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Spatiotemporal Analysis of Health Service Coverage in the Philippines

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Abstract

We conducted a spatiotemporal analysis of trends and disparities in health service coverage indicators using PhilHealth data on insurance claims, membership, and accredited facilities merged with auxiliary datasets from the Department of Health and Philippine Statistics Authority. The results emphasize clear disparities in population coverage, facility coverage, service coverage, and financial protection across different subpopulations.

Keywords: universal health care, health service coverage, spatiotemporal analysis, PhilHealth, equity

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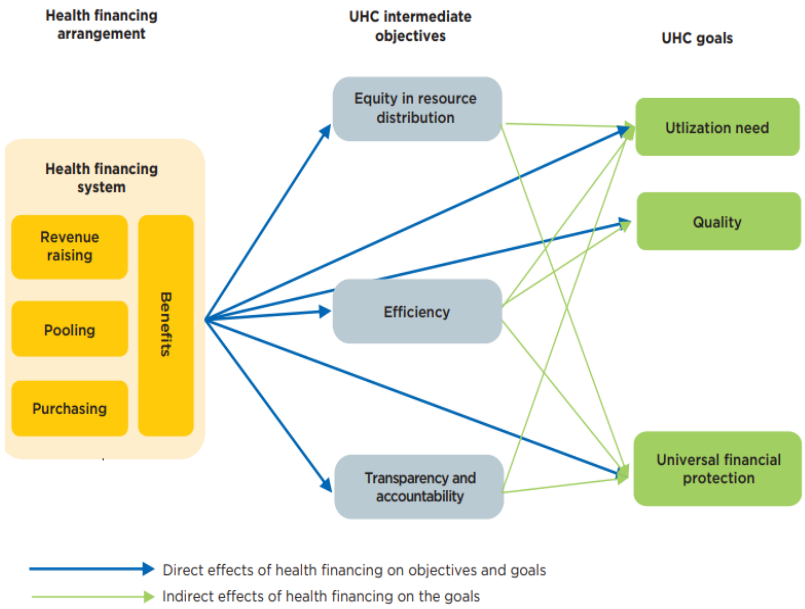
1. Introduction

The Universal Health Care (UHC) Act of 2019 paved the way for ensuring that healthcare services are "affordable, acceptable, available, and accessible" (Republic of the Philippines 2019). It outlines comprehensive reforms to achieve health system goals, *that is,* all Filipinos regardless of socio-economic status should have access to essential high-quality care services without financial hardship.

To achieve these health system goals, the country depends on the ability of the health financing system to drive equity, efficiency, transparency and accountability in the provision of healthcare services. **Figure 1** shows the functional components of health financing systems, *namely,* revenue raising, resource pooling, provider purchasing, and breadth and depth of benefits (see Kutzin, 2013). The UHC Act provides specific reform actions to strengthen these components, and PhilHealth, being the main purchaser of healthcare services plays a vital role. In this light, the government should regularly assess its performance.

Figure 1. Links between the health financing system and policy objectives, other system functions and overall health system goals



Source: Kutzin 2013

In this paper we examine the performance of PhilHealth in terms of population coverage (*that is*, how many people are covered), service coverage (*that is,* how many people are accessing care), and financial risk protection (*that is*, how much of the population are exposed to out-of-pocket payments).To our knowledge, this study is one of the first in the Philippines to thoroughly use PhilHealth membership, accredited facilities, and insurance claims data, tying it to other auxiliary datasets to investigate performance at the provincial level.

The paper is organized as follows: the next section provides a review of the literature and discusses the theoretical framework used as the basis for this study; the third section provides details on the data and methodology applied to estimate the spatiotemporal and distributional equity of health service coverage in the Philippines. Section 4 describes the trends in population coverage, service coverage and financial risk protection, with a detailed discussion of trends observed. The last section concludes and provides several policy recommendations.

2. Literature review

2.1 Research framework of the analysis

2.1.1. Health performance

In recent decades, the Philippines has made significant improvements in population health. Infant mortality rate (IMR), the most sensitive indicators of population had improved from almost 50 infant deaths in 1980's to 20 death infant deaths in 2019. The improvement in child survival resulted to improvement in life expectancy at birth, which increased from 62 years in 1980 to 69 years in 2019.

However, the trend of general improvement in health status on a national level masks inequity across geographic locations, sex, age, and income group. The IMR of the poorest quintile (31 deaths per 1,000 livebirths) is comparable to most low-income countries, while their richest counterparts (9 deaths per 1,000 livebirths) are at par with most upper-middle-income or even some high-income countries. This shows the variable health performance across sub-national units.

The Philippines is facing rapid epidemiologic transition to non-communicable diseases (NCDs). While progress has been made in maternal and child health and infectious diseases, the incidence of noncommunicable diseases (NCDs) is increasing due to a combination of increasing behavioral (e.g., smoking) and metabolic risks (e.g., high consummation of sugar and fat) and population aging. Data from the Institute of Health Metrics and Evaluation (IHME) show that the share of NCDs accounted for about 65% of the country disease burden in 2019, which increased from 39% in the early 1990s. Evidence suggests that the share of premature mortality is increasing in poorer communities (Ulep, Uy, and Casas, 2020).

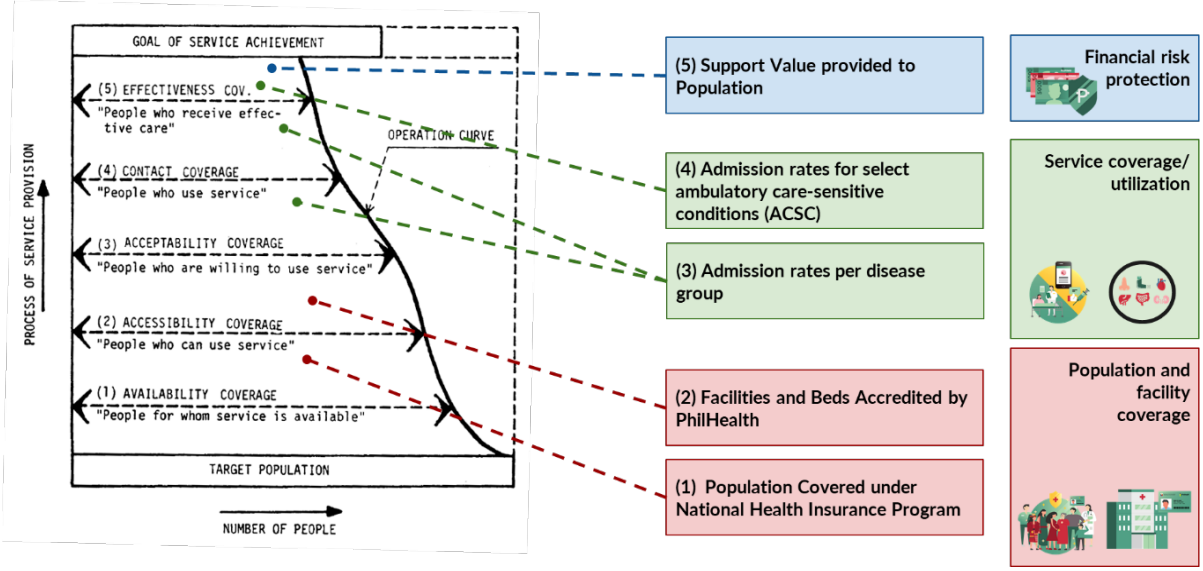
The slow improvement in health outcomes could be attributed to limited access to essential healthcare services. While the Philippines has undertaken various health sector reforms towards achieving universal health coverage, access to essential healthcare services remains a major challenge. The World Health Organization (WHO) measures access of the population to essential using the UHC Service Coverage Index. The Philippines has the lowest index score in the region. Countries with lower per capita national income in the ASEAN region have better scores than the Philippines (World Health Organization, 2019).

2.1.2. Accessibility of healthcare

Universal access to healthcare services is critical to improve population health. Healthcare access is a complex process. Therefore, Tanahashi (1978) proposes a working framework,

which captures five interrelated dimensions: availability (*that is,* people for whom service is available), accessibility (*that is,* people who can use the service), acceptability (*that is,* people who are willing to use service), contact (*that is,* people who use service), and effectiveness (*that is,* people who receive effective care). Services must have the capacity and resources available to deliver the appropriate level of care, be accessible to those who will use them, and be acceptable to those who will use them, based on financial and sociocultural factors. Any challenge that affects any dimension hinder the provision of healthcare services. For example, lack of capital investments limit the services that can reach the target population. Even if services are available, low acceptability results in decreased service provision.

Figure 2. Analytical framework based on Tanahashi (1978)



Source: Left image from Tanahashi (1978), Right image created by authors

Disparities in service provision occur from poor availability, geographic accessibility, affordability, or acceptability of services (Peters et al. 2008). As barriers can arise from issues with multiple dimensions (Tanahashi 1978), addressing problems requires a holistic approach that utilizes interventions that consider the complex interaction across these dimensions (Jacobs et al. 2012). In addition, given that the burden of diseases and health needs tend to be higher for disadvantaged populations, service delivery should address social determinants of health (Marmot 2007; Friel and Marmot 2011).

2.2. Research objectives

Using Tanahashi (1978) as the theoretical basis, we examine the performance of PhilHealth in providing healthcare services. Specifically, we selected a variety of indicators that could be further categorized into the following domains:

- *Population and facility coverage* - focuses on the (1) population covered by the NHIP and (2) health facilities and beds accredited by PhilHealth. Assessing membership coverage vis-à-vis accredited facilities under the NHIP provides insight on how to implement policies that can maximize the availability and geographic accessibility of services.

- *Service coverage* - focuses on admission/utilization rates by different disease groups and categories. By assessing admission rates, the demand for services in terms of both willingness to use services and actual utilization of services can be determined. Furthermore, the quality of care and efficiency of healthcare providers can also be inferred, based on the diseases treated at different levels of care.

- *Financial risk protection* - measures support value per member of the population, (i.e., the proportion of healthcare costs covered by the NHIP). This indicator provides a direct assessment of progress towards the goal of the NHIP to cover a higher proportion of costs for services and ensure effective service delivery to the population without risk of expenditure beyond the capacity of a patient to pay.

3. Methodology

3.1. Data

This study uses information collected from various data sources. The primary datasets were collected from PhilHealth, while the auxiliary datasets were retrieved from the Department of Health (DOH), Philippine Statistics Authority (PSA) and Institute for Health Metrics and Evaluation (IHME).

3.1.1. Primary data sources

- *Membership*: Annual aggregate data on PhilHealth membership were provided for years 2018 to 2021 in Excel format, where each sheet contains data for a specific member type.[1] The dataset contains variables such as member type, sex, member count and location data (e.g. PhilHealth Regional Office name, province, municipality). The variable year represents the latest membership count as of year-end. For example, all information for year 2018 is interpreted as the status of PhilHealth membership as of December 2018. The same applies for the other years. To prepare this dataset for analysis, the research team generated new variables such as member category and member subcategory based on member type information. There are two (2) member categories: direct contributor and indirect contributor; and six-member subcategories: formal economy, informal economy, lifetime paid, others (which include migrant workers, dual citizens, kasambahays, etc.), senior citizen, and indigent/sponsored beneficiaries. For this study, membership is defined as the sum of the total number of members and dependents registered in the PhilHealth database.

- *Accredited facilities*: PhilHealth data on accredited facilities consist of the following information: institution name, accreditation number, institution code, location details (i.e. region, municipality, province), social sector (i.e. private, government), class (i.e. Level 1, 2 or 3 hospital, etc.), number of implementing beds and number of PhilHealth accredited beds. The data was extracted from the PhilHealth PowerBI server last August 2022 and has information on all the PhilHealth accredited health facilities as of

[1] Due to data availability and privacy constraints, this study opted to use aggregate data (i.e. sum of membership counts) instead of member level data for the analysis.

30 June 2022. To further exploit this database, it was later on linked to the DOH National Health Facility Registry (NHFR) and the PSA PSGC codes.

- *Electronic Insurance Claims (eClaims)*: The data on electronic insurance claims collected by PhilHealth contains variables describing patient characteristics (e.g. age, sex, anonymized PhilHealth ID number, patient member type), and hospital and claims information such as unique identifier number for each claim filed, primary and secondary diagnosis/es in ICD-10 code, room type, year and date of admission, date the claim was received, received-refile date, date check was issued and institution code. **Table 1** lists the relevant variables from the eClaims database that were used for this study.

Table 1. Relevant variables from eClaims data used for the study

Variable	Description	Data Type
series	Unique identifier for the claim, anonymized	String
pseudo_pin	Patient's PhilHealth Identification Number (PIN), anonymized	String
inst_code	PMCC licensing number of the health care provider	String
member_category	Major category for the patient's PhilHealth membership type: either Formal Economy, Informal Economy, Lifetime Member, Sponsored, Senior Citizen, or Indigent	String
member_subcategory	Subcategory for the patient's membership type	String
patage	Patient age, in years	Numeric
patsex	Patient sex: M for male or F for female	String
out_patient	Indicator for whether the claim was for an outpatient service	Boolean
c1, c2	Case rates 1 and 2, whether diagnosis or procedure code	String
Icdcode1 - icdcode10	Other diagnosis codes as listed in the claim forms	String
rvscode1 - rvscode10	Other procedure codes as listed in the claim forms	String
claim_amount	Total amount reimbursed by PhilHealth to the health care provider taken as the total amount for case rate 1 + the half of the amount for case rate 2	Numeric
actual_amount	Actual total charge by the hospital for the inpatient stay	Numeric

Source: Authors' compilation.

3.1.2. Auxiliary datasets

- *Philippine Standard Geographic Code (PSGC)*: The PSGC dataset is publicly available from the PSA website for downloading in Excel format. It provides information on the PSGC codes used as of 30 September 2020 for each region, province, and municipality along with the corresponding LGU name, LGU type, and other LGU characteristics such as city type, income class, population count (2015 census), number of barangays per LGU, urban population count in LGU, and the poverty incidence at the province and municipality/city level. Linking this dataset with the primary data sources from PhilHealth allow researchers to identify spatial trends at more granular levels (provincial or municipal) and generate more location-specific insights and policy recommendations.

- *Poverty Statistics*: The latest poverty statistics can be downloaded from the PSA website in Excel format with relevant variables such as province name, poverty cluster[2], poverty incidence rates, and 90% confidence interval values.

- *National Health Facility Registry (NHFR)*: The NHFR is a registry that is managed and annually updated by the Department of Health. It lists all the national health facilities in the country and provides information such as accreditation year, whether the facility is DOH licensed or not, HCI number, accreditation number, HCI name, HCI description (e.g. Level 1 hospital, maternity clinic, etc.), social sector (e.g. government, private), region, province name, municipality name, number of DOH beds, and number of PhilHealth accredited beds. The annual data for used for this study was provided last 7 September 2022 through eFOI in an Excel file format and covers all health facilities accredited in 2018 until 2021. This dataset is merged with the PhilHealth accredited facilities data as part of the data quality check process that ensure consistency.

- *Global Burden of Disease (GBD) Grouping:* Another auxiliary data used in this study is the list of International Classification of Diseases (ICD) codes mapped to the Global Burden of Disease cause list. The raw list contains variables such as cause/disease and its corresponding ICD-10 and ICD-9 numeric codes. The dataset was further processed to assign a unique numeric code (cause ID) for each cause. These information helps broaden the analysis of health service coverage indicators used in this study, allowing to focus on particular diseases or conditions of interest.

3.2. Data processing

3.2.1. Linking the primary and auxiliary datasets

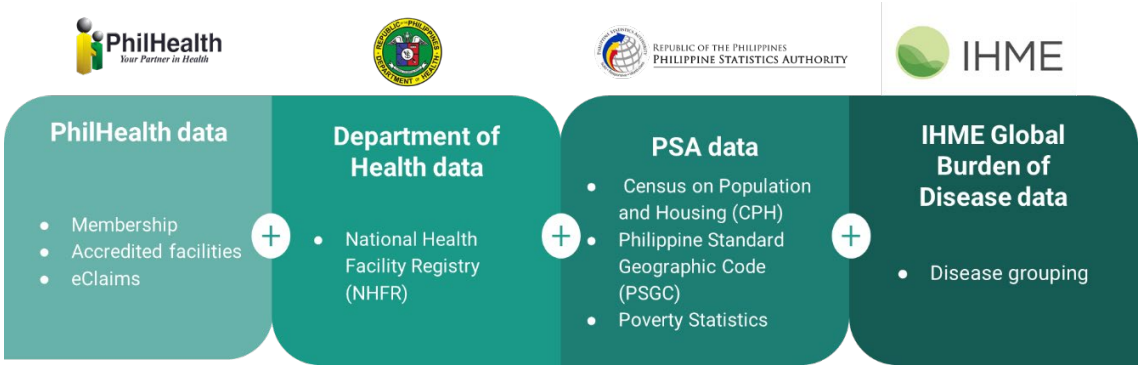
We conduct a series of data cleaning and processing steps for the PhilHealth datasets, including the rearranging of data table structures, standardizing geographic location names across datasets, and excluding data that has quality issues.

[2] The poverty incidence cluster variable is a numeric variable with values ranging from 1 to 5, where Cluster 1 indicates the bottom (poorest) cluster of provinces and Cluster 5 refers to the top (richest) cluster of provinces.

After initial data processing of PhilHealth data, the primary datasets were merged to the auxiliary data from the Department of Health (DOH), Philippine Statistics Authority (PSA), and the IHME Global Burden of Disease (**Figure 3**) before final analysis.

- To ensure that the standard provincial naming convention is used throughout the study, we link the location information available from the primary datasets to the PSGC dataset from the Philippine Statistics Authority. This initial step standardizes location data across PhilHealth, DOH, and PSA datasets. Instead of using province names, we use PSGC codes as the main location identifiers. Prior to the linking process, we conduct data quality checks since naming standards are inconsistent across datasets (e.g. some province names are abbreviated, different formatting).

Figure 3. Linking datasets for spatiotemporal analysis



Source: Created by authors.

- We link auxiliary datasets, particularly the DOH National Health Facilities Registry and PSA Poverty Statistics to the PSA PSGC codes using province name. Similar to the first step, this allows for the use of province PSGC code as the main location identifier across all datasets.
- We link the primary datasets to PSA Poverty Statistics, using province PSGC code as the common identifier. We classify provinces from poorest to richest, based on poverty incidence clusters. This step is helpful in conducting equity analysis that can produce insights on the relation between the different health service coverage indicators of interest and poverty incidence at the province level.
- We compare the data on PhilHealth accredited facilities by different characteristics to data from the DOH National Health Facility Registry to determine facilities accredited under NHIP. We link the datasets using the healthcare institution code that is common in both databases.
- Lastly, we merge eClaims data with the IHME data on Global Burden of Disease grouping using the ICD-10 codes as the common identifier.

3.2.2. Conducting data quality checks

We implement data quality checks to ensure that the insights from the spatiotemporal analysis are accurate. We focus on six data quality attributes, which are completeness, timeliness, uniqueness, accuracy, validity and consistency.

Throughout the data processing and linking of datasets, we identify several data quality issues. There are some that could be resolved by further cleaning and processing, while others are

quite challenging to address. These issues are noted accordingly throughout this paper for transparency.[3] Examples of data quality issues include:

- Different naming conventions for provinces and municipalities across datasets require additional processing of geographic location data to ensure that they could be properly assigned the correct PSGC codes. Furthermore, variables for provinces in PhilHealth and some PSA datasets do not exclusively include provinces and some datasets included highly urbanized and independent component cities amongst list of provinces, resulting in province lists of different sizes across datasets.
- There are duplicate observations for data that should pertain to unique IDs (e.g. duplicates based on name, year and location), which are excluded in the analysis of accredited facility coverage. Furthermore, not all facilities with healthcare institution ID codes were accredited facilities, necessitating the exclusion of facilities without an indicated accreditation number for the analyses.
- Text string names are inconsistently or incorrectly encoded, even when the same facility was being referred to, requiring further processing to identify facilities by similarity of names and identify potential duplicates before further analysis of facility coverage.
- For the facilities data, we address completeness by dropping observations where the HCI location was unknown.
- There are inaccurate and inconsistent data points. For instance, in the PhilHealth – DOH merged facilities dataset, there where instances that a health facility had lesser number of DOH licensed beds than the number of PhilHealth accredited beds. Inconsistent facility coding between the PhilHealth and DOH datasets also posed challenges in the merging process.
- Membership categories are not uniform across years (e.g. categories were changed 2020 onwards) and there is a lack of documentation provided detailing the changes to these variables and how previous member counts were converted to most recent membership categories, requiring the study team to determine criteria on how to consolidate categorization of certain member types to be consistent across years before doing further analysis.
- For membership data by sex and province, there are observations where member count had a value of zero, or with no assigned sex. These are excluded in the analysis.
- Claims are not always tagged with ICD-10 codes and some claims using ICD-10 codes are not always encoded according to the original data standard, due to a lack of data validation at time of entry and receival of claims. Claims without codes and those improperly tagged are excluded before analyzing admission rates and support value by diseases.
- Claims do not always provide valid values for age and sex. Claims that indicated patients with an age less than zero and greater than 120 or with an invalid value that did not indicate male, or female are excluded from subgroup analyses.

3.3. Statistical analysis

This study focuses on five indicators of health service coverage outlined in **Table 2**, covering different subpopulations based on location, time, age group, sex, member category, and facility type. The processed datasets, complemented by other dimensional and factual information that were gathered, were used to calculate the indicators. The indicators were holistically evaluated

[3] Data attribute definitions are provided in the **Annex Table A1**.

across all dimensions of service coverage to analyze the factors underlying the challenges and gaps in membership, facilities accreditation, service coverage, and financial protection in support of PhilHealth and other relevant stakeholders' functions to provide equitable, efficient, and high-quality services throughout the country.

The linked primary and auxiliary datasets were used to estimate the indicators and conduct the spatiotemporal and distributional health equity analysis. STATA V17.0 was used for initial data processing of data from PhilHealth claims with PSA data on population counts, geographic location. Python was used to perform data engineering, cleaning, and transformations into the tables used for visualization. Choropleth maps to visualize admission rates per subpopulation were generated through Tableau using PSGC codes to geo-reference locations across different provinces.

3.3.1. Population and facility coverage

We analyze membership counts and accredited facilities count using the processed and merged membership and accredited facilities data from 2018 to 2021 across provinces within the country. Due to limited data on outpatient and primary care benefits, the analysis focused on inpatient services admissions and costs provided by accredited hospitals.

Table 2. Criteria for assessing framework domains

Domain	Indicator name	Numerator	Denominator
Population and facility coverage	Population covered by the National Health Insurance Program	PhilHealth member count	Population count
	Facilities and beds accredited by PhilHealth	PhilHealth accredited facility or bed count	Population count
Service coverage	Admission rates by disease and disease group	Number of claims per disease group	Population count
	Admission rates for select ACSC	Number of claims per ACSC	Population count
Financial risk protection	Support value provided to Population	PhilHealth reimbursement for claim	Hospital charge for claim

Source: Authors' compilation

We define population coverage as the proportion of PhilHealth registered beneficiaries by province, including members and dependents, to total province population. To estimate the ratio, we merge membership data with PSA geolocation codes and population census data for 2020. Since disaggregation by sex were available for both datasets, we perform subpopulation analysis.

We assess facility coverage by comparing hospital bed density across provinces. This indicator is the proportion of PhilHealth accredited beds per province per 1,000 province population. For accredited bed counts that exceed the bed capacity determined by the DOH, as indicated in the NHFR, accredited beds, we assume to be the hospital bed capacity, to account for possible overestimations of actual availability in accredited beds in hospitals. We perform subgroup analysis by hospital ownership and hospital level. Lastly, we perform equity analysis by determining the correlation between population coverage, facility coverage and poverty incidence at the province level.

3.3.2. Service coverage

As PhilHealth policy provides case rates for patients being treated for multiple conditions, the ICD-10 code indicated as primary diagnosis in the claim was used, with a single claim representing one instance of service utilization within hospitals. We conduct a subgroup analysis based on GBD groupings and another for ambulatory-care sensitive conditions (ACSC). In general, we estimate utilization rates using data from eClaims and PSA population census. It is the ratio of the number of claims per province relative to province population. Again, we perform subpopulation analysis by age and hospital characteristics (ownership, facility type).

For this study, we included the eClaims data collected from 2018 to 2020 in the analysis of service utilization rates. We exclude the year 2021 due to the reduction in hospitalizations and claims amounts since March 2020, the onset of the COVID-19 pandemic, due to the imposition of travel restrictions and increased reluctance to travel in fear of infection (Ulep et al 2021). We exclude 2,420,169 claims due to failure to conform with ICD-10 codes set for specific conditions.

For the analysis by Global Burden of Disease (GBD), the primary diagnosis of each claim was classified into the main GBD groups, based on common causes and risk factors across age, sex, and geographic location. These groups are:

- Infectious, maternal, neonatal, and nutritional diseases:
    - Infectious diseases are those that can be spread through contact with persons or animals infected or objects contaminated with pathogens.
    - Maternal and neonatal conditions refer to any conditions that can cause health complications during critical stages in life.
    - Nutritional disorders are diseases that arise from lack of proper amount of nutrients from dietary intake. This includes lower respiratory tract infections, urinary diseases and infections, diarrhea, and dengue.
- NCDs: Chronic conditions that do not result from infection. This includes hypertension, diabetes, chronic kidney disease, and asthma.
- Injuries: Bodily harm caused by accidents, falls, hits, weapons, and more. This includes road injuries, mechanical accidents, violence, and self-harm.

Next, we tag claims according to whether the main ICD-10 code was considered an ACSC (see Supplementary **Table A2**). Although ACSCs are commonly monitored in multiple countries, the list of specific conditions that are considered ACSCs vary between countries due to different financial, political, and sociodemographic contexts. Therefore, ACSCs that were common across ACSC lists used by different countries (Gibbons et al. 2012) and those used in

studies with similar designs conducted in other countries (Magalhães and Morais Neto 2017; Santos et al. 2022; Becker et al. 2022) were chosen.

For service coverage, we use crude admission rates as the numerator in the formula to calculate adjusted admission rates (Equations 1 and 2). Admission rates are age-adjusted, based on life stages grouping (0-4 years, 5-19 years, 20-59 years, 60 years and above) using counts of different subpopulations from the 2020 population census. We calculate 95% confidence intervals to measure precision and compare the rates of different provinces.

Crude Rate = [Average claims in 2018 to 2021 for ACSC within province / Total population in province] x 1,000 (Eq. 1)

Adjusted Rate = [(Crude Admission Rate by age, sex, and province) x (Total population by age, sex, and province / Total population of country)] (Eq. 2)

3.3.3. Financial risk protection

Alongside service coverage and utilization, we estimate support value provided by the NHIP. Effective financial protection in a health system should reduce out-of-pocket (OOP) patient costs that are not covered by insurance, as much as possible. Support value is the total cost covered by national health insurance, out of the total hospital charges for services (Equation 3). We perform analysis at the province level, as well as subgroups by membership category and disease groupings, using the merged eClaims and GBD datasets.

Support Value = [Total adjusted claims amount covered by national health insurance / Total adjusted hospital charges] (Eq. 3)

Individual case support values that are above 100% were excluded from the calculation of average support value to account for potential administrative and data quality issues, including the underestimation of charges and actual service delivery costs or inaccurate reporting of claims amounts.

4. Results and discussion

This section presents and discusses the results of the assessment of geographic and distributional health equity in the country within the context of dimensions of health service coverage, specifically population coverage, facility coverage, service coverage, and financial risk protection using PhilHealth data.

4.1. Population coverage

Indicators on population coverage reflect who are currently insured by PhilHealth. Through the Universal Healthcare Law, all Filipinos are automatically enrolled under the National Health Insurance Program – which makes PhilHealth coverage rate 100 percent. However, to allow for monitoring and evaluation of progress in this dimension, this study relies on data collected by PhilHealth on ***registered beneficiaries*** (both members and dependents) listed in their database. The results from the spatiotemporal analysis provide more granular information that produces location-specific insights that could be helpful in setting targets to ensure full coverage is achieved and fully implemented. The goal of this domain is to identify any geographic discrepancies in PhilHealth population coverage across provinces.

On average, population coverage in 2020 was high across the country, apart from a select few provinces in the Mindanao area (**Table 3**). The province level disaggregation is presented in **Figure 4**. Red-shaded cells represent areas with low coverage, while the green-shaded ones are those with high coverage; those in the middle are shaded yellow/orange.[4] The map is dominantly green indicating that most Filipinos across provinces are registered in the PhilHealth database.

Table 3. Average population coverage by location, 2020

Location	Average population coverage
Luzon	90.7
NCR, Region III, Region IV-A	98.9
Visayas	90.5
Mindanao	87.82

Source: Authors' analysis of merged data on PhilHealth membership (2020) and PSA Census on Population and Housing (2020). Note: Population coverage is computed as the share of PhilHealth registered beneficiaries to total population.

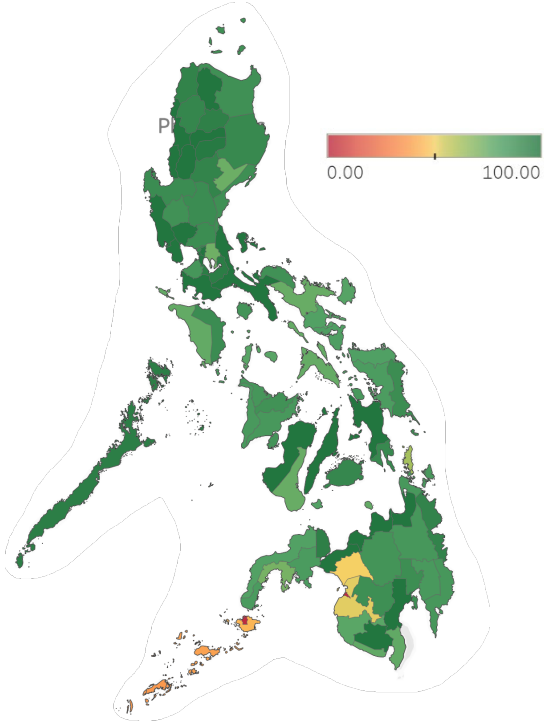
The provinces with the least coverage (52 percent and below) are Maguindanao, Lanao del Sur, Basilan, Sulu and Tawi-Tawi – all of which are in Mindanao with some even considered as conflict-affected areas (Figure 4). This could pose a challenge for PhilHealth in endeavoring to raise member registration for these priority areas and achieve universal population coverage of the NHIP in the country.

In terms of distribution by category, around 71 percent of registered beneficiaries in GMA are direct contributors, particularly from the formal and informal economy[5]. Membership breakdown in Luzon and Visayas is fairly divided between direct and indirect contributors while Mindanao has the largest share of indirect contributors – mostly indigent/sponsored at 57 percent (**Table 4**). Indigents and families under government programs such as the Pantawid Pamilya Pilipino Program (4Ps) and individuals or families under the National Household Targeting System for Poverty reduction fall under the indirect contributor category and are at-higher risk of contracting diseases.

[4] Ideally, the indicator value should range from 0 percent (no coverage) to 100 percent (full coverage). However, due to data quality issues, there were several instances where the number of registered beneficiaries exceeded the population count. For the purpose of this study, the authors acknowledge this issue but nonetheless decided to proceed with the analysis with this caveat in mind.

[5] Members in the formal economy include those who are employed either in the public or private sector, while those in the informal economy comprise of professionals or are self-employed. Direct contributors (others) consist of members registered as *kasambahay* (househelp), family driver, migrant worker, or dual citizens.

Figure 4. PhilHealth population coverage by province, 2020



Source: Authors' analysis of data on PhilHealth membership data (2020) and PSA Census on Population and Housing (2020). Note: Population coverage is computed as the share of PhilHealth registered beneficiaries (members and dependents) to total population. Red-shaded areas represent provinces with low coverage. The green-shaded areas are those with high coverage, those in the middle are shaded orange. Grey-shaded areas indicate that data the indicator was not computed due to data unavailability or failed data merging.

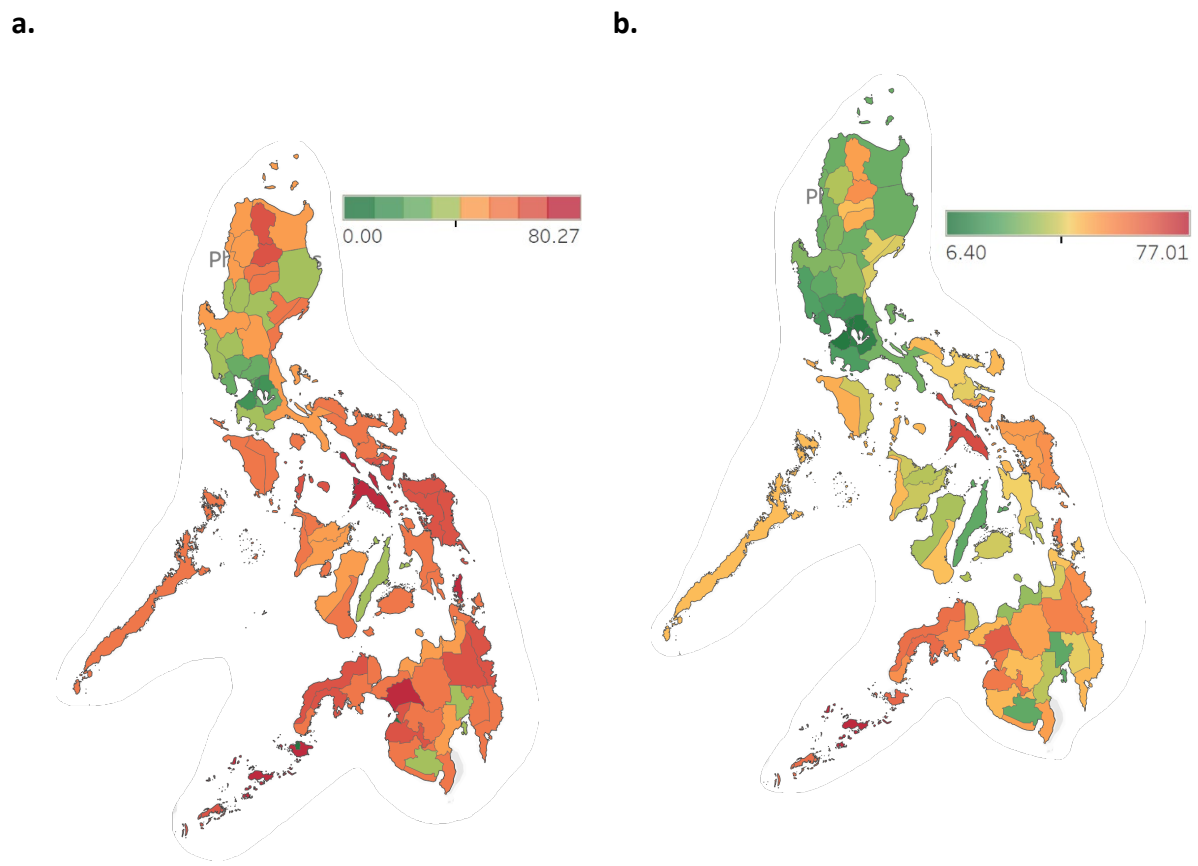
Table 4. Breakdown of population coverage by membership category, 2020

		Direct contributor (%)				Indirect contributor (%)	
	All members	**Formal**	**Informal**	**Lifetime Paid**	**Others**	**Senior Citizen**	**Indigent/ Sponsored**
Philippines	**100**	27.0	17.5	2.3	6.0	11.4	35.8
GMA	**100**	39.3	21.5	2.3	8.5	11.9	16.5
Luzon	**100**	23.0	17.5	2.3	6.4	12.7	38.1
Visayas	**100**	23.8	16.2	2.5	4.9	12.3	40.4
Mindanao	**100**	22.0	14.8	2.0	4.1	8.6	48.5

Source: Authors' analysis of merged PhilHealth membership data (2020) and PSA Census on Population and Housing (2020). Note: GMA = Greater Manila area is composed of NCR, Reg III, and Reg IV-A.

An example is Sulu where 77 percent of the population are registered as indigent/sponsored (**Figure 5**). In addition to Sulu, areas with a share of indigent/sponsored members greater than 60 percent are Masbate (69%) in Visayas, and Lanao del Sur (65%), Basilan (63%), Tawi-Tawi (61%), and Zamboanga del Norte (61%) in Mindanao. As a result, majority of membership in these provinces consists of indirect contributors. Other provinces with higher than 60% share of indirect contributors include Kalinga (62%) in Luzon, Dinagat Islands (70%) and Eastern Samar (62%) in Visayas, and Maguindanao (64%), Agusan del Sur (62%), Surigao del Sur (61%), exhibiting that provinces that consist majorly of indirect and indigent/sponsored members are in Mindanao.

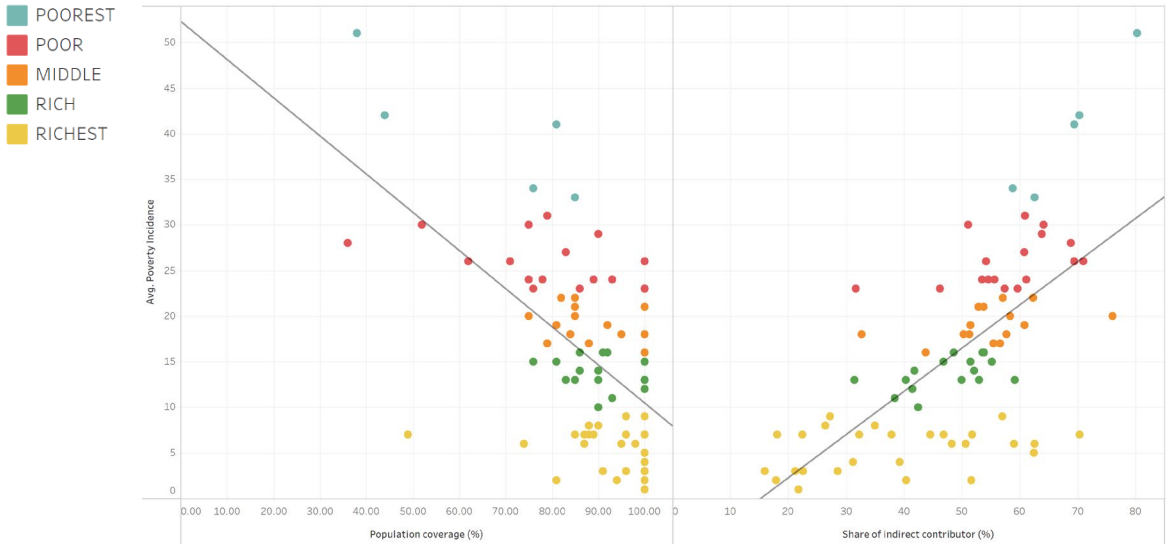
Figure 5. (a) Share of indirect contributors and (b) share of indigent/sponsored to total registered members



Source: Authors' analysis using data on PhilHealth membership (2020) and PSA Census on Population and Housing (2020). Notes: Red (green)-shaded areas represent provinces with high (low) shares of indirect contributors or indigent/sponsored members, those in the middle are shaded orange. Grey-shaded areas indicate that data the indicator was not computed due to data unavailability or failed data merging.

Additionally, there is an inverse relation between population coverage and poverty incidence (coefficient: -0.4183; R-squared: 0.3304; P-value: <0.0001). Provinces with low poverty incidence tend to have high membership coverage, while there is still a need to expand beneficiary coverage in the poorest areas. Priority areas are those in the poorest provinces with low coverage such as Sulu, Basilan, and Sarangani in Mindanao (**Figure 6**). Furthermore, there is a positive correlation between the share of indirect contributors and poverty incidence (coefficient: 0.4737; R-squared: 0.4511; P-value: <0.0001), suggesting that challenges with enrolment are encountered in provinces with high poverty incidence possibly due to difficulty in reaching and or categorizing indirect contributors within said provinces. This result, when interpreted with the previous findings, shows that the poorest provinces tend to have low population coverage – of which most are senior citizens, indigents, or sponsored beneficiaries.

Figure 6. Equity analysis for population coverage indicators



Source: Authors' analysis of merged PhilHealth membership data (2020), PSA Census on Population and Housing (2020), and PSA Poverty Statistics (2021).

These insights are similar to the finding by Larson and Hill (2005) in the United States where health insurance disparities between urban and rural areas exist. These differences were related to employment, with rural areas tending to have smaller scale employers, lower wages, greater prevalence of self-employment, and higher poverty incidence. Similarly, there could be a larger proportion of direct contributors in rich and richest provinces due to bigger scale employment opportunities, higher wages, and lower poverty incidence influencing the ratio of direct to indirect contributors among those registered under the NHIP. Furthermore, lower wages and fewer job alternatives in rural areas are also associated with higher risk of illness (Tian et al. 2015; J. Li and Rose 2017). Process inefficiencies in the classification and enrolment of indigent and sponsored members under the NHIP may also limit membership coverage in poorer provinces. In other LMICs, indigent members of the population may not be enrolled under the National Health Insurance Schemes if the applied criteria for classifying indigent members is not properly adjusted to the socioeconomic conditions of subpopulations that are being targeted (Kotoh and Van der Geest 2016) and the definition of eligible populations for different types of membership schemes is inconsistent between communities (Savadogo et al 2015).

The urban-rural disparity in membership coverage is concerning, given that OOP expenditures remain a major source of household health expenditure throughout the country (Higuchi 2010; G. Flores and O'Donnell 2016) and overall health expenditure is estimated to increase for the entire population in the upcoming years (Abrigo 2019). Coupled with findings from other countries that HCPs accredited under national insurance schemes are disproportionately located in urban areas (Adewole et al. 2022) and they do not cover the costs of all hospital services in rural areas (Xiong et al. 2018), there is a need to improve membership coverage to ensure equitable distribution of benefits to all Filipinos across provinces.

4.2. Facility coverage

Accessibility to healthcare was examined by analyzing trends in facility coverage to determine whether there are adequate number of accredited hospitals or beds available to meet the population's health needs.

Based on the DOH Administrative Order No. 2006-0004, the bed-to-population ratio must not exceed 1:1,000 before allowing additional beds to be put up in a particular province or region.[6] In 2021, the median available accredited hospital bed density for the Philippines was 0.735. (**Table 5**). A subgroup analysis by location reveals that there are differences between island groups, with NCR, Region III, and Region IV-a having the highest median hospital bed density, that is closer to the DOH bed-to-population ratio for allowing additional beds to be implemented, compared to the noticeably lower median bed densities in Luzon and Mindanao, revealing a pronounced need to prioritize availability of beds in provinces within island groups with low hospital bed density to meet health demands of the population.

Table 5. Median provincial hospital bed density by location, 2021

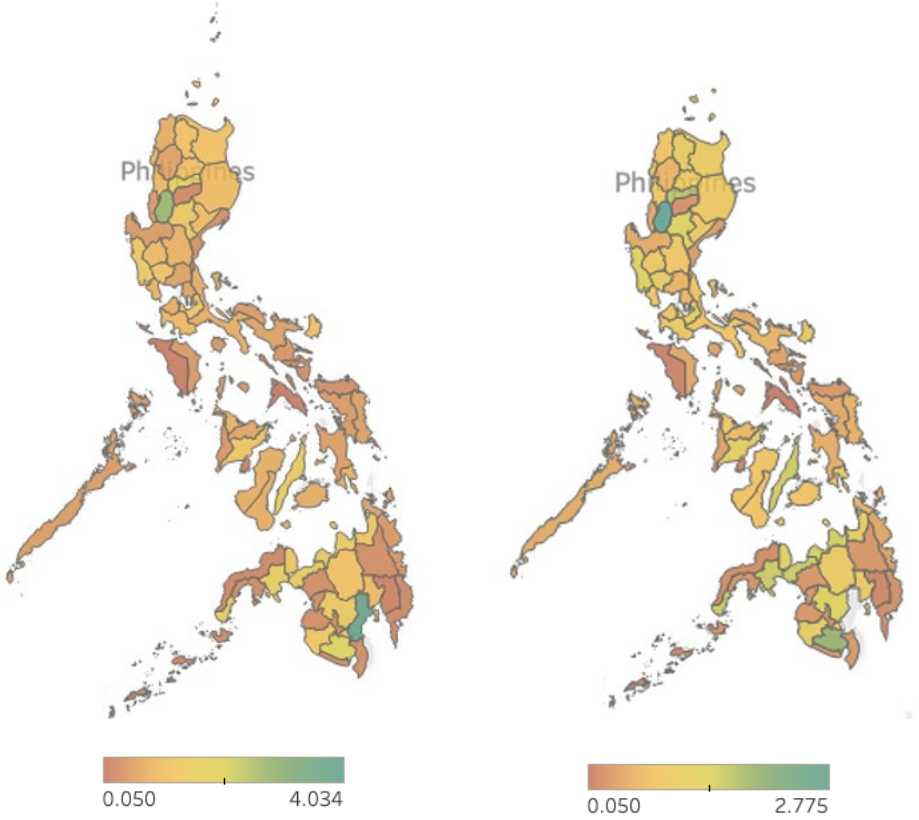
	All hospitals
Philippines	**0.735**
NCR, Reg III, Reg IV-a	0.813
Luzon	0.568
Visayas	0.728
Mindanao	0.555

Source: Authors' analysis of data on PhilHealth Accredited Facilities, DOH National Health Facility Registry, PSA 2020 Census on Population and Housing. This table only includes accredited beds in Levels 1 to 3 hospitals. The indicator was not computed for some provinces due to data unavailability or failed data merging (e.g. Dinagat Islands). Median was used due to the presence of outliers, such as Davao del Sur and Batanes being outliers with a hospital bed density of 3.854 and 4.034

The disparities in hospital bed density across regions and provinces reflect clear discrepancies in the accessibility and utilization of health services, with wide variability in hospital bed density across provinces (**Figure 7**).[7] The map indicates many provinces with hospital bed density values below 1 across the country, thus showing that the insufficiency of beds, relative to their population needs, is a widespread challenge in the country. Provinces with a density less than 0.5 per 1,000 population include Occidental Mindoro (0.096), Oriental Mindoro (0.464), Aurora (0.336), Ifugao (0.241), La Union (0.469), Pangasinan (0.485), Palawan (0.499), Romblon (0.428), and Marinduque (0.314) in Luzon, Samar (0.474), Northern Samar (0.29), Masbate (0.05), Antique (0.417), and Guimaras (0.133) in Visayas, and Tawi-Tawi (0.214), Sulu (0.25), Zamboanga del Norte (0.198), Zamboanga, Sibugay (0.262), Lanao del Sur (0.276), Maguindanao (0.29), Basilan (0.254) Sarangani (0.306), Davao de Oro (0.141), Davao Oriental (0.226), Sulu (0.15), Surigao del Sur (0.429), and Agusan del Sur (0.285) in Mindanao. Most of aforementioned provinces are located in Mindanao provinces, some of which were also identified to have populations that mostly consist of indirect contributors and have high poverty incidence. These provinces, therefore, require attention from PhilHealth to further increase the availability of accredited beds, alongside DOH projects to augment the availability of both hospitals and beds to the different subpopulations.

[6] AO-2006-0004.pdf (doh.gov.ph)
[7] Hospital bed density across provinces is computed as the number of PhilHealth accredited beds per 1,000 population for each province.

Figure 7. Hospital bed density by province, 2021



Sources: Authors' analysis of merged data on PhilHealth Accredited Facilities, DOH National Health Facility Registry, and PSA 2020 Census on Population and Housing. Notes: Red and orange-shaded areas represent provinces with hospital bed density less than 1, while the green-shaded areas are those values equal to or greater than 1. Grey-shaded areas indicate that data the indicator was not computed due to data unavailability or failed data merging (e.g. Dinagat Islands). Davao del Sur and Batanes were outliers that were excluded in the left map due to having a hospital bed density of 3.854 and 4.034, respectively; the legend and color scheme were adjusted to reflect this.

General hospitals are classified into three levels — Level 1 which offer minimum healthcare services, Level 2 that provide extra facilities like intensive care unit and specialist doctors, and Level 3 hospitals that have training programs for doctors, rehabilitation, and dialysis units, among others. Subgroup analysis of bed density by hospital ownership and level suggest that there are also inequities in access to health services across locations and hospital characteristics (**Table 6**). Median hospital bed density is higher for privately-owned Level 2 and 3 hospitals than government-owned hospitals. Between hospital ownership, median bed density is higher across all levels for NCR, Reg III, Reg IV-a, and Mindanao, as well as higher in private Level 2 and 3 hospitals in Luzon and Visayas. Within ownership across all island groups, median bed density among government-owned hospitals is highest in Level 1 hospitals, except for Mindanao, while median bed density is the lowest in Level 1 hospitals that are privately owned. In Mindanao, median hospital bed density is highest among Level 3 hospitals across ownership. These results are similar to findings in other LMICs that suggest that service availability and readiness is generally higher in private hospitals (O'Neill et al 2013). There is a need to improve the capacity of government hospitals beyond Level 1 and the accessibility of Level 1 private hospitals to ensure high availability and quality of services across ownership and level. This can be partially addressed through the provision of hospital beds and that contribute to service delivery capacity and lead to improvements in the quality of care (Dayrit et al. 2018).

Table 6. Median hospital bed density by hospital ownership and level, 2021

	Government			Private		
	Level 1	**Level 2**	**Level 3**	**Level 1**	**Level 2**	**Level 3**
Philippines	0.67	0.42	0.55	0.67	1.15	0.97
NCR, Reg III, Reg IV-a	0.66	0.25	0.27	0.78	1.33	0.34
Luzon	0.68	0.51	0.55	0.57	0.97	0.98
Visayas	0.69	0.49	0.54	0.25	0.90	0.96
Mindanao	0.45	0.35	1.01	0.83	2.07	1.10

Sources: Authors' analysis of merged data on PhilHealth Accredited Facilities, DOH National Health Facility Registry, and PSA 2020 Census on Population and Housing. Median was used due to the presence of outliers, such as Davao del Sur and Batanes being with a hospital bed density of 3.854 and 4.034.

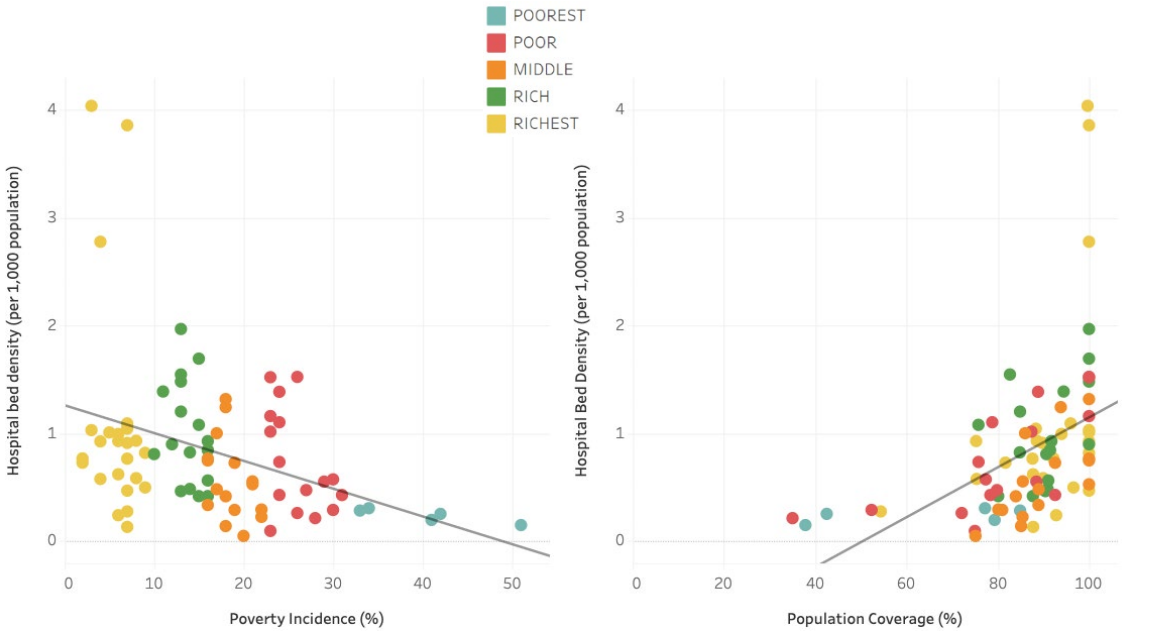
The scarcity of accredited beds across the country indicates disparities in hospital capacity that limits the availability and readiness of hospital services for subpopulations residing in these areas, which is most prominent in poorer provinces. The negative relation between provincial poverty incidence and hospital bed density (coefficient: -0.0257; R-squared: 0.1348; P-value: <0.001) emphasizes the lack of accredited beds in these poor areas (**Figure 8a**).

The goal of policymakers is to maximize service coverage across provinces, as represented by high population coverage and hospital bed density. There is a significant positive relation between population coverage and hospital bed density (coefficient: 0.023; R-squared: 0.2097; P-Value: <0.0001), suggesting that most focus is directed towards increasing hospital bed availability for provinces with 85 percent population coverage and above, regardless of poverty income cluster (**Figure 8b**). However, provinces with less than 85 percent population coverage tend to have lower hospital bed densities and can be considered as priority areas. For instance, Tawi-Tawi, which belongs to the poor poverty incidence cluster, has only 36 percent membership coverage and less than 1 hospital bed for every 1,000 population.

In terms of the distribution of accredited hospitals, **Figure 9** illustrates the variations across provinces. Since 2018, the total number of accredited hospitals has increased from 1,104 to 1,141; however, the total number of hospitals from 2020 decreased from 1,150 (**Table 7**). The share of hospitals by location has remained stable from 2018 to 2021, where a large number are in the NCR, Region III, Region IV-a, and Luzon. The share of accredited hospitals by ownership and level has also remained stable from 2018 to 2021. In 2021, there were a total of 1,141 accredited hospitals, of which 65 percent are privately owned. A subgroup analysis by hospital level shows that around 94 percent of accredited hospitals are categorized as Level 1 and 2 hospitals. However, the low share of Level 3 hospitals implies that only a limited number of beneficiaries, mostly those in richer provinces where said hospitals are more available, benefit from services offered by these specialty hospitals, while those in poor areas have no access to specialized services to handle critical cases, which somewhat places a higher burden on the Level 1 and 2 hospitals to provide effective primary care.

Figure 8. Equity analysis on hospital bed density, 2021

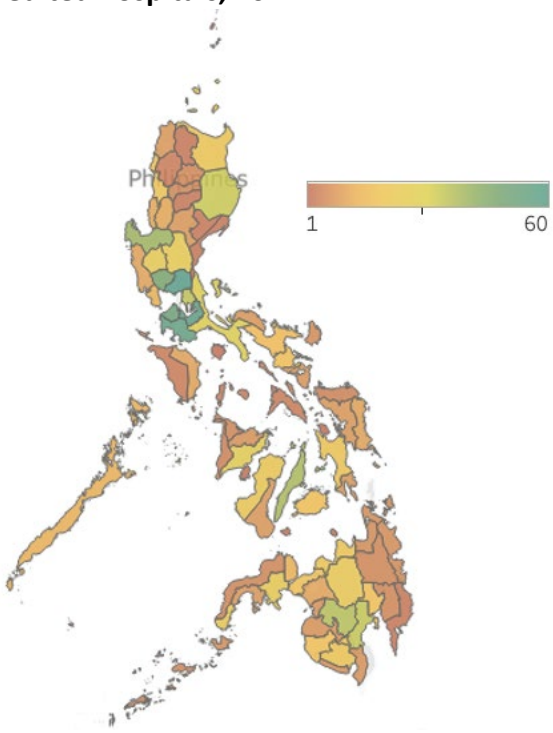
a. Relation with poverty incidence **b. Relation with population coverage**



Source: Authors' analysis of merged data on PhilHealth Accredited Facilities, DOH National Health Facility Registry, PSA Poverty Incidence Statistics.

