

**National and subnational coverage and other service statistics for reproductive, maternal, newborn and child health using health facility data and surveys**

**ETHIOPIA**

**Brief synthesis of the analyses**

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## Background

This synthesis report presents the background, methods, data sources and results obtained from preliminary analyses of health facility data for selected indicators of reproductive, maternal, newborn and child health (RMNCH), supported by survey analyses and health system data where available. It focuses on national and subnational analyses of administrative units in Ethiopia. The set of indicators presented in this report is limited but can easily be expanded using similar methods into other areas such as family planning, adolescent health, and nutrition.

The aim of the analyses is to inform subnational, national and global reviews of progress and performance of the national plan and strategy for RMNCH. In addition to survey data, a clean data set extracted from routine health facility data (from DHIS2 software) was created and utilized for the analysis. The preparation of a clean dataset was done through a systematic approach, with a due 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. Denominators or target populations
4. Survey coverage trends and equity: facility data derived coverage trends and inequalities
5. Private sector bias
6. Analysis of subnational progress and performance
7. Potential additional indicators

### Description of the dataset

Ethiopia has a population of over 105 million (2021), and is subdivided into 11 regions and two city administrations, more than zones, and more than 1000 districts. The country has a three-tier healthcare delivery system and more than 353 public hospitals, 3,706 public health centers and 17,561 health posts. In addition to the public health facilities, there are also more than 5,000 other categories of health facilities such as other-government health facilities, private for profit and private-not-for profit health facilities that provide preventive and curative health services. The implementation of District Health Information System (DHIS2) – a health information management system used for collecting, validating, analyzing and presenting routine health facility data – started in mid-2018.

Monthly facility level data, extracted from DHIS2 for the period from January 2018 to December 2021, were used for the analyses. After data quality assessment and adjustment was performed, monthly facility level data were aggregated into regional and annual data for further analysis and synthesis..

**Table 1: Health facility data summary**

Indicator	
<b>Administrative organization</b>	
Number of regions, including city administrations	13
Number of districts	>1000
<b>Health facilities (Public)</b>	
Hospitals	353
Health Centers	3706
Health posts	17,561
Data on core health professionals	Yes
Data on hospital beds	Yes
<b>Facility data analysis period</b>	
First month and year with health facility data	January, 2018
Last month and year with health facility data	December 2021*
<b>Indicators with facility data for the analysis</b>	<b>Has data</b>
Antenatal care first visit	Yes
Antenatal care 4 <sup>th</sup> visit	Yes
IPT 2 <sup>nd</sup> dose (malaria)	No
Institutional delivery or skilled birth attendant	Yes
Caesarean Section	Yes
Early Postnatal care	Yes
Family planning new and repeat acceptors	Yes
BCG vaccination	Yes
Pentavalent / DPT first dose	Yes
Pentavalent / DPT third dose	Yes
Measles vaccination	Yes
Stillbirths (fresh / macerated)	Yes, total still births available but dnot disaggregated as fresh/macerated
Maternal deaths in health facilities	Yes
OPD visits children under 5 years	Yes
IPD admissions children under 5 years	No
Under 5 deaths in health facilities	Yes

Population projection data in DHIS2	
Total population for every year	Yes
Live births for every year	Yes
Population under 1 year for every year	Yes

\* Tigray only 2018 and 2019

## Data quality assessment and adjustments

### Data quality scorecard

Routine data quality can be measured using different quality dimensions. The World Health Organization's data quality review guideline, the major dimensions include completeness, timeliness, and consistency (internal, external). These dimensions can mainly be assessed using different methods such as DQR, RDQA, desk review and other methods. We have conducted a desk review method for this analysis. Accordingly, these metrics of data quality were used to analyze the level of data quality of facility data from the routine health management information system.

Regarding completeness of reports, the national reporting completeness rate was increased from 81% in 2018 to 88% in 2021. The reporting rate showed increment over the years and was higher in 2019 and 2020, with a slight decline in 2021. Similarly, the percentage of regions with completeness of facility report more than 90% was increased from 48% in 2018 to 81% in 2020 but reduced to 73% in 2021. The low completeness in 2018 was due to transition from other reporting system to DHIS2 resulting in missed reports from some facilities. The reduction in 2021 was mainly due to a conflict in the northern part of the country that affected health service delivery in Tigray, Amhara and Afar regions.

