National and subnational coverage for reproductive, maternal, newborn and child health from health facility data and surveys, 2017-2021

GHANA

Brief synthesis of the analyses

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Background

This synthesis describes the data, methods, and results of an analysis of the health facility data for selected indicators of reproductive, maternal, newborn and child health, supported by survey analyses and health system data where available. It focuses on national and subnational (regions / provinces / counties and in some instances districts) administrative units in countries. The set of indicators is limited but can easily be expanded using similar methods into for instance family planning, adolescent health, and nutrition.

The aim of the analyses is to inform national and global reviews of progress and performance of the national plan and strategy for RMNCH. From the health facility data (kept in DHIS2 software) a clean data set is created for the endline review. This is done through a systematic approach, with ample attention for facility data quality assessment and adjustment, denominator selection, joint assessment of surveys and facility results and consideration of possible other biases.

This report has the following sections:

1. Description of the data sets
2. Data quality assessment and adjustment
3. With number 2
4. Denominators or target populations
5. Survey coverage trends and equity
6. Facility data derived coverage trends and inequalities
7. Private sector bias
8. Analysis of subnational progress and performance
9. Potential additional indicators

Description of the data sets

Ghana currently has 16 administrative regions with a total of 261 districts. A total of 8523 core health 8523 health facilities is reporting to the DHIS2 database in the country. Figure 1 below shows the regional map of Ghana and the number of districts in each region (Figure 1).

Monthly district data from January 2017 to December 2021 were extracted from the Ghana DHIS2 database on all the required Reproductive, Maternal, Newborn and Child Health care indicators. National Survey estimates were used to compute denominators for facility-based coverages and for external comparison of the coverage statistics. The most recent surveys conducted were the 2014 Ghana Demographic Health Survey (GDHS-2014), 2017-2018 Ghana Multiple Indicator Cluster Survey (GMICS-2017/2018), The 2017 Ghana Maternal Health Survey (GMHS-2017) and the 2019 Ghana Malaria Indicator Survey (GMIS-2019). The last census was conducted in 2021.

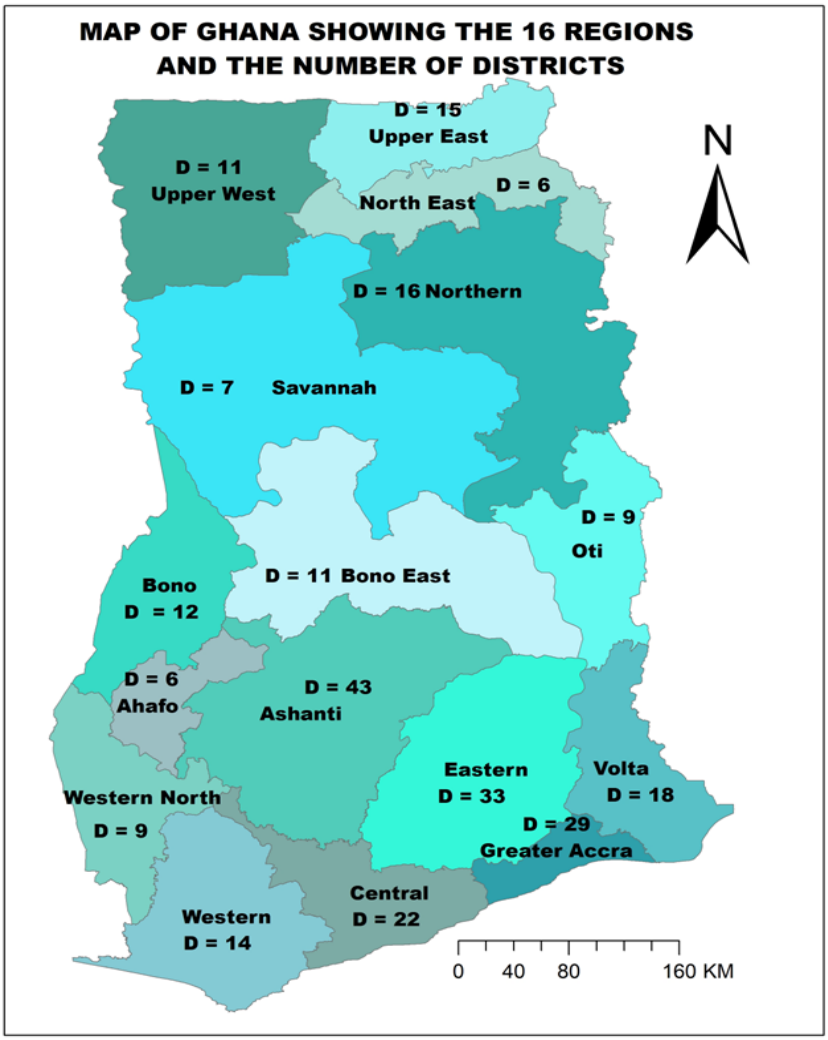

Figure 1: Regional maps of Ghana showing the number of districts

Table 1: Health facility data summary

Indicator	
Administrative organization	
Number of provinces / **regions** / counties	16
Number of districts	261
Health facilities	
Number of health facilities in country	8523
Data on core health professionals	Yes
Data on hospital beds	Yes
Facility data analysis period	
First month and year with health facility data	January, 2017
Last month and year with health facility data	December, 2021
Indicators with facility data for the analysis	**Has data**
Antenatal care first visit	Yes
Antenatal care 4th visit	Yes
IPT 2nd dose (malaria)	Yes
Institutional delivery or skilled birth attendant	Yes
Caesarean Section	Yes
Postnatal care	Yes
Family planning new and revisits	Yes
BCG vaccination	Yes
Pentavalent / DPT first dose	Yes
Pentavalent / DPT third dose	Yes
Measles vaccination	Yes
Stillbirths (fresh / macerated)	Yes
Maternal deaths in health facilities	Yes
OPD visits children under 5 years	Yes
IPD admissions children under 5 years	Yes
Under 5 deaths in health facilities	Yes
Population-based surveys (3 most recent health surveys)	
Name of survey	**Year**
Malaria Indicator survey (MIS)	2019
Maternal Health Survey (MHS)	2017
Multiple Indicator Cluster Survey (MICS)	2017-2018
Population projection data in DHIS2	
Indicator	**Year**
Total population for every year	Yes
Live births for every year	Yes
Population under 1 year for every year	Yes

Data quality assessment and adjustments

The data quality assessment shows that the quality of the DHIS2 heath facility data was above average (>70%) over the years (Table 2). The completeness of reporting rate was very high for the five years (>90%) and was showing an increasing trend. The percentage of districts with reporting rates above 90% was also increasing during the period. A few (<1%) of the districts had missing information on the monthly reports over the period. Extreme outliers were always minimal across the monthly reports (<1%) however, 93.6% of the districts had no extreme outliers in 2021. High inconsistencies were observed using the ratios of ANC1-Penta1 and Penta1- Penta3 during the period (Table 2).

Table 2: Data quality summary score card, DHIS2 data, Ghana, 2017-2021

		Years				
	Indicators	**2017**	**2018**	**2019**	**2020**	**2021**
ID	**Completeness of monthly facility reporting (Green > 90%)**					
DQ 1a	Reporting rate (%) by year (National average of ANC, delivery, vaccination, OPD)	91.0	91.5	92.3	95.0	95.5
DQ 1b	Percentage of districts with reporting rate >= 90% by year *	70.9	72.1	75.1	82.3	88.3
DQ 1c	Percentage of districts with no missing monthly values by year *	99.5	99.7	99.9	99.9	99.7
	Extreme outliers (Green > 95%)					
DQ 2a	Percentage of monthly values that are not extreme outliers	99.7	99.7	99.8	99.4	98.8
DQ 2b	Percentage of districts with no extreme outliers in the year	97.4	97.4	98.1	96.3	93.6
	Consistency of annual reporting (Green>85%)					
	Ratio ANC1 - Penta numbers (National)	0.90	0.85	0.83	0.87	0.82
DQ 3a	Percentage of districts with adequate ratio between ANC1 and Penta1 (between 1.0 and 1.5) by year	29.9	26.1	21.8	30.7	19.5
	Ratio Penta1 - Penta3 numbers (National)	0.99	0.99	0.99	0.99	0.97
DQ 3b	Percentage of districts with adequate ratio between Penta1 and Penta3 (between 1.0 and 1.5) by year	46.4	48.3	43.3	45.6	35.2
	Overall data quality score (%) by year (Average DQ11a, DQ1b, DQ1c, DQ2a, DQ3a, DQ3b) *	76.4	76.4	75.8	78.4	75.8
* National average of ANC, delivery, vaccination, OPD						

Figure 2 shows the national reporting rates of selected RMNCH indicators. The reporting rates for the periods were above 80% and increasing for almost all the interventions across the years. From Figure 2, the percentage of districts with low reporting rates was also decreasing over the years. Low reporting rate was defined as districts with reporting rate below 90%. The default adjustment factor of 0.25 was used to account for the volume of services provided by the non-reporting health facilities.

A few of the districts recorded outliers in the monthly data. In figure 4, corrections made to two districts, Oforikrom and Pru districts, is shown. The inconsistency between ANC1 and Penta1 volume service volume and that of Penta1 and Penta3 is depicted with a scatter plot (Figure 5). Comparison with the diagonal lines showed more Penta1 services than ANC1 however Penta1 volumes was much closer to Penta3 volumes.

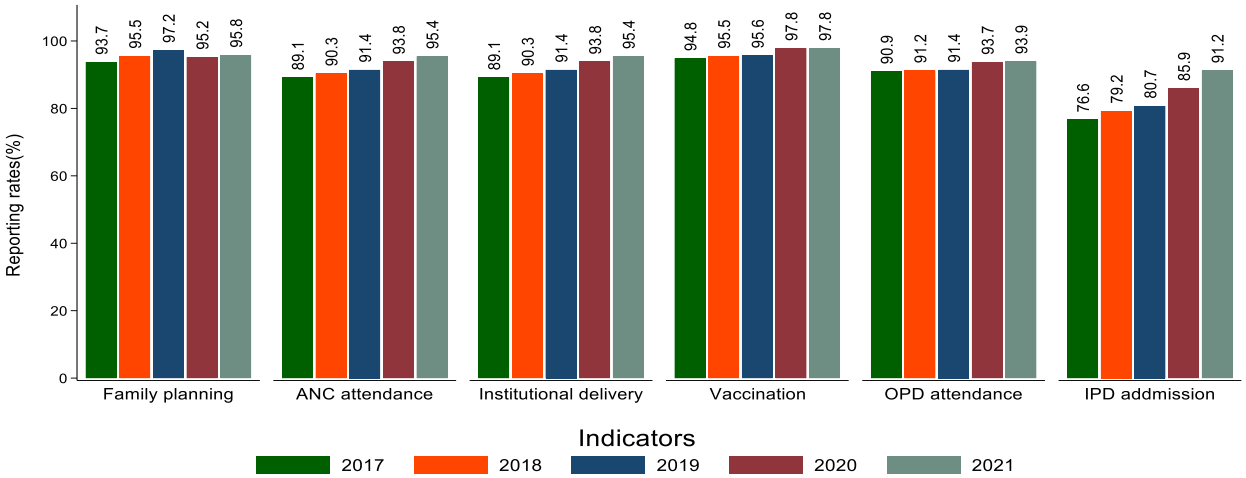

Figure 2: Trend of the national reporting rates in Ghana, 2017 to 2021

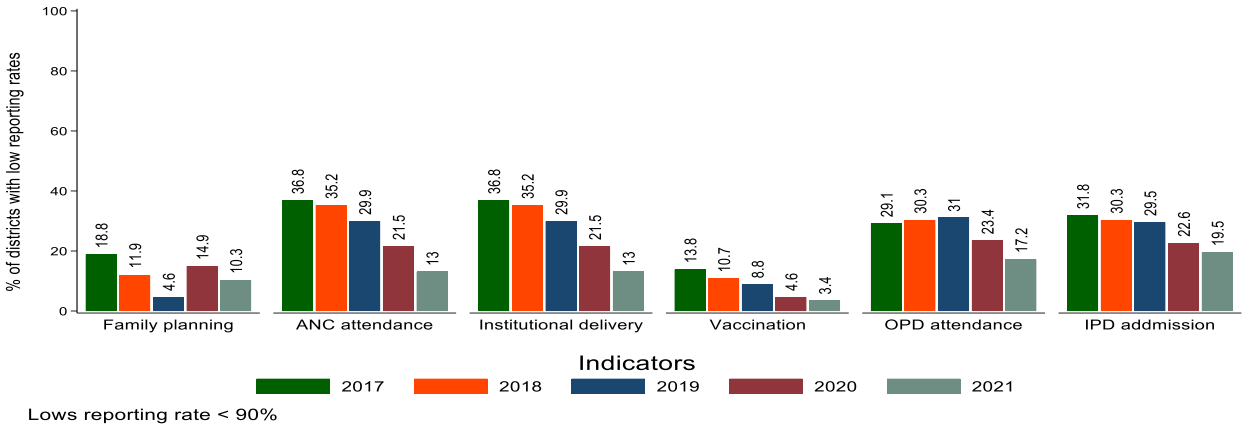

Figure 3: Trend of the percentage of districts with low reporting rates in Ghana, 2017 to 2020

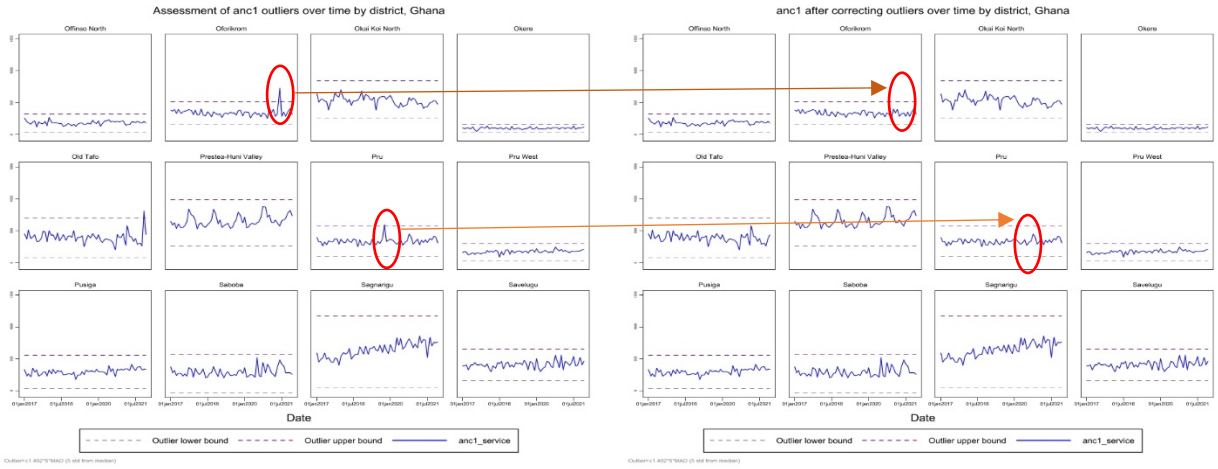

Figure 4: An example of an adjustment to outliers for first ANC visit in two districts in Ghana

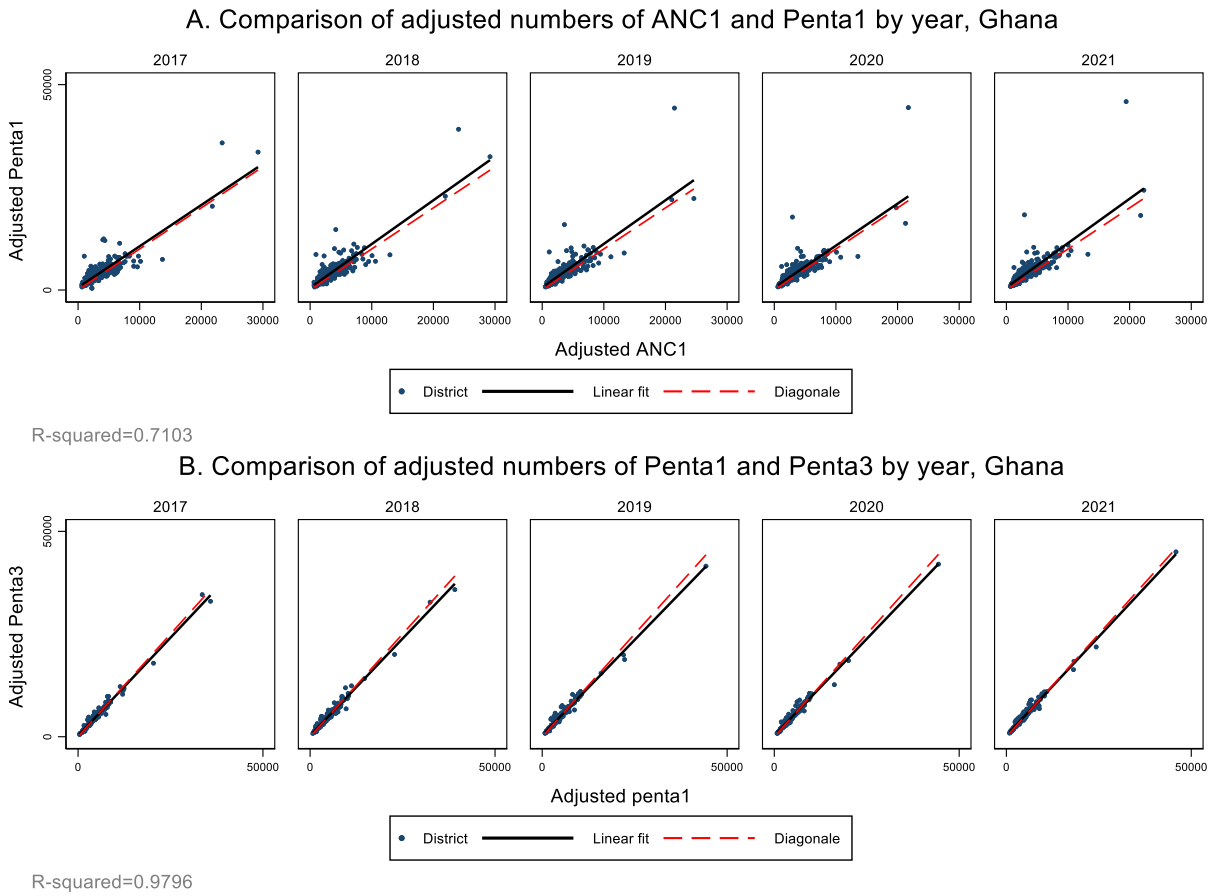

Figure 5: Annual comparison of ANC1 to Penta1 and Penta1 to Penta3 services in Ghana, 2017 to 2020

Denominators or target populations

The 2021 population and housing census (PHC) was used to project the population size of the previous years using an annual growth rate of 2.10% [1]. The population from the 2021 PHC was 30,832,019. Percentage of children under-1, children under-5 and women of reproductive age were also projected to be 2.4%, 12.2% and 27.0% respectively annually [1]. Based on the number of livebirths from the DHIS2, the crude birth rate was 25.7 per 1000 population in 2021 compared to 24.4 per 1000 population in 2017 (Table 3).

Comparisons of the estimates from the 2021 PHC with data from the world bank data (WBD) show consistencies with the total population, children under-5 years, women of reproductive age 15-49 years, and crude birth rates (Ratios closer 1) [1–3]. However, the crude death rate was an under-estimate in the DHIS2 when compared to data from WBD by around a factor of 2, see (Figure 6).

Table 3: Assessment of the population projection figures used in DHIS2, 2017-2021

	Years				
Demographic parameter	**2017**	**2018**	**2019**	**2020**	**2021**
Total population	28372591	28968415	29576752	30197864	30832019
Population growth rate (%)		2.10	2.10	2.10	2.10
% Of total population					
Under 1 year	2.40	2.40	2.40	2.40	2.40
Under 5 years	12.2	12.2	12.2	12.2	12.2
Women 15-49 years	27.0	27.0	27.0	27.0	27.0
Crude Birth rate (per 1000 population)	24.4	25.6	24.4	24.6	25.7
Crude death rate (per 1000) = CBR minus -pop. growth rate*10		4.6	3.4	3.6	4.7

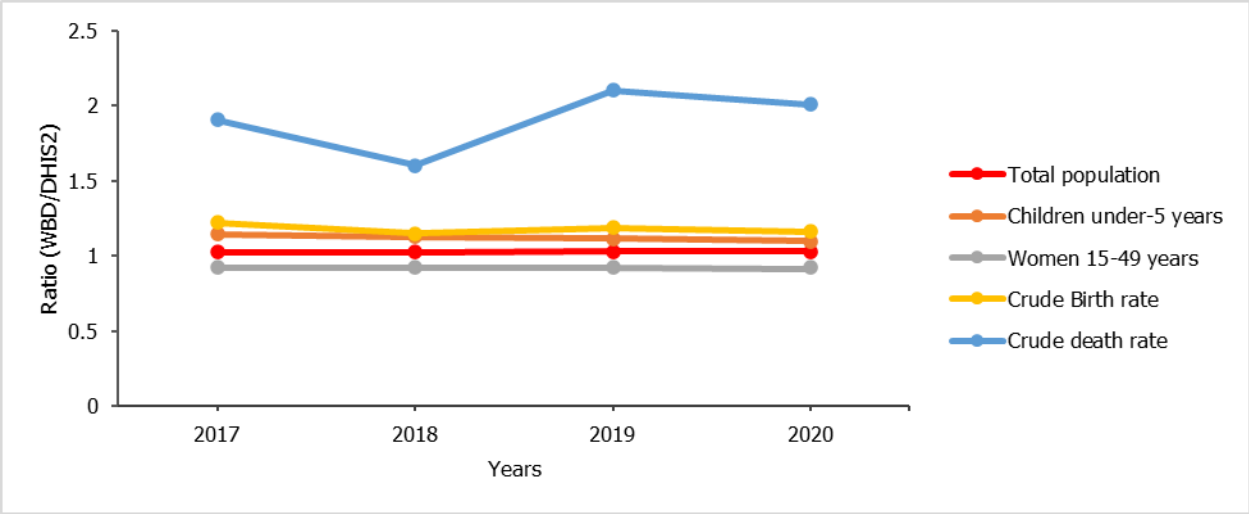

Figure 6: Ratio of population estimates from the DHIS2 to world Bank data (WBD) projections from 2017 to 2020 in Ghana.

Testing facility data derived denominators

Estimates from the 2017-2018 Ghana multiple indicator cluster survey showed that coverages of ANC1 to be 98%, ANC4+ to be 85%, institutional delivery to be 78%, IPTp3 coverage of 52% [4]. The 2014 Ghana demographic health survey estimated BCG coverage of 96.6%, Penta-1 coverage of 96.5%, Penta-3 coverage of 87.7% and measles coverage of 82.5% [5].

Two-thirds (67.8%) of pregnant women attend their first ANC before reaching their fourth month of gestation whilst extra 25.3% attend during their 4th and 5th month of gestation according to the 2014 GDHS [5]. Thus, about 93% of pregnant women have their first ANC visits by the 5th month. We can therefore conclude that the number of ANC1 visits recorded in DHIS2 should be much closer to the number of pregnant women in the population. And that the reported number of immunizations (BCG, penta1) should be close to the number of infants eligible for first vaccinations (at birth and at 6 weeks of age).