The UHC law requires all provinces ensure that its population has access to Level 1 and Level 2 hospitals. As of 2021, all provinces were generally able to meet this requirement. Overall, around 43 percent of all Level 1 hospitals are publicly owned by the government; however, this proportion changes depending on the location – with Visayas having more than half of its Level 1 hospitals classified as publicly owned. As certain benefit packages are only made available in government-owned hospitals (Ulep, Uy, and Casas 2021), PhilHealth should endeavor to develop benefit packages responsive to the health needs of different subpopulations and available across hospital level and ownership, given that majority of accredited hospitals are privately-owned and private hospitals tend to have higher bed capacity.

Figure 9. Distribution of PHIC accredited hospitals, 2021



Source: Authors' analysis of merged data on PhilHealth Accredited Facilities

Our findings show marked disparities between provinces, based on poverty incidence, similar to findings in other countries that national health insurance coverage is limited in rural areas due to limited availability of services (Pratiwi et al. 2021) and having a lower proportion of accredited HCPs (Adewole et al. 2022). The limited number of accredited hospitals in the poorest provinces may also be an overall deficiency of hospitals since previous studies found that funds for health facility development are not necessarily allocated based on the needs of LGUs (Lavado et al. 2012) and or efficiency and equity of services for the target populations (L. J. Y. Flores et al. 2021; Lao, Paringit, and Roleda 2022). The lack of services and facilities covered by public health funds forces patients to spend on more expensive care and disproportionately reduces affordability of healthcare for lower income patients (Abiye, Tesfaye, and Hawaze 2013), warranting reforms to improve the methods to increase coverage of NHIP benefits by concurrently addressing gaps in membership and facility coverage.

Table 7. Summary statistics on PhilHealth accredited hospitals per location, ownership, and level (2018-2021)

			Government			Private			
		All	**Level 1**	**Level 2**	**Level 3**	**All**	**Level 1**	**Level 2**	**Level 3**
2018	Philippines	**385 (34.87%)**	**321 (29.08%)**	**37 (3.35%)**	**27 (2.45%)**	**719 (65.13%)**	**426 (38.59%)**	**260 (23.55%)**	**33 (2.99%)**
Total: 1104 (100%)	NCR, Reg III, Reg IVa	**107 (9.69%)**	94	6	7	**286 (25.91%)**	165	111	10
	Luzon	**110 (9.96%)**	91	12	7	**143 (12.95%)**	91	49	3
	Mindanao	**88 (7.97%)**	66	15	7	**196 (17.75%)**	129	62	5
	Visayas	**80 (7.25%)**	70	4	6	**94 (8.51%)**	41	38	15
2019	Philippines	**387 (34.34%)**	**323 (28.66%)**	**37 (3.28%)**	**27 (2.4%)**	**740 (65.66%)**	**437 (38.78%)**	**273 (24.22%)**	**30 (2.66%)**
Total: 1127 (100%)	NCR, Reg III, Reg IVa	**109 (9.67%)**	96	6	7	**294 (26.09%)**	167	118	9
	Luzon	**108 (9.58%)**	89	10	9	**150 (13.31%)**	96	51	3
	Mindanao	**91 (8.07%)**	70	16	5	**199 (17.66%)**	130	64	5
	Visayas	**79 (7.01%)**	68	5	6	**97 (8.61%)**	44	40	13
2020	Philippines	**394 (34.26%)**	**329 (28.61%)**	**36 (3.13%)**	**29 (2.52%)**	**756 (65.74%)**	**447 (38.87%)**	**277 (24.09%)**	**32 (2.78%)**
Total: 1150 (100%)	NCR, Reg III, Reg IVa	**112 (9.74%%)**	98	5	9	**299 (26%)**	168	122	9
	Luzon	**112 (9.74%)**	92	11	9	**149 (12.96%)**	95	51	3
	Mindanao	**90 (7.83%)**	70	15	5	**209 (18.17%)**	141	63	5
	Visayas	**80 (6.96%)**	69	5	6	**99 (8.61%)**	43	41	15
2021	Philippines	**395 (34.62%)**	**329 (28.83%)**	**37 (3.24%)**	**29 (2.54%)**	**746 (65.38%)**	**436 (38.21%)**	**277 (24.28%)**	**33 (2.89%)**
Total: 1141 (100%)	NCR, Reg III, Reg IVa	**113 (9.9%)**	100	5	8	**295 (25.85%)**	162	124	9
	Luzon	**110 (9.64%)**	89	12	9	**146 (12.8%)**	92	51	3
	Mindanao	**92 (8.06%)**	71	15	6	**208 (18.23%)**	141	62	5
	Visayas	**80 (7.01%)**	69	5	6	**97 (8.5%)**	41	40	16

Source: Authors' analysis of data on PhilHealth Accredited Facilities. Note: The table only reflect the number of Levels 1, 2, and 3 hospitals, and does not include other health facility types such as infirmaries, MCP providers, and others.

4.3. Service coverage

Trends in service coverage and utilization were identified to distinguish differences in demand and quality of services across time and different provinces throughout the Philippines.

In the Philippines, NCR, Region III, and Region IVa have the largest proportion of all claims out of all island groups (34.76), followed by Mindanao (31.47), Luzon (13.77), and Visayas (12.18) (**Table 8**). The most prevalent GBD group, both nationally and across island groups, is the infectious, maternal, neonatal, and nutritional diseases, consisting of around 57.47 percent of all claims, followed by NCDs, consisting of around 39.22 percent of all claims. Both groups combined account for 96.69 percent of claims filed during 2018 to 2020.

Table 8. Share to total admissions by island group and GBD grouping, 2018 to 2020

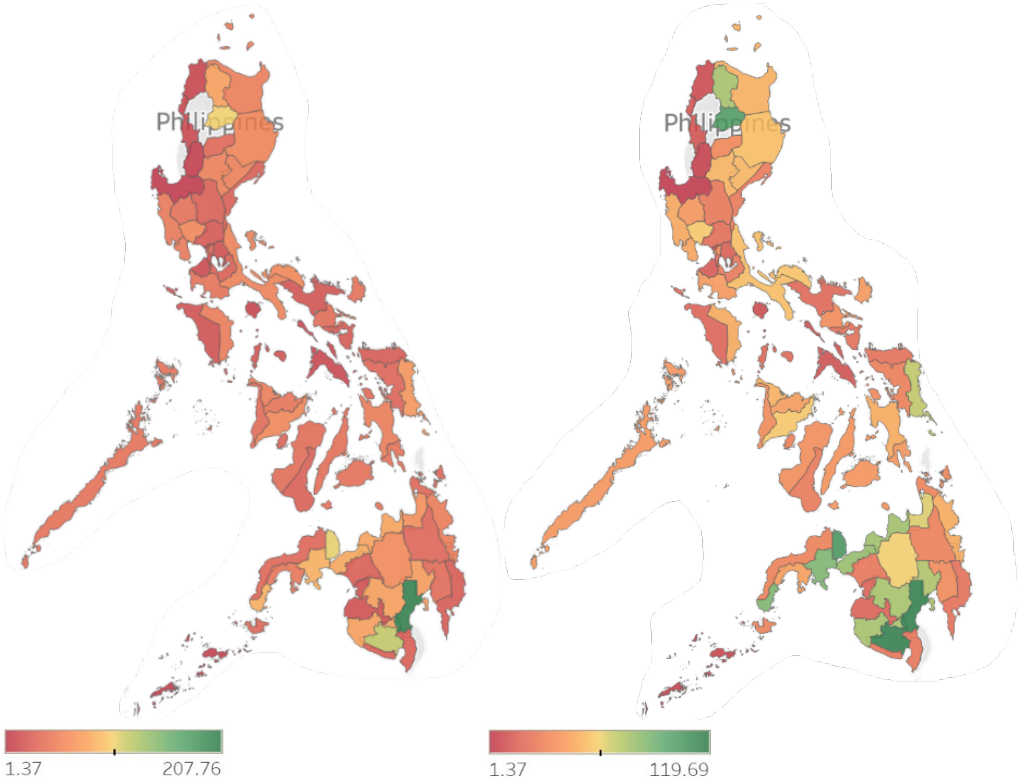
		Share to total number of Claims (%)
NCR, Reg III, Reg IVa	**All**	**34.76**
	Infectious, Maternal, Neonatal, and Nutritional	20.07
	NCDs	13.59
	Injuries	0.01
Luzon	**All**	**13.77**
	Infectious, Maternal, Neonatal, and Nutritional	7.64
	NCDs	5.6
	Injuries	0.05
Mindanao	**All**	**31.47**
	Infectious, Maternal, Neonatal, and Nutritional	17.58
	NCDs	12.85
	Injuries	1.05
Visayas	**All**	**20**
	Infectious, Maternal, Neonatal, and Nutritional	12.18
	NCDs	7.18
	Injuries	0.6

Source: Authors' analysis of 2018-2021 PhilHealth eClaims data

In **Figure 10**, the spatial map shows inequity in the distribution of admission rates across provinces. Though admission rates per 1,000 population vary greatly between provinces across regions, the largest cluster of provinces with admission rates above 60 per 1,000 population are in Mindanao, namely Agusan del Norte, Cotabato, South Cotabato, Davao del Sur, Davao del Norte, Misamis Occidental, Misamis Oriental, Lanao del Norte, Sultan Kudarat, and Zamboanga del Norte. Among the aforementioned provinces, Davao del Norte (207.76), South Cotabato (119.69), and Misamis Occidental (107.35) had the highest admission rates per 1,000 population in the Philippines. In other island groups, Eastern Samar (69.79) in Visayas, and Kalinga (104.5) and Apayao (76.87) in Luzon also had admission rates exceeding 60 per 1,000 population.

Greater admission rates in more economically developed provinces may be due to increased transmissibility of infectious diseases in more densely populated areas, as urbanization and higher population density are associated with increased transmission of infectious diseases (Alirol et al. 2011; Hu, Nigmatulina, and Eckhoff 2013; Boyce, Katz, and Standley 2019). Modernization and economic development is associated with increasing risk factors, such as unhealthy diets and less physical activity (Habib and Saha 2010), and risk factors for NCDs are more prevalent in wealthier populations (Subramanian et al. 2013; Yin et al. 2017), which may also explain higher admission rates for NCDs in more economically developed areas. Certain injuries may also be more prevalent in urban populations, including transportation-related injuries and falls (Moshiro et al. 2005; Kobusingye, Guwatudde, and Lett 2001) but rural residents may also have a higher risk of injury-related mortality due to less accessibility of emergency services (Khorashadi et al. 2005; Y. Li et al. 2020). However, due to areas also having greater population density, the rate of admissions per 1,000 population may also be less, in comparison to other provinces with smaller populations but high admission rates.

Figure 10. Admission rates (per 1,000 population) in each province



Sources: Authors' analysis of merged data on PhilHealth eClaims and PSA 2020 Census on Population and Housing. Notes: Red and orange-shaded areas represent provinces with lower admission rates while the green-shaded areas are those values equal to or greater admission rates. Grey-shaded areas indicate that data the indicator was not computed due to data unavailability or failed data merging (e.g. Dinagat Islands). Davao del Sur was an outlier with admission rate of 207.76 per 1,000 population; legend and color scheme were adjusted to reflect this.

Admission rates and proxy measures of burden of disease were also observed to be high in provinces that can be considered less economically developed, particularly the provinces in Mindanao. The high admission rates, both in terms of raw claims count and admission rates, may be due to the lack of accessible healthcare affecting service utilization and filed claims for diseases across groups. Low availability of facilities other than hospitals forces the subpopulations to utilize services in hospitals, causing a rise in admission rates that may avoid

hospitalization through effective primary health care (PHC), even in poorer provinces (Ulep, Uy, and Casas 2020). Even if facilities and services are available and hospital bed density is high in some provinces that are less economically developed, low affordability and geographic accessibility of services may also force patients to forego seeking services altogether (Gao and Kelley 2019), suggesting that a reduction in claims amount does not necessarily mean that the health needs of the population are being met through effective and efficient service coverage (Uy et al. 2021; Ulep, Uy, and Casas 2020).

Subgroup analysis by membership category show that 57.1 percent of all claims were availed for indirect contributors, the majority across facilities (**Table 9**). Among indirect contributors, indigent members had the largest share of claims (25.74 percent). As indirect contributors consist of members that rely on government funding to finance their membership in the NHIP, this suggests that majority of national health insurance claims are directed towards members identified to be part of at-risk subpopulations. However, there are large differences between different membership subcategories for both direct and indirect contributors. The elderly members from both contributor categories, represented by Lifetime members and Senior Citizen, have the smallest shares out of all member subcategories. As both NCD incidence and healthcare expenditure is projected to increase for the elderly population and the poor and elderly experience greater unmet health needs and financial burden from healthcare costs in the Philippines (Abrigo 2019; Carandang et al 2019), this suggests that elderly members may utilize care less than other membership subcategories due to low affordability and higher proportion of hospital charges not covered by the national health insurance.