Extreme outliers were identified using a modified Z-score, which is a standardized score of observations measuring the deviation from the median, obtained by dividing the difference from the median by the median absolute deviation. Monthly data with a score greater than five standard deviations from the annual median were identified as extreme outliers. These extreme outliers were also observed and nearly 23% of regions in 2018 and 15% of regions in 2021 have extreme outliers.

Consistency of data between related indicators was computed by comparing ANC 1 & Penta 1; Penta 1 & Penta 3. The comparison showed that the ratio for both indicators falls with the acceptable range (1.0 to 1.5).

The annual data quality indicator score was the same over the years, 82%.

**Table 2: Data quality score card for national levels, 2018-2021, Ethiopia (Green  $\geq 90\%$ , Yellow 50-89%, Red  $< 50\%$ )**

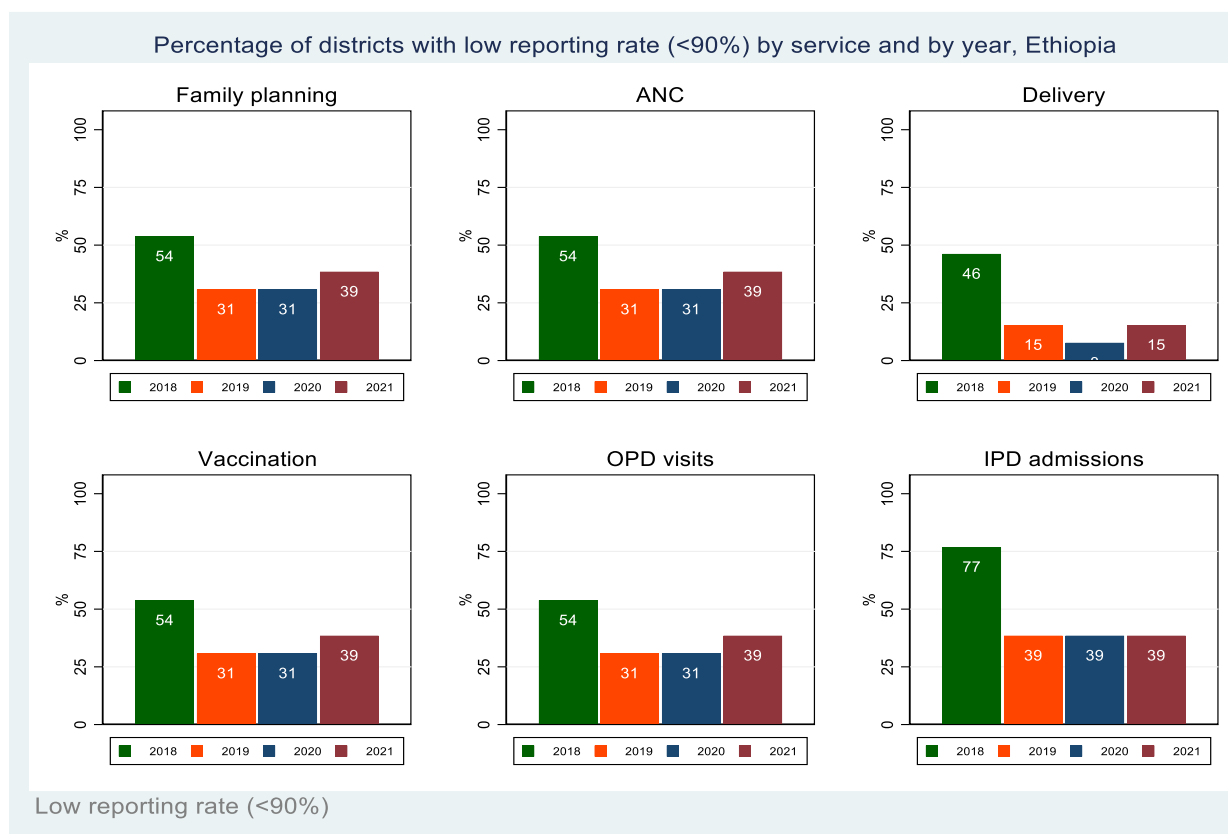
		2018	2019	2020	2021
<b>1</b>	<b>Completeness of monthly facility reporting (green <math>\geq 90\%</math>)</b>				
<b>1a</b>	<b>% of reporting completeness from expected monthly facility reports (mean, national)*</b>	81	90	91	88
<b>1b</b>	<b>% of Region with completeness of facility reporