	Level 2	Level 3	All	Level 1	Level 2	Level 3
Disease Admissions										
	Median	-42	-43	-41	-43	-49	-43	-39	-42	-52
	Interquartile Range	32	29	36	30	22	32	40	32	24
AGE	252,789	-55	-54	-51	-60	-63	-55	-49	-57	-65
Asthma	104,174	-66	-62	-62	-61	-67	-69	-69	-67	-71
COPD	42,250	-58	-14	-13	-15	-14	-19	-12	-17	-31
Dengue	364,392	-69	-57	-56	-55	-64	-59	-56	-60	-67
Pneumonia	730,346	-65	-20	-1	-12	-25	-8	16	1	-25
Diabetes	60,947	-31	-31	-24	-34	-45	-31	-20	-36	-47
Hypertension	208,759	-38	-74	-72	-76	-80	-64	-62	-65	-65
IHD	76,243	-35	-38	-34	-42	-50	-38	-28	-40	-56
Tuberculosis	40,171	-46	-39	-27	-39	-48	-32	-24	-34	-44
CKD	53,167	-17	-62	-62	-64	-63	-68	-70	-68	-63
Cancer	41,593	-14	-26	-5	-19	-40	-7	9	-7	-25
Stroke	127,679	-17	-46	-48	-43	-42	-47	-49	-44	-46
Procedures										
	Median	-5	-17	-6	-21	-32	8	18	8	-23
	Interquartile Range	21	13	51	27	31	-15	18	37	23
Cataract Surgery	93,516	-57	-71	-70	-32	-74	-54	-52	-47	-65
Chemotherapy	145,917	3	-11	-47	0•4	-11	12	18	34	-0•1
C-Section	331,532	-5	-17	4	-16	-32	8	24	8	-21
Hemodialysis	1,654,116	25	13	51	46	-5	27	26	33	16
Vaginal Delivery	160,779	-18	-24	-6	-26	-42	-3	6	-4	-25
Legend: Non-urgent and respiratory Diseases with maintenance Urgent and non-elective										

Table 3: Year-on-year percent changes in disease admissions and procedures in PhilHealth-accredited hospitals by hospital ownership and level, 2019-2020

pandemic negatively impacted non-COVID-19 inpatient care.

Third, we do not include all diseases and procedures reimbursed by PhilHealth. The 12 diseases and five procedures accounted for 49% and 32% of all paid medical and procedural claims in 2019.²⁷ Trends may be different for other diseases or procedures, particularly non-elective procedures, of which only one was captured in this analysis.

Fourth, our analysis focused on disease admissions and procedures done in hospitals. Currently, 7% of hospitals are not PhilHealth-accredited, 13% of Filipinos are not listed in the national SHI database, and 33% of patients billed for inpatient care may not use PhilHealth.²⁸ While PhilHealth claims may capture acute and severe events that require hospital care well, it does not cover all healthcare utilization in the country for these diseases and procedures. Changes in health-seeking behavior may have shifted hospital care to home-care, telemedicine, or primary care when possible. PhilHealth does not reimburse the former two and has limited outpatient- and primary-care packages. Nevertheless, in a country with weak population-based health information systems, the PhilHealth database

represents the most comprehensive available dataset on hospital utilization in the Philippines.

Added value

Our study contributes to the literature in three ways. First, we provide estimates for disease admissions and procedures that are not yet well-studied. Available literature for tuberculosis in LMICs have limited sample size or focus on new case diagnosis and qualitative descriptions of disruptions in primary care.^{29,30} Chemotherapy utilization in the Philippines faced a modest drop of 30% in April 2020, but almost recovered to 2020 levels by December 2020. Hemodialysis was peculiar: monthly utilization in 2020 was similar for the same months in 2019, with growth starting in August (13%) to December 2020 (150%). In November 2020, PhilHealth increased coverage of hemodialysis session from 90 to 144 sessions per year for 2020 as policymakers were concerned about the affordability of this life-saving health procedure during the pandemic.³¹

Second, we provide insight on equity by hospital characteristics cross-tabulated with condition. Declines were largest for Level 3 hospitals across diseases and

sectors. For procedures, private hospitals saw smaller declines compared to public hospitals. Declines in non-elective procedures in private Level 3 hospitals were compensated by increases in lower-level private hospitals — a trend absent in public hospitals.

Third and overall, we present an analysis that can inform a whole-of-system strategy. While a growing body of literature on the effect of COVID-19 on health care utilization has been reported by HICs and other LMICs,^{3,5,32–34} they sought trends in one or a few diseases or disease areas like maternal care. Meanwhile, there has been no LMIC in Southeast Asia with similar research on a national scale focusing on the country's most burdensome diseases and looking across lockdown stringency over time, levels of care, and equity in patient access.

In part, our results may reflect the effect of prolonged lockdowns on hospital utilization in an LMIC. The Philippines is unique in that varying degrees of lockdown have been the mainstay response to COVID-19 since March 2020. Contrary to most literature, which identified a recovery period associated with better national control over COVID-19,^{18,22,35} both admissions and procedures in the Philippines generally had greater cumulative decline during M/GCQ. Apart from lockdowns, however, our results may also reflect intentional and unintentional changes in health system conditions caused by national policy and the progression of the pandemic that must be considered more thoughtfully in a holistic strategy to control COVID-19. Qualitative reports suggest COVID-19 has overwhelmed public health systems, with governments siphoning resources to COVID-19 and reducing non-COVID-19 capacity.^{6,36} Though there were no hospital closures between 2019 and 2020 based for PhilHealth accredited facilities, hospital capacity for non-COVID-19 services were reduced by the designation of COVID-19 referral hospitals.³⁷ Several large national and provincial secondary and tertiary hospitals, of which there is usually only one in a province, were designated as COVID-19 referral hospitals.³⁸ DOH also directed public and private hospitals to allocate at least 30% and 20% of their total beds to COVID-19.³⁹ However, rising numbers of COVID-19 cases have pushed many facilities to critical capacity, leading them to turn away both COVID- and non-COVID patients.^{40–42}

Similarly, limited health human resources were reallocated to COVID-19 response, most evidently in public hospitals unable to hire additional manpower. To exacerbate the matter, many health workers resigned amidst worsening working conditions, including shortages of personal protective equipment, increased work hours, and delayed government assistance and release of hazard pay.^{43,44}

Recommendations and implications

Global, national, and local government policymakers must address the needs of both COVID-19 and non-

COVID-19 patients strategically. Instead of disease-specific approaches, a whole-of-health perspective considering all conditions and procedures, service delivery networks, and access for the most vulnerable through epidemic waves and lockdown restrictions is critical:

- Governments must prioritize conditions that require hospitalization and direct patients to appropriate levels of care, facilitating access not only for conditions with immediate life-threatening consequences, but also conditions that require maintenance to prevent future long-term morbidity and mortality.
- There must be a plan to follow-up with defaulters during lighter lockdown periods. Lower-level hospitals may be capacitated and maximized to facilitate catch-up care.
- Focus and special protections can be given to lower-level public hospitals and their health workers, which may be the only hospitals accessible in poorer provinces or rural areas.
- If public hospitals are overwhelmed, there is potential for lower-level private hospitals to be tapped, given they saw some growth in 2020 for procedures like C-sections and chemotherapy despite the pandemic.
- As in the case of hemodialysis, SHI like PhilHealth may play a role in improving the affordability of healthcare during the pandemic, especially in accessible private facilities.
- Mixed-methods and epidemiological research at the community-level will be invaluable to uncovering demand-side (e.g., fear of infection) and supply-side reasons (e.g., public hospitals becoming COVID-19 referral centers) for healthcare utilization trends, the development of public communication strategies, and uncovering further effects of lockdowns on hospital finances and population health outcomes.

As of August 2021, less than 10% of the Philippine population has been fully vaccinated against COVID-19.⁴⁵ The presence of the delta variant and a surge of cases has precipitated a return to ECQ in the capital region and further strain to overburdened hospitals and health care workers.⁴⁶ Considering our results and the current context, we believe these deleterious effects on hospital utilization continue today.

Our results suggest a looming public health crisis in the long-term for the Philippines and other LMICs with frail health systems. Foregone care for infectious diseases such as AGE and pneumonia may exacerbate the already high prevalence of chronic childhood malnutrition (30% among under-5 children) in the country.⁴⁷ Eight of the top 12 PhilHealth inpatient claims pertain to noncommunicable diseases (NCDs). In a country where 68% of deaths are due to NCDs,⁴⁸ forgone urgent and non-urgent hospital care for NCDs may lead to an increase in premature mortality, debilitating and

impoverishing complications, and a surge in future demand for rehabilitation services.⁴⁹

As LMICs struggle to navigate the multi-dimensional complexities of direct and indirect effects of the COVID-19 pandemic, global partners have a key role in capacitating governments to think strategically and operationalize holistic recommendations such as those listed above.⁸ Likewise, national leaders have the same role of capacitating hospitals and local government leaders at the subnational level. Governments and health systems, most crucially in countries that frequently use lockdowns as a significant means of COVID-19 control, must ensure patients with conditions requiring hospitalization can access it with ease and financial protection during this protracted pandemic.

Author Contribution

JU, VS, and VU are co-first authors who had equal contribution to study conceptualization, data analysis, interpretation, and manuscript drafting. DB and DW provided feedback throughout the study and manuscript writing. All authors had full access to the full data in the study and accept responsibility to submit for publication.

Declaration of Interests

We declare no competing interests.

Data Availability

The Supplementary File contains the administrative data underlying our analyses, tables, and figures. Local government income class may be downloaded online <https://www.psa.gov.ph/classification/psgc/?q=psgc/search>. Updated claims datasets may be requested from PhilHealth through the government's Electronic Freedom of Information program (<https://www.foi.gov.ph>). Analyses code may be shared upon reasonable request from the corresponding author.

Declaration of Competing Interest

The authors declare no conflict of interest.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.lanwpc.2021.100310](https://doi.org/10.1016/j.lanwpc.2021.100310).

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