Table 9. Share of claims (%) by membership categories, hospital ownership, and hospital level, 2018 to 2020

	All Facilities	Government			Private		
		Level 1	Level 2	Level 3	Level 1	Level 2	Level 3
Direct Contributors	42.9	23.5	23.1	30.5	48.4	66.3	74
Formal	24.03	10.83	9.75	14.35	27.39	40.14	50.93
Informal	15.53	11.61	12.14	14.36	17.26	20.02	18.5
Lifetime	3.34	1.11	1.22	1.82	3.75	6.15	7.54
Indirect Contributors	57.1	76.5	76.9	69.5	51.6	33.7	23
Indigent	25.74	37.86	40.38	24	27.35	11.73	4.24
Senior Citizen	15.62	13.02	11	12.44	19.37	18.9	17.14
Sponsored	15.74	25.58	25.5	33.02	4.88	3.05	1.65

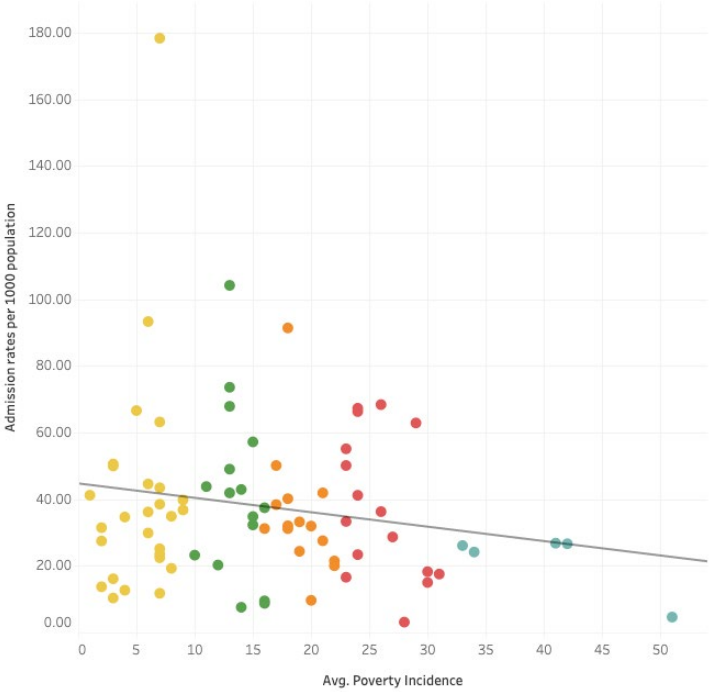
Source: Authors' analysis of 2018-2020 PhilHealth eClaims.

Further subgroup analyses by hospital ownership and level shows that a larger proportion of claims in government hospitals was availed by indirect contributors, while a larger proportion of claims in private hospitals was availed by direct contributors. consistent with findings across LMICS that private-owned facilities tend to have better availability and readiness (O'Neill et al. 2013). This finding is concerning, given the previous finding that most hospitals are

government-owned in poorer provinces. Furthermore, Ulep, Uy, and Casas (2021) found that the patients in richer wealth quintiles tend to utilize services in private hospitals. Higher income is associated with increased risk factors and prevalence for NCDs, although NCD-related mortality is higher among subpopulations with lower socioeconomic status (Subramanian et al. 2013; Yin et al. 2017), suggesting the greater share of NCD admissions may be due to the tendency of richer patients to utilize services of private hospitals. This is also supported by the finding that the share of claims for direct contributors rises alongside hospital level, while share for indirect contributors decreases as level rises. The trend of decreasing proportion of claims from indirect contributors may be due to lower affordability of specialized services provided at tertiary hospitals, as studies in other countries have found that national health insurance does not cover costs of all services from said hospitals (Xiong et al 2018).

When analyzing admission rates per 1,000 population alongside provincial poverty incidence, there is an inverse relation between provincial poverty incidence and admission rates per 1,000 population (coefficient: -0.4327; R-squared: 0.0295; P-value: 0.12) (**Figure 11**). Though the relationship is not significant, the direction of the relationship indicates that as poverty incidence increases, admission rates decrease. This trend may be due in part to this study and previous study findings of inequities in the accessibility of facilities in provinces with higher poverty incidence.

Figure 11. Equity analysis for admission rates



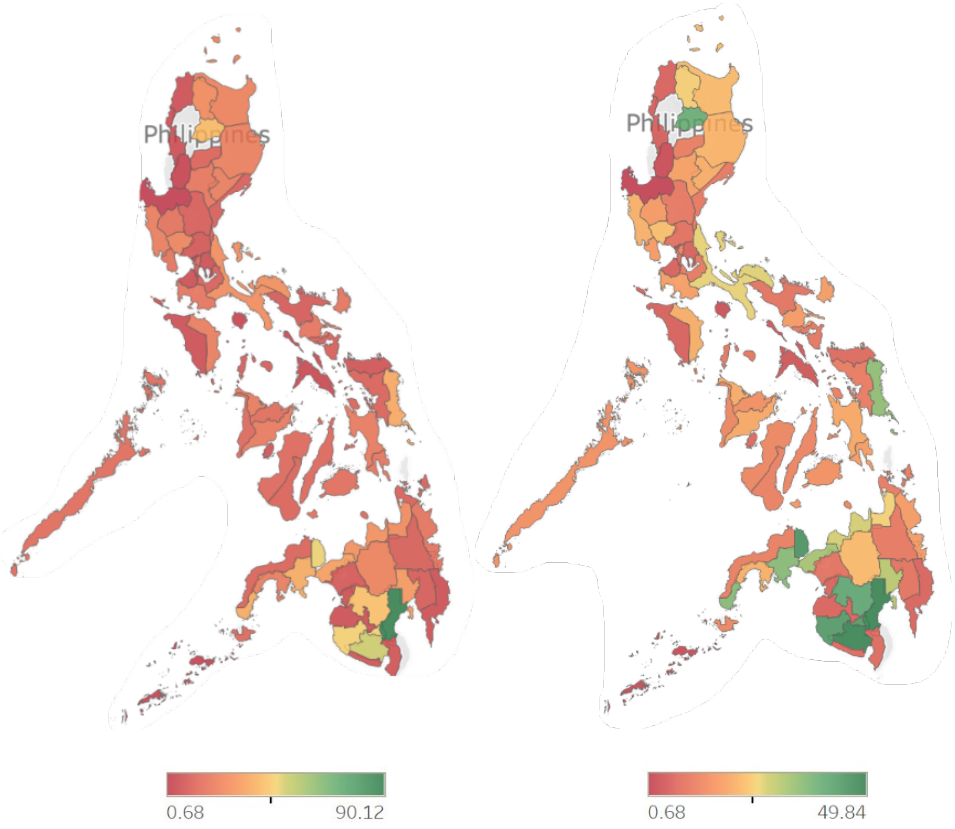
Source: Authors' analysis of merged data on PhilHealth eClaims data and PSA Poverty Incidence Statistics.

Government facility and service augmentation projects are not always allocated, based on the poverty incidence of provinces and municipalities (Lavado et al 2012) and there are large disparities between LGUs in terms of available human resource for health (HRH), facilities, and funds for providing primary care (Ulep, Uy, and Casas 2022). In the Philippines, population members from poor households are less likely to seek care due to the lack of perceived need to seek care, availability of high-quality services, and funding to pay for healthcare costs (Carandang et al 2019; Luu et al 2022). Barriers in the availability, accessibility, and affordability of services, in consideration to variations between members,

hospitals, and provinces must be addressed to ensure that target populations are being covered by essential healthcare services.

As NCDs can exert an enormous burden on the health systems of countries (World Health Organization 1999) and are expensive to treat (Subramanian et al 2018), admission rates for NCDs were further analyzed by province. A map of NCD admission rates per 1,000 population shows a similar trend to overall admission rates, with the largest cluster of NCD admission rates per 1,000 population in provinces in Mindanao (**Figure 12**). In addition to these provinces, Quezon (26.05) and Camarines Norte (26.51) in Luzon also had NCD admission rates higher than 25 per 1,000 population. High admission rates per 1,000 population across provinces in different regions and of different socioeconomic conditions suggests that NCDs is pervasive throughout the country. This could be due to common risk factors for NCDs across different subpopulations in the country, such as tobacco use, harmful alcohol consumption, excess weight, high blood pressure, and elevated blood glucose and cholesterol levels (Ezzati and Riboli 2013).

Figure 12. Admission rates for NCDs (per 1,000 population) in each province



Sources: Authors' analysis of merged data on PhilHealth eClaims, GBD disease groups, and PSA 2020 Census on Population and Housing. Notes: Davao del Sur was an outlier with admission rate of 90.12 per 1,000 population; legend and color scheme were adjusted to reflect this (map on the right).

Sustainable Development Goal 3.4 sets the global public health goal of reducing premature mortality due to NCDs among people aged 70 years old and younger by one third between 2015 and 2030 (Adair 2018). To achieve this goal, strong PHC is imperative to prevent and manage NCDs before the development of any further complications (World Health Organization 2011; Demaio et al. 2014) for age groups younger than the elderly. A subgroup

analysis of admission rates by different life stage groups reveals that adults aged 20-59 years old had the highest admission rates per 1,000 population and share of NCD claims, followed by the elderly aged 60 years and above, children and adolescents aged 5-19 years, and children aged 4 years and below (**Table 10**). This finding is of great concern, as the higher demand for NCD admissions amongst young and middle-aged adults may suggest that there are challenges that hinder the effectiveness and efficiency of approaches to prevent early onset of NCDs and improve access to NCD services for the elderly in the country, also taken in consideration with the previous finding that Lifetime and Senior Citizen members have the lowest shares of claims. This is supported by previous studies in the Philippines suggesting the lack of available, accessible, affordable, and high-quality primary health care for NCDs (Ulep, Uy, and Casas 2021; Higuchi 2009). Extensive health system reforms are required to strengthen PHC to address the burden of NCDs on populations younger than 60 years old.

Table 10. Admission rate and share to total admissions for NCDs by age group, 2018 to 2020

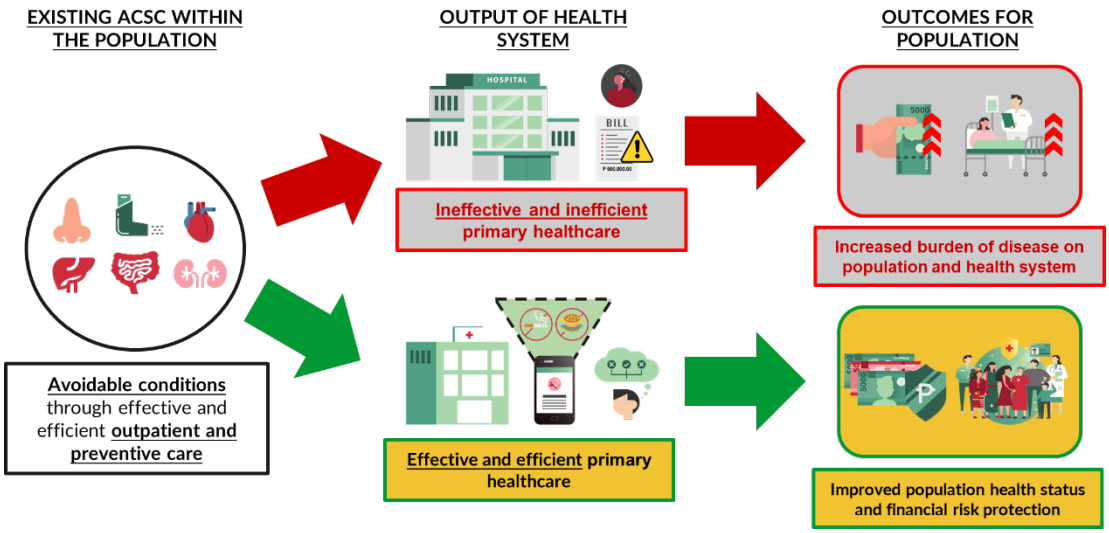
	Admission rate (per 1,000)	Share to Total Number of Claims (%)
0-4 years	4.43	10.87
5-19 years	4.94	12.12
20-59 years	16.72	41.03
60 years and above	14.66	35.98

Source: Authors' analysis of 2018-2020 PhilHealth eClaims data

Ambulatory-care sensitive conditions

Ambulatory-care sensitive conditions (ACSC) are conditions that, in theory, do not need hospital admissions if primary health care is effective in prevention and early management of diseases before they become more complicated or grow in severity (Billings et al. 1993). If PHC is effective, hospital admission rates for low risk and uncomplicated ACSC should shift demand for healthcare to outpatient and preventive services as high hospital admissions may indicate ineffective and inefficient PHC (Purdy et al. 2009). It is desirable to reduce ACSC admission rates since hospitalizations are more expensive, both directly (actual cost of services) and indirectly (loss of income due to hospitalization, travel costs) for both patients and health systems and reducing admissions leads to greater cost savings from avoided inpatient admissions (Galarraga, Mutter, and Pines 2015; Dimitrovová et al. 2017) (**Figure 13**).

Figure 13. Ambulatory-care sensitive conditions and Health Systems



Source: Created by authors.

ACSCs include (1) respiratory conditions such as asthma, chronic obstructive pulmonary disease and pneumonia; (2) maternal and child health conditions such as nutritional deficiencies, gastroenteritis, and urinary tract infection; (3) noncommunicable diseases such as hypertension, and diabetes mellitus; and (4) vaccine-preventable diseases, including influenza and measles.

When analyzing admission rates by ACSC and non-ACSC, about 33 percent of admission rates are considered ACSC, meaning that this percentage is considered avoidable if PHC in the country was effective and efficient (**Table 11**).

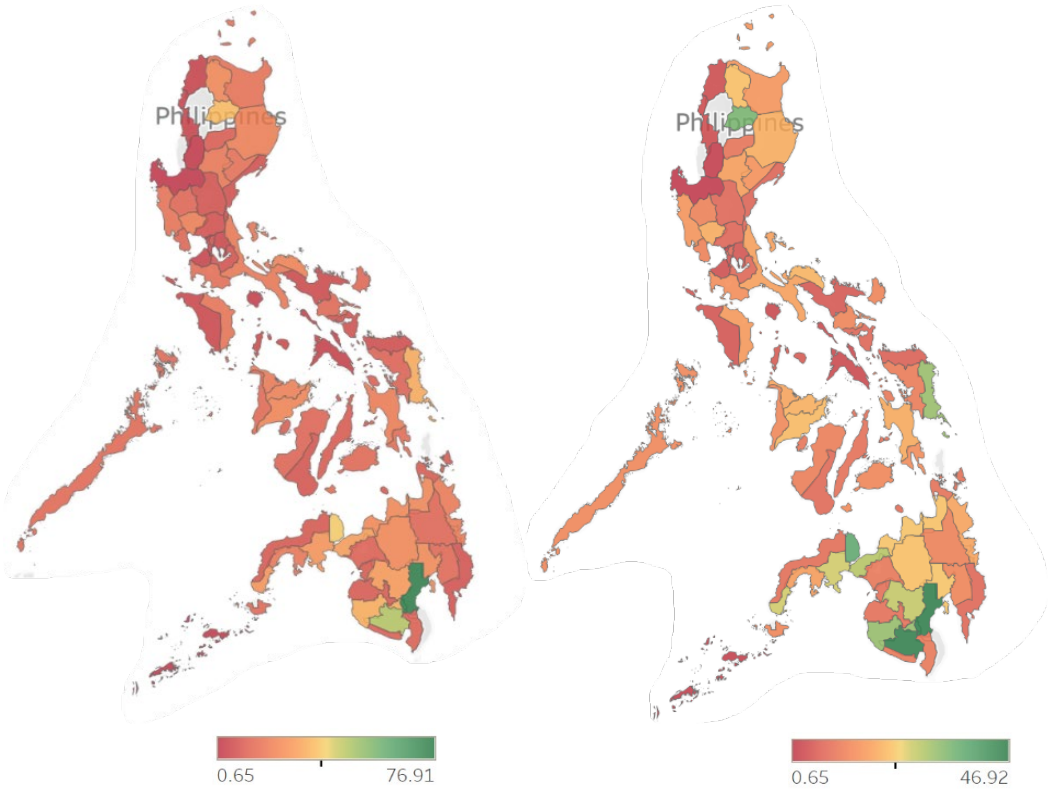
Table 11. Average number of ACSC claims and share to total admissions, 2018 to 2020

	Average Number of Claims	Share to Total Number of Claims (%)
ACSC	2,712,008	33.61
Non - ACSC	5,357,790	66.39

Source: Authors' analysis of 2018-2021 PhilHealth eClaims data

The spatial map of ACSC admission rates per 1,000 population indicates that the provinces with highest admission rates, with rates higher than 25 per 1,000 population, are in Mindanao, particularly the provinces Cotabato, South Cotabato, Davao del Sur, Lanao del Norte, Misamis Occidental, Sultan Kudarat, and Zamboanga del Sur (**Figure 14**). Additionally, Eastern Samar in Visayas (31.26) and Kalinga in Luzon (34.67) had ACSC admission rates higher than 25 per 1,000 population.

Figure 14. Admission rates for ACSCs (per 1,000 population) in each province



Sources: Authors' analysis of merged data on PhilHealth eClaims and PSA 2020 Census on Population and Housing. Notes: Davao del Sur was an outlier with admission rate of 76.91 per 1,000 population; legend and color scheme were adjusted to reflect this.

The greater admission rates in the aforementioned provinces may be due to hospitals being more accessible than primary health care providers in these provinces, leading to greater demand for hospital services, even if hospitalizations for ACSC are theoretically avoidable. In the Philippines, both longer travel time to HCPs and socioeconomic status are associated with higher risk of disease (Leining et al. 2020). Lack of accessible infrastructure and services in the country leads to unmet health needs and an increased financial burden for vulnerable populations, such as the poor elderly and women. (Carandang et al. 2019; Luu et al. 2022). Coupled with the maldistribution of primary care facilities prevalent throughout the country (Ulep, Uy, and Casas 2020; L. J. Y. Flores et al. 2021), this may lead to an increased demand for hospital services among subpopulations in poorer provinces.

However, since claims are not completely reflective of population health needs (e.g. Ulep et al 2021), it is also possible that low ACSC admissions rates may not be due to increased accessibility or quality of PHC, since lack of availability and affordability of services in provinces may also lead to patients forgoing care altogether and lower admission rates. Similar studies on ACSC admission rates in other countries found that both low socioeconomic status of patients and accessibility of healthcare providers are significant predictors of admission rates for ACSC (Magalhães and Morais Neto 2017; Huang, Meyer, and Jin 2018; Wallar, De Prophetis, and Rosella 2020). Based on findings from the current study and previous studies, issues in the availability, quality, and equity of PHC must be addressed in provinces that have a high proportion of at-risk subpopulations to reduce the risk of adverse health outcomes and costs attributable to ACSC.

Table 12. Admission rate and share to total admissions for ACSCs by age group and sex, 2018 to 2020

		Admission rate (per 1,000)	Share to Total Number of Claims (%)
0-4 years	**All**	**9.54**	**29.17**
	Female	4.34	13.27
	Male	5.2	15.9
5-19 years	**All**	**4.48**	**13.68**
	Female	2.34	7.15
	Male	2.14	6.53
20-59 years	**All**	**8.74**	**26.7**
	Female	5.05	15.43
	Male	3.69	11.27
60 years and above	**All**	**9.96**	**30.45**
	Female	5.8	17.73
	Male	4.16	12.72

Source: Authors' analysis of 2018-2020 PhilHealth eClaims data

When analyzing ACSC admission rates and share of claims by age group, the top three admission rates and share of claims are for the females aged 60 years and above (admission rate: 5.8; Share of claims: 17.73), followed by males aged below 4 years (admission rate: 5.2; Share of claims: 15.9), and females aged 20-59 years (admission rate: 5.05; Share of claims: 15.43) (**Table 12**). ACSC admission rates and share of claims were higher for females aged 5 years and older. The current results are similar to findings in other countries that ACSC admission rates are highest for children under the age of 10 years and the elderly older than 60 years, with infectious ACSC being more prevalent in children and noncommunicable ACSC in the elderly (Magalhães and Morais Neto 2017; Santos et al 2022), and higher for female populations (Souza and Peixoto 2017). Policies and investments aiming to reduce ACSC admissions and increase the accessibility of PHC should be sensitive to the higher vulnerability of women, children, and the elderly among the population to ACSC to maximize effectiveness, efficiency, and equity of reforms.

4.4. Financial risk protection

For the entire Philippine population, the average support value is 55.83 percent. Although majority of charges are covered on average, the NHIP does not cover more than a 40 percent of charges for hospital services, suggesting that OOP and other sources of expenditure are required to pay for hospital charges. Furthermore, huge disparities are observed when disaggregating support value by member type (**Table 13**). Average support value is highest for provinces within Visayas, followed by Luzon, Mindanao, and the NCR, Region III, and Region IVa group (**Table 13**).

Table 13. Average support value by location, 2018 to 2021

	Average support value (%)
Philippines	55.83
NCR, Reg III, Reg IVa	50.17
Luzon	58.63
Visayas	59.7
Mindanao	54.8

Source: Authors' analysis of 2018-2021 PhilHealth eClaims.

On average, indirect contributors have lower support value than direct contributors (**Table 14**). This could partially be due to indirect contributors having a greater share of claims and admission rates influencing the support value of claims, especially when a large amount of admissions for NCDs occur in provinces that consist mostly of indirect contributors. However, there is less variation in support value across subcategories for indirect contributors, suggesting that the NHIP provides more consistent coverage of at-risk subpopulations. This could partially be due to certain benefit packages, such as the Primary Care Benefit (PCB) package being offered only to indigent and sponsored beneficiaries (Ulep et al 2021). However, subgroup analysis reveals more apparent differences between membership subcategories. Elderly members, represented by lifetime direct contributors and senior citizen members in the indirect contributor category, have the lowest support value. This is concerning, given that the Philippine population is aging, and that the elderly tend to have less income than other age groups and are more vulnerable to chronic NCDs. Alongside the current study finding that elderly members have the lowest share of claims and findings from other studies in the country that the elderly have the largest health expenses out of all age groups that is projected to increase alongside growing incidence of NCDs (Abrigo 2019) and that poor and elderly experience greater unmet health needs and financial burden from healthcare costs (Carandang et al 2019), this suggests that support value for elderly subpopulations throughout the country must be improved through realignment of pooling and purchasing functions of national health insurance.

Subgroup analyses by hospital ownership and level reveal that the average support value is lower for all members receiving health services in Level 3 hospitals relative to other hospital levels; with higher financial risk for those seeking care in private-owned hospitals than government-owned facilities (**Table 14**). For all member categories, less than 45 percent of hospital charges are covered in private hospitals that are Level 3. These results are similar to findings in other countries that national health insurance tends to have lower coverage of costs incurred in tertiary hospitals due to not covering all specialized services (Xiong et al 2018) and patient costs being higher in private than public-owned hospitals, due to varying levels of mark-ups in charges (Subramanian et al. 2013).

Table 14. Average support value (%) by membership categories, hospital ownership, and hospital level, 2018 to 2021

	Government				Private			
	All	**Level 1**	**Level 2**	**Level 3**	**All**	**Level 1**	**Level 2**	**Level 3**
Direct Contributors	**66.41**	72.38	65.99	60.84	**44.45**	53.57	42.77	37.02
Formal	**69.35**	74.72	70.06	63.27	**45.56**	54.73	43.41	38.55
Informal	**67.25**	73.72	66.99	61.05	**47.11**	56.1	45.86	39.37
Lifetime	**62.61**	68.71	60.93	58.2	**40.69**	49.89	39.03	33.15
Indirect Contributors	**64.53**	64.69	64.69	64.21	**49.54**	69.68	56.55	43.35
Indigent	**65.59**	65.55	65.55	65.66	**56.53**	69.68	56.55	43.35
Senior Citizen	**63.12**	63.8	63.8	61.77	**41.84**	52.45	39.85	33.23
Sponsored	**64.87**	64.71	64.71	65.19	**50.24**	61.97	48.09	40.67

Source: Authors' analysis of 2018-2021 PhilHealth eClaims.

Furthermore, support value is also shown to vary between types of patient accommodation across ownership. On average, patients who are admitted in private rooms have less support value than those admitted to wards (**Table 15**). This is due to private rooms being more expensive than wards. Given that private accommodation allow for more controlled patient care environments (Van Enk, Richard, and Steinberg 2011) and better outcomes for certain types of care, such as maternal and neonatal care (Domanico et al 2011), affordability of private accommodation for special or intensive cases should be improved, while also enhancing the effectiveness and efficiency of care provided in wards should also be improved to reduce cost of resource utilization and patient charges for less complicated cases.

Table 15. Average support value (%) by location, hospital ownership, and patient accommodation, 2018 to 2021

	Government		Private	
	Private Room	**Ward**	**Private Room**	**Ward**
Philippines	60.93	70.46	46.69	58.43
NCR, Reg III, Reg IVa	60.69	73.77	39.35	44.8
Luzon	60.76	74.5	48.94	62.81
Visayas	58.8	62.7	55.42	69.27
Mindanao	63.45	70.87	43.06	56.82

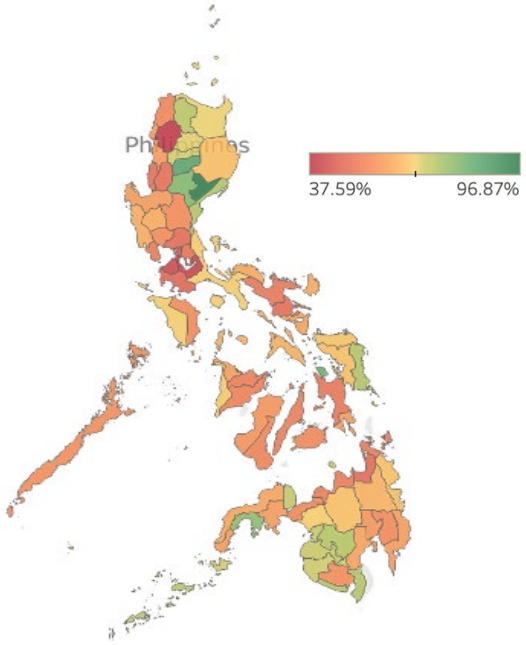
Source: Authors' analysis of 2018-2021 PhilHealth eClaims.

Trends at the national and island group level also mask disparities between provinces. Majority of provinces in the country have less than 70 percent average support value, suggesting large variation across provinces in different regions (**Figure 15**). Support value is lower than 55 percent in provinces that consist mostly of indirect contributors, such as Lanao del Norte (54.11

%), Misamis Oriental (51.42 %), Agusan del Norte (47.11%), Surigao del Norte (51.05%) in Mindanao, Bohol (54.02 %) and Leyte (50.29 %) in Visayas, and Camarines Sur (50.58 %) and Albay (48.24 %) in Luzon, suggesting that financial risk is higher in these provinces due to majority of the population having less income to pay for healthcare. However, the average support value is even low in certain higher-income provinces where hospitals are more accessible, such as NCR, Batangas, Laguna, and Cavite. Facilities may be accessible to most of the population in an area, but service coverage may be limited by the costs of services (Lawal and Anyiam 2019). Facilities tend to be less available in rural areas but more expensive in urban areas (Y. Li et al. 2020). Furthermore, national health insurance usually does not cover the costs of all services in tertiary hospitals (Xiong et al 2019), increasing the financial risk of populations who utilize services at these facilities. Low support value in richer provinces suggests that services are less affordable due to patient costs not being sufficiently covered by the NHIP benefits.