In estimating denominators or target populations based on DPT1 and ANC1 reported from DHIS2, we added those who never use the services (2% for ANC1, 3.4% for BCG and 3.5% for penta1) [5]. To obtain live births from we subtracted pregnancy loss (3% abortion, 1.4% stillbirths)[5] from the total number of women pregnant at 4-5 months obtained from ANC1 numbers and added multiple birth (4.5%) using estimates from the 2017-2018 GMICS [4]. Thus,

$$Livebirths_{anc\ derived} = (ANC\ from\ DHIS2) - (Pregnancy\ loss) + (Multiple\ birth)_{adjusted}$$

To obtain live births from the immunization numbers, we use penta1, add the percent that never used the services (3.5%) and add 2.7% for neonatal deaths [5]. Thus,

$$Livebirths_{dpt1\ derived} = (Penta1\ from\ DHIS2) + (Non\_vaccinated\ with\ penta) + (neonatal\ deaths)$$

Coverages using the DPTI derived denominators were much closer and reasonable to estimates from the population-based survey coverages compared to the ANC1 based derived denominators [4,5]. Hence, the DPTI derived denominators was much reliable. Figure 6 shows the coverages estimated from the ANC1 and DPT1 derived denominators. (Figure 7)

Figure 8 shows the regional estimates of coverages estimated using the DPT1 based derived denominators. (Figure 8)

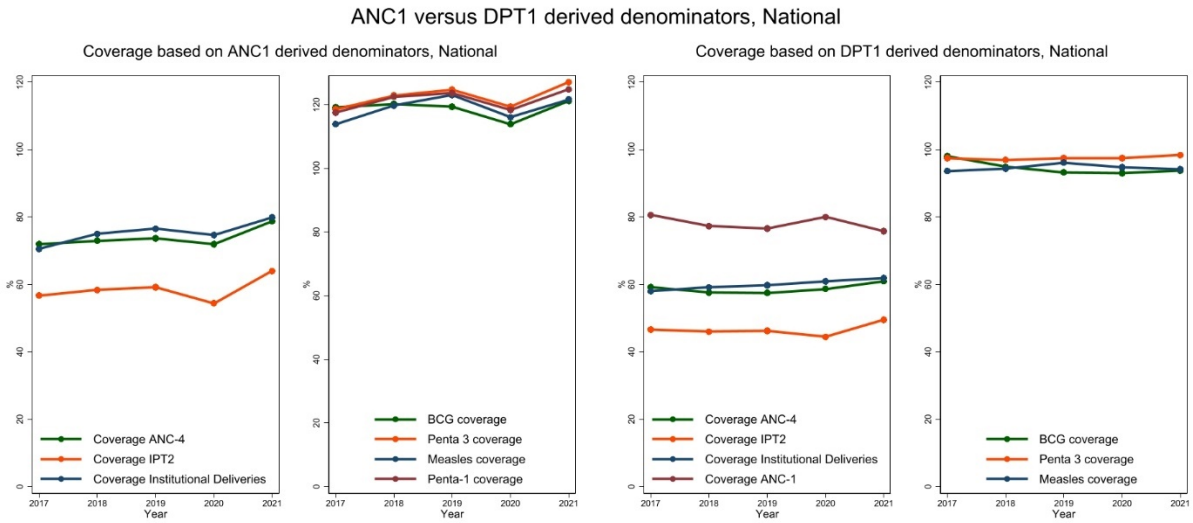

Figure 7: Comparison of population-based coverages estimated using denominators derived from ANC1 and DPT1 derived indicators

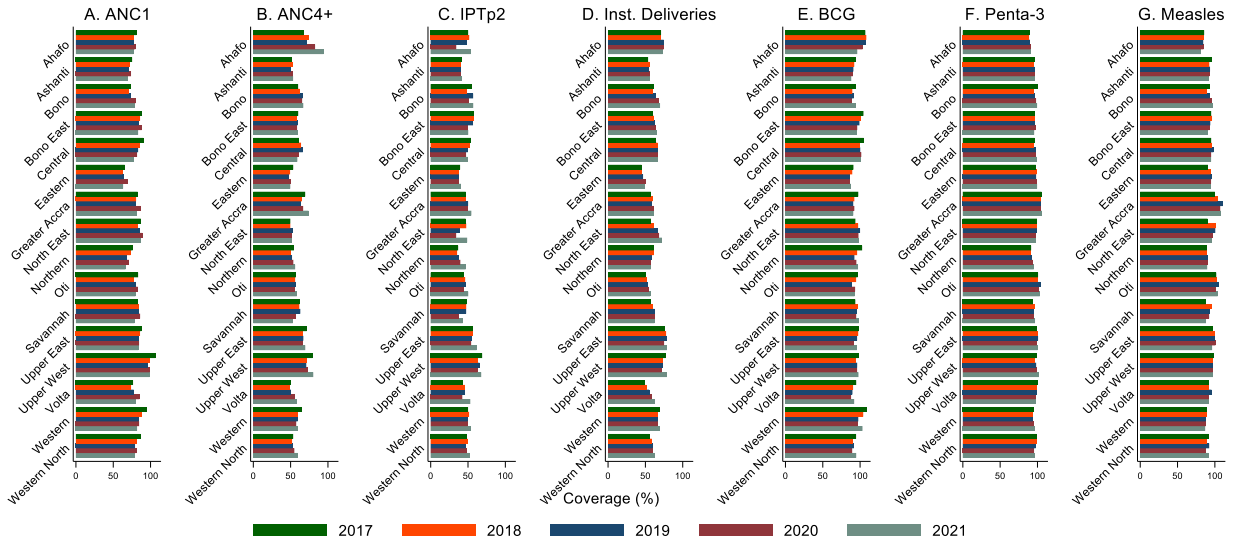

Figure 8: Comparison of population-based coverages estimated using denominators derived from ANC1 and DPT1 derived indicators

Survey coverage trends and equity

Coverages from recent national surveys in Ghana was assessed and are shown in table 4 below. No RMNCH coverages was obtained from both the 2019 and 2016 Malaria indicator surveys (MIS) [6,7]. IPTp2, and the vaccination coverages were also not accessible from the 2017 MICS [4] and 2017 MHS [8] surveys. However, coverages of all the RMNCH were obtained from the 2014 GDHS [5] survey (Table 4).