The data also shows that multiple provinces with low overall admission rates per 1,000 population have support values below 50 percent, such as the districts in NCR (38-43%), Batangas (46.23%), Laguna (39.83%), Cavite (40.92%), Rizal (49.22%), Bulacan (48.14%), Abra (37.59%), Benguet (48.39%), La Union (48.75%), and Albay (48.24%). This suggests that low admission rates may also be influenced by low financial coverage and reliance on OOP expenditure and other sources of financing to pay for healthcare. This is supported by findings across LMICs that both direct (services feeds, drugs, other supplies), and indirect costs (transport, loss of income due to sickness) are perceived as expensive and discourage utilization of services, with tertiary hospitals often deferred by poorer populations (Grimes et al. 2011), even when they are aware of the health risks of foregoing care (Luong et al. 2007; Waiswa et al. 2008; Shafiq, Shaikh, and Kumar 2011). National health insurance coverage is limited by the services and HCPs available in different locations and lack of availability can exacerbate the financial burden of patients (Pratiwi et al. 2021; Adewole et al. 2022). Low admission rates, paired with low support value suggest that there are unmet health needs within the population due to the low accessibility of services.

Figure 15. Average support value by province, 2018 to 2021



Source: Authors' analysis of 2018-2021 PhilHealth eClaims data.

In countries where OOP spending is a major source of household health expenditure, the risk of catastrophic expenditure is greater for populations with less income and financial resources, such as rural, elderly, and female populations (Goudge et al. 2009; Tibebe et al. 2012; Long et al. 2013; Y. Li et al. 2020). In the Philippines, the burden of healthcare costs varies across age, sex, location, and socioeconomic status, with the financial risk being greater for the elderly, women, rural, and poorer subpopulations (Carandang et al. 2019; Luu et al. 2022), emphasizing the importance of social determinants when analyzing support value and in ensuring equitable resource distribution.

Variations in support value for diseases with the highest claims amount are also observed (**Table 16**). Majority of diseases on the top 15 list are infectious, maternal, neonatal, and nutritional diseases, with only three diseases in the NCD group. However, the average support value of the two groups is similar among the diseases in the list. This is due in part to the variability in support value between diseases, even in the same GBD group with commonly associated causes and risk factors. For example, the support value for stroke, the disease with the fifth highest total claims amount, has a support value of 53.52 percent but the support value for other NCDs, including primary hypertension, chronic kidney disease, ischemic heart disease, asthma, diabetes mellitus, and other cardiovascular and circulatory diseases is below 50 percent, even if all are considered NCDs and some have common risk factors (Adisasmito et al 2020). It is concerning that fourteen of the fifteen diseases with the highest claims amount, on average, covered less than 50 percent of total hospital charges, suggesting that majority of hospital charges for diseases are still financed by OOP expenditure across diseases, even when said diseases have the highest reimbursement amounts. These results are in line with a recent study that suggests that OOP expenses are a major source of primary health care expenditure, given that majority of diseases with the highest total claims amount are preventable and manageable at the primary health care level (Ulep et al 2021).

The large variation in support value across diseases and the considerable portion of charges that are not covered by the NHIP across diseases suggests the need for a strategic shift in the purchasing of services and reassessment of revenue generation functions to ensure that there are enough funds to reimburse all diseases that PhilHealth offers benefit packages for. The development and adoption of provider payment methods that incentivize increased accessibility and ensure the quality of services most needed by different subpopulations are required. The transition to case-based methods, such as diagnosis-related groups (DRGs), which group all patient costs into clinically meaningful and economically homogeneous groups may assist in reducing gaps in support value between different diseases by (1) standardizing payments for different diseases across hospitals, (2) encouraging efficient utilization of resources through limiting unnecessary services and length of stay, and (3) improving quality of care through thorough assessment of care processes and complications for patients within groups (Busse et al. 2013; Chiang, Chu, and Romeis 2015).

Table 16. Adjusted claims amount, claims charge, and average support value for top 15 GBD sub-groups in claims amount, 2018 - 2021

	Total adjusted claims amount (billion PHP)	Total adjusted claims charge (billion PHP)	Average support value (%)
Lower respiratory tract infection	21.8	44.54	48.93
Maternal and child care	7.57	16.96	44.63
Dengue	7.34	16.2	45.32
Neonatal disorders	6.68	14.61	45.73
Stroke*	6.33	11.83	53.52
Urinary diseases and male infertility	5.82	14.2	41
Diarrheal diseases	5.6	9.88	43.57
Primary hypertension*	5.05	9.08	43.28
Chronic kidney disease*	3.74	8.27	39.61
Upper digestive system disorders	3.07	7.22	42.58
Ischemic heart disease*	2.65	7.03	37.73
Asthma*	2.41	5.22	46.05
Other cardiovascular and circulatory diseases*	2.16	5.32	40.54
Diabetes Mellitus*	1.83	5.01	36.5
Maternal disorders	1.71	4.02	42.5

Source: Authors' analysis of 2018-2021 PhilHealth eClaims data. Note: Diseases marked in * are classified as a noncommunicable disesase (NCD). All claims for each GBD sub-group with support value above 100% were excluded.

5. Conclusion and policy recommendations

The trends presented in this study elucidated challenges that the Philippine health system is currently facing as evidenced by the clear disparities in (1) population coverage, (2) facility coverage, (3) service coverage, and (4) financial protection across different subpopulations. Despite modest improvements in health outcomes, inequities continue to exist due to unresolved challenges in access to healthcare. This includes the physical constraints due to lack of health facilities, along with the financial risks of catastrophic health expenses especially for vulnerable populations. Another possible source of the observed disparities could be demand related. In other words, there may be differences across different subpopulations in terms of awareness or knowledgeable of the health services being offered within their area. Based on the Tanahashi (1978) framework, the inequities observed in availability and accessibility are expected to affect how the issues identified in service coverage and financial risk protection are addressed.

This study demonstrates the value of using spatiotemporal analysis in identifying disparities in accessibility and service coverage. For instance, maximizing information on geolocation allowed us to produce more location-specific insights at the provincial level, thereby providing increased precision in terms of creating distinct, targeted policies on health service coverage. With the inclusion of the geographic dimension in the analysis, the study was able to go beyond the usual descriptive analysis (e.g. by membership category, facility characteristics, disease groups). Analyses by geographic location that considers different social determinants of health and datasets should be standardized by policy makers to ensure accurate, responsive, and nuanced assessments of both national and local health systems towards UHC. These include the implementation of PSA PSGC codes across datasets to standardize geographic data being referenced. Setting data encoding and validation measures for healthcare institution codes, membership IDs, sex, and age would reduce the risk of invalid or null data entries for required data for subgroup analyses and would allow for direct comparison of these factors across different datasets. Leveraging the databases from other NGAs for key public programs, such as the PSA Philippine Identification System (PhilSys), DOH Health Facilities and Services Regulation program, and DOH Medical Assistance Program (MAP) and harmonizing data standards used across all programs will allow for clear and quick merging of datasets to enable more comprehensive, higher quality, and holistic monitoring and evaluation of health reforms of population, health facility data, and financial management data.

Improving administrative process for membership enrollment, especially for priority areas in Mindanao can help PhilHealth update its registered beneficiaries database, allowing for better monitoring of its performance in terms of population coverage. There may be process inefficiencies in the classification and enrolment of indigent and sponsored members under the NHIP that limit membership coverage, even when annual subsidies for said subpopulations are increasing (Kimwell et al 2022). It is imperative for PhilHealth, in collaboration with other government agencies, to ensure the accuracy, validity, and consistency of data on indigents at both national and sub-national levels to improve equity of healthcare throughout the country. For example, provinces in Mindanao with lower membership (Maguindanao, Lanao del Sur, Basilan, Sulu and Tawi-Tawi) may have lower membership rates due to enrolment not being adjusted to the socioeconomic conditions of the aforementioned provinces.

In areas with low hospital bed density and high general admission rates, such as Zamboanga del Norte, and ACSC admission rates, such as Eastern Samar, it is important to increase accessibility of primary care services, as the low accessibility of hospitals necessitates increasing population covered by essential services outside of hospitals for the detection and management of diseases. For provinces with high admission rates and greater hospital bed density, but low support value, such as Agusan del Norte, Cotabato, South Cotabato, Davao del Norte, Davao del Sur, Lanao del Norte, and Zamboanga del Sur in Mindanao, provinces with higher shares of indirect contributors and poverty incidence, and even in provinces with higher share of direct contributors and lower poverty incidence, such as the NCR, Batangas, Laguna, Cavite, and Rizal in Luzon, it is important to increase the accessibility of PHC to increase financial protection of the populations within the provinces. PhilHealth and DOH, as the national health purchaser and health regulatory body, should coordinate initiatives, such as the development of outpatient benefit packages and deployment programs to augment facilities, HRH, and quality of primary health care services outside of hospitals in aforementioned provinces to address issues that may arise from different dimensions of service coverage. For provinces with low availability of primary care facilities, adjustments in contracting healthcare providers under NHIP can help expand the scope of available services.

Investments geared towards improving health literacy and knowledge about the NHIP, especially in areas identified to have high admission rates, can minimize the geographical inequities in health coverage. Patient knowledge of diseases and services is positively associated with willingness to utilize disease prevention services, such as Mass Drug Administration and immunization (Amarillo et al. 2008; Sumile et al. 2020). Conversely, lack of knowledge on diseases, treatments, services, and PhilHealth insurance coverage (Higuchi 2010) may lead to inconsistent utilization and continuity of care. Even if this study did not explicitly investigate the influence of patient knowledge on selected indicators, the lack of knowledge about benefits packages, accredited facilities, availability of outpatient providers, and general practices to prevent diseases should be considered, as these can all influence the demand and utilization of services provided by PhilHealth.

Given the findings of inverse correlations between membership, hospital beds, and claims amounts, PhilHealth, DOH, and other NGAs should standardize the usage of equity measures, such as the use of poverty incidence, in national allocation and prioritization frameworks of projects and activities to ensure efficiency and equity across health programs. As national health insurance coverage is limited by the services and HCPs available in different locations and lack of availability can exacerbate the financial burden of patients (Pratiwi et al. 2021; Adewole et al. 2022), and low affordability and geographic accessibility of services may also force patients to forego seeking services altogether (Gao and Kelley 2019), provinces with lower support value and higher poverty incidence such as Agusan del Norte, Cotabato, South Cotabato, Davao del Norte, Davao del Sur, Davao de Oro, and Zamboanga del Sur, should be addressed collaboratively to holistically address barriers in service coverage pertaining to availability, accessibility, affordability, and quality of services.

To facilitate all these reforms, PhilHealth, DOH, and other relevant stakeholders should synergize efforts to facilitate the integration of healthcare under unified province-/city-wide healthcare provider networks stipulated in the UHC Act.

- Ensure that LGUs and HCPs, both public and private, within provinces are capacitated, having mechanisms to effectively coordinate service delivery and refer patients to appropriate levels of care.
- Expand breadth, depth, and accessibility of primary care services to improve efficiency and equity of local health systems.
- Strengthening PhilHealth functions, as the national health purchaser, and harmonizing functions of DOH and other government agencies to ensure they are complementary to, rather than fragmented from, PhilHealth's main functions and objectives.

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7. Annex

Table A1. Criteria for assessing data quality

	Data quality category*	Attribute	Definition
1	**Completeness** 	**Completeness**	The absence of data values at a single moment in time (or measured over time) agrees with local or common expectations. (i.e. no missing values)
2		**Timeliness**	Data represents reality within a reasonable period of time for organization's needs.
3	**Plausibility** ● Uniqueness ● Temporal 	**Uniqueness**	Data values that identify a single object that are not duplicated.
4		**Accuracy**	Observed or derived values conform to expected temporal properties. The data corresponds to reality or truth.
5	**Conformance** ● Value ● Relational 	**Validity**	Data values conform to internal formatting constraints and/or allowable values or ranges.
6		**Consistency**	Data values conform to relational constraints. No contradictions among data fields.

***Categories are based on Kahn et al. (2016).** A Harmonized Data Quality Assessment Terminology and Framework for the Secondary Use of Electronic Health Record Data.

Table A2. List of ICD-10 Used for Classifying ACSC

Disease	ICD-10 Codes
Asthma	J45.00, J45.10, J45.80, J45.90, J46
Chronic obstructive pulmonary disease (COPD)	J43.0, J43.1, J43.2, J43.8, J43.9, J44.1, J44.8, J44.9, J20.9
Pneumonia	J12.03, J12.13, J12.23, J12.33, J12.93, J13.3, J14.3, J15.03, J15.13, J15.23, J15.33, J15.43, J15.53, J15.63, J15.73, J15.93, J16.03, J18.03, J18.13, J18.23, J12.02, J12.22, J12.32, J12.92, J13.2, J14.2, J15.02, J15.12, J15.22, J15.32, J15.42, J15.52, J15.62, J15.72, J15.92, J16.02, A01.0+J17.0, A02.2+J17.0, A21.2+J17.0, +A22.1+J17.0, A37.0+J17.0, A37.1+J17.0, A37.8+J17.0, A37.9+J17.0, A42.0+J17, A53.0-+J17.0, A54.8+J17.0, A69.8+J17.8, A70+J17.8, A78+J17.8, B01.2+J17.1, B05.2+J17.1, B06.8+J17.1, B25.0+J17.1, B37.1+J17.2, B38.1+J17.2, B38.2+J17.2, B39.0+J17.2, B39.1+J17.2, B39.2+J17.2, B44.0+J17.2, B58.3+J17.3, B65.0+J17.3, B65.2+J17.3, B65.8+J17.3, B65.9+J17.3, I00+J17.8, J18.93, J18.99+Y95, J18.02, J18.12, J18.22, J18.92
Urinary Tract Infection (UTI)	N10, N11.0, N11.1, N11.8, N11.9, N12, N13.6, N39.0
Hypertension	I10.1, I10.9, I11.9
Diabetes Mellitus	E10.0, E10.1, E10.2+N08.3, E10.5, E10.6, E10.7, E10.8, E10.9, E11.0, E11.1, E11.2+N08.3, E11.5, E11.6, E11.7, E11.9, E12.0, E12.2+N08.3, E12.5, E12.6, E12.8, E13.0, E13.1, E13.2+N08.3, E13.5, E13.6, E14.0, E14.1, E14.2+N08.3, E14.5, E14.6, E14.7