Table 4: RMNCH coverages from recent National Surveys in Ghana

	National Surveys (%)				
Indicators	**2019 MIS**	**2016 MIS**	**2014 DHS**	**2017 MICS**	**2017 MHS**
ANC attendance	-	-	97.4	97	97.6
ANC4+ attendance	-	-	92.3	85	89.3
Family planning (Use of modern methods)	-	-	31.7	24	30.6
IPTp2 coverage	-	-	67.5	-	-
Institutional deliveries	-	-	73.1	78	78.7
Skilled birth attendant	-	-	73.7	79	79.4
PNC 48	-	-	81.1	91	85.3
BCG coverage	-	-	96.6	-	-
Penta1 coverage	-	-	96.5	-	-
Penta3 coverage	-	-	87.7	-	-
Measles coverage	-	-	82.5	-	-

NOTE: MIS: Malaria Indicator Survey, DHS: Demographic Health Survey. MICS: Multiple Indicator Cluster Survey. MHS: Maternal health Survey

The regional coverages of the RMNCH indicators were extracted from the 2014 GDHS and was used for the inequality plots. Ghana had 10 regions at the time of the 2014 GDHS survey, hence coverages were estimated across the 10 regions. Results from the inequality plot showed less variation and high coverages across regions for BCG, Penta 1, Penta3, Measles vaccination, and at least one ANC visit. The Northern region had the lowest coverages in 10 of the 11 indicators except for IPTp2 which was lowest in the Greater Accra region. Skill birth attendant and Institutional delivery recorded the highest inequalities in coverages across the 10 regions (Figure 9).

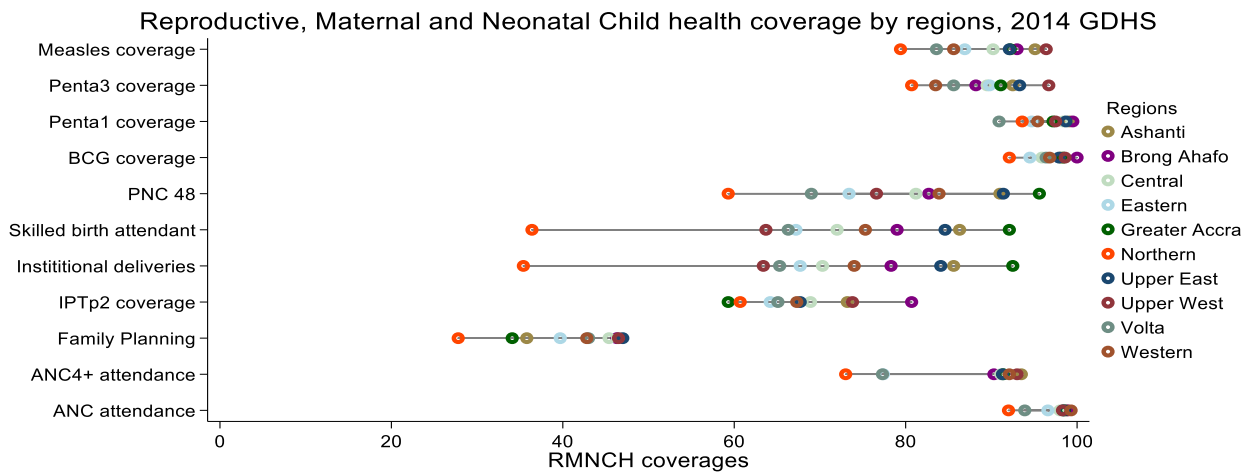

Figure 9: Inequality plots of the coverages of RMNCH indicators across regions using the 2014 GDHS.

Facility data derived coverage trends and equity

Seven weighted MADM indicators, ANC4, IPTp2, delivery, PNC at 48 hours, BCG, Penta3 & Measles1 were used to construct a composite Maternal and Neonatal child health index for the years 2017 to 2021. Figure 10 shows that there were less inequalities observed across the MNCH indicators in 2021 compared to the previous years. The inequalities across regions were lowest in 2021 (Figure 10).

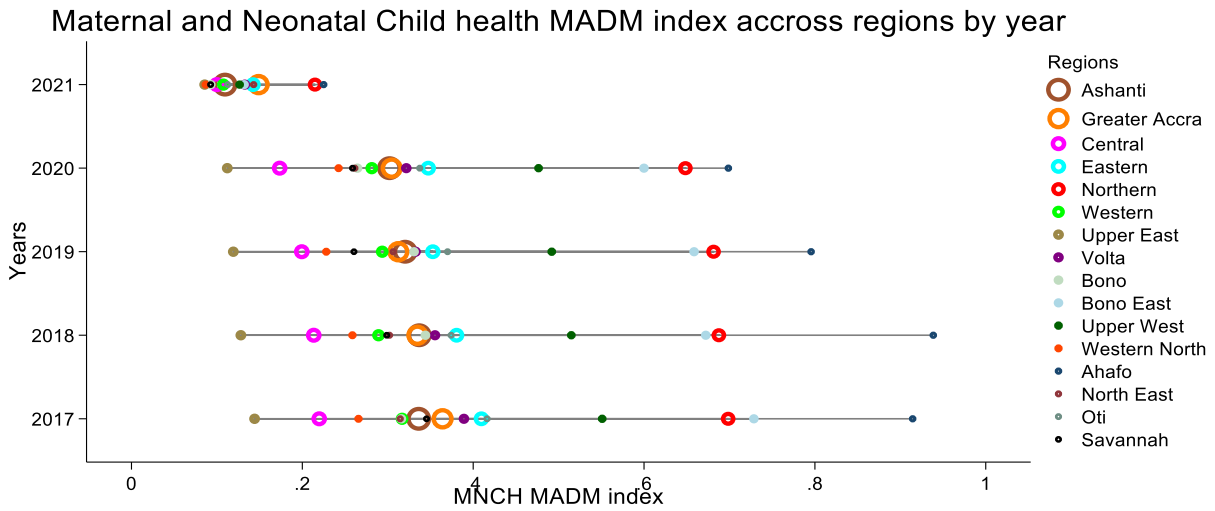

Figure 10: MNCH MADM index across regions by years in Ghana, 2017 to 2021

The inequalities were significantly reduced in 2021 compared to previous years for the RMNCH index as well as ANC1, ANC4, IPTp2, institutional delivery, skill birth attendants, c-section deliveries and Postnatal

at 48 hours. The inequalities were low and consistent over the years for family planning and vaccination indicators (Figure 11).

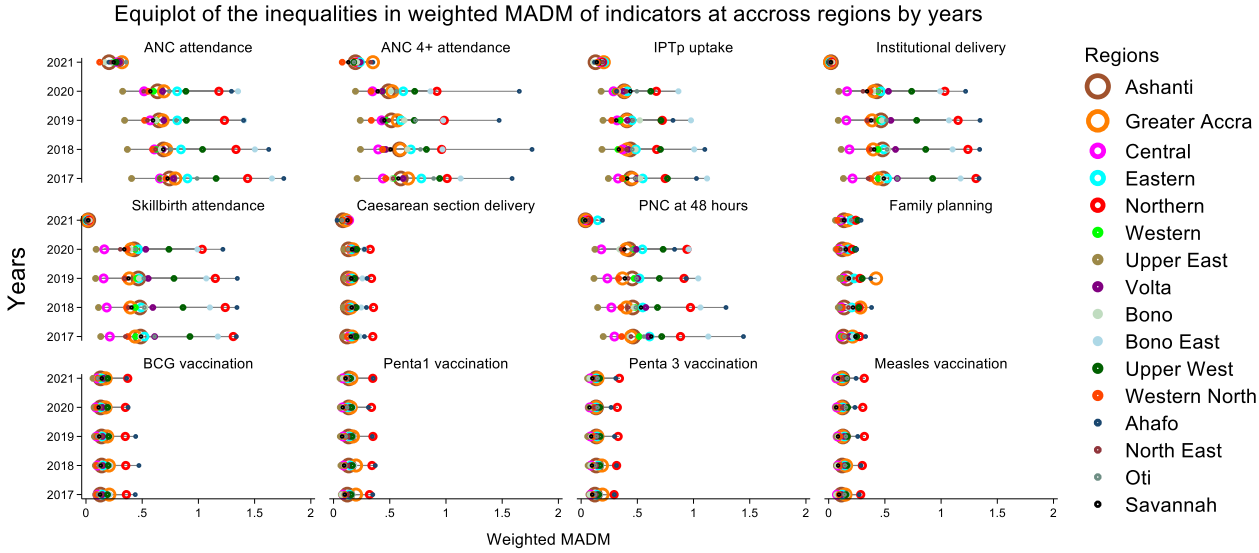

Figure 11: MNCH Indicators specific MADM index across regions by years in Ghana, 2017 to 2021

Private sector bias

Anecdotal evidence estimates over 90% of the private health facilities report data into the DHIS2 database. This means that at most 10% of the private health facilities do not report their services in DHIS2 in Ghana. Figure 12 shows the average volume of services reported by the reporting private health facilities from 11 major RMNCH indicators (first ANC attendance (ANC1), Penta-1 vaccination, Penta-3 vaccination, four or more ANC attendance (ANC4+), 2 or more Intermittent preventive therapy (IPT2), Institutional deliveries, Caesarean section deliveries, Postnatal attendance in the first 48 hours (PNC48), Maternal deaths, still births, and BCG vaccination).

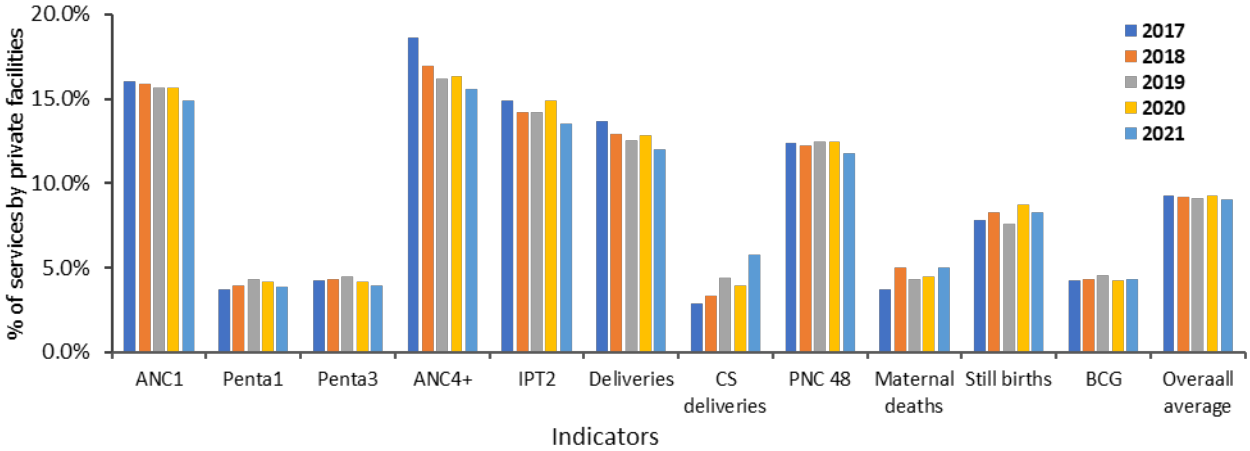

Figure 12: Trend of the Percentage of service delivery in DHIS2 that are reported by the private health facilities

Based on the 11 major RMNCH indicators, the average volume of services reported in DHIS2 by the reporting Private health facilities is estimated to be 9.3%. Based on the two estimated parameters described above, an estimated 0.85% of services are not reported into DHIS2 by the private sector. However, this estimate assumes that the non-reporting health facilities produce similar volume of services as the reporting private facilities. The above can be expressed mathematically below:

$$pvs_{nrpf} = \frac{pvs_{nrpf} * \left(pvs_{rpf} * tvs_{arf}\right)}{pvs_{nrpf} * \left(pvs_{rpf} * tvs_{arf}\right) + tvs_{af}} * 100\%$$

$$= \frac{\left(0.10 * (0.093 * 1)\right)}{0.10 * (0.093 * 1) + 1} * 100\% = 0.85\%$$

Where:

pvs_{nrpf} is the proportion of volume of services provided by the non-reporting private facilities

pvs_{rpf} is the proportion of volume of services provided by the reporting private facilities in DHIS2

tvs_{arf} is the total volume of services provided by all reporting facilities in DHIS2. (Assumed to be 1)

The estimated number of services that are not reported into DHIS2 is therefore minimal (<5%). Also, in some situations, smaller private health facilities report to DHIS2 through other established public health facilities due to lack of capacity, logistics and access to DHIS2. Based on the above information we conclude that the bias from non-reporting private health facilities is minimal and negligible.

Analysis of subnational progress and performance

A total of 8,523 health facilities reports into Ghana's DHIS2 database as of December 2021. Majority of the facilities were from the Ashanti region (17.3%), Greater Accra (13.6%) and Eastern (12.7%) regions. These facilities had a combined total of 28,420 hospital beds with 19.5% hospital beds in the Ashanti, 11.5% in Eastern, and 11.1% in Greater Accra regions. A total of 95,793 core health professionals rendered services in these health facilities with most of them operating from facilities in the Ashanti (14.3%), Greater Accra (12.9%) and Eastern (10.9%) regions. An extra 13,257 other health professionals also worked in these facilities. (Table 5)

Generally, coverages of ANC, BCG and Penta3 at the regional levels increased from 2017 to 2019 but dropped in 2020 due to COVID-19 for some selected regions, however, increased in 2021. Coverages were generally high in Northeast, Savannah, and the Northern regions. Coverages dropped in 2021 in the Greater Accra region. In general, there is increase progress in the coverages of intervention across regions in Ghana. Table 6 shows the trends and nature of the coverages of these 3 critical RMNCH indicators across regions from 2017 to 2020. (Table 6)

Table 5: Regional distribution of health facilities, hospital beds and health professionals in Ghana, 2021

	Health facilities (all types/categories)		Hospital beds		Core health professionals		Other health professionals	
Regions	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Ahafo	172	2.0	624	2.2	3116	3.3	289	2.2
Ashanti	1476	17.3	5532	19.5	13723	14.3	1814	13.7
Bono	424	5.0	1415	5.0	5092	5.3	819	6.2
Bono East	344	4.0	977	3.4	4042	4.2	321	2.4
Central	631	7.4	2519	8.9	7680	8.0	1298	9.8
Eastern	1083	12.7	3266	11.5	10475	10.9	1611	12.2
Greater Accra	1159	13.6	3153	11.1	12345	12.9	2392	18.0
North-East	124	1.5	517	1.8	1784	1.9	132	1.0
Northern	416	4.9	2009	7.1	6037	6.3	705	5.3
Oti	225	2.6	544	1.9	2597	2.7	367	2.8
Savannah	161	1.9	471	1.7	2138	2.2	175	1.3
Upper East	482	5.7	913	3.2	5995	6.3	537	4.1
Upper West	412	4.8	1255	4.4	4943	5.2	663	5.0
Volta	491	5.8	1893	6.7	5647	5.9	996	7.5
Western	590	6.9	2058	7.2	6898	7.2	857	6.5
Western North	333	3.9	1274	4.5	3281	3.4	281	2.1
National	**8523**	**100.0**	**28420**	**100.0**	**95793**	**100.0**	**13257**	**100.0**

Table 6: Regional coverages of ANC, BCG, and Penta-3 from 2017 to 2021

Regions	ANC coverage					BCG Coverage					Penta-3 coverage				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Ahafo	57.7	70.6	66.5	64.7	79.2	95.4	119.2	108.6	100.8	115.2	83.9	100.5	94.1	85.5	113.9
Ashanti	73.8	70.4	67.4	69.2	73.7	107.5	99.4	99.3	98.8	113.3	98.3	98.5	100.6	100.6	116.4
Bono	63.5	70.8	76.2	62.9	74.8	89.9	97.6	104.0	78.4	96.0	88.6	99.7	105.6	80.9	96.4
Bono East	86.4	87.7	88.0	90.6	84.6	116.1	116.4	113.9	112.3	107.4	102.1	103.4	105.3	108.4	102.9
Central	84.0	85.3	75.0	77.8	77.5	96.3	100.1	91.5	96.5	100.6	86.7	92.1	86.2	89.2	97.9
Eastern	64.9	67.0	60.5	64.7	73.9	94.0	97.6	81.8	81.8	104.3	93.4	97.4	86.5	88.3	109.7
Greater Accra	82.0	81.5	75.5	75.5	72.8	90.4	89.9	82.9	76.4	75.7	95.1	97.5	92.6	82.8	85.4
North East	109.4	107.3	103.9	105.2	95.2	110.4	118.1	118.6	117.7	116.2	110.9	112.1	106.1	109.9	106.0
Northern	119.8	119.0	114.6	120.7	106.8	138.0	139.3	133.9	131.2	126.9	130.7	131.2	126.2	130.3	118.7
Oti	84.0	78.0	77.9	84.1	88.7	100.5	96.0	88.1	90.4	98.4	98.2	97.6	92.5	92.5	103.4
Savannah	115.7	105.8	112.4	98.0	96.3	118.7	109.5	118.5	102.2	107.6	125.5	119.7	120.8	108.3	108.2
Upper East	77.1	74.9	77.0	81.2	84.1	82.9	82.2	85.6	83.6	92.5	78.7	80.6	84.8	85.9	92.2
Upper West	83.4	81.6	81.8	87.3	85.8	83.1	83.0	82.8	83.9	87.9	81.6	79.3	80.2	83.7	88.8
Volta	62.1	61.3	57.7	61.0	67.4	81.2	80.7	69.9	67.2	80.0	81.6	81.4	73.9	69.0	81.3
Western	76.8	73.5	75.6	71.3	88.2	80.7	82.5	82.1	75.4	98.5	79.5	82.6	87.2	80.1	103.7
Western North	70.8	73.9	80.8	76.5	84.3	74.6	81.3	90.3	81.3	99.1	71.2	78.9	90.6	78.0	92.5
National	**78.9**	**78.6**	**75.6**	**76.5**	**80.0**	**97.1**	**97.4**	**93.1**	**89.8**	**99.5**	**93.7**	**96.4**	**94.4**	**91.3**	**101.4**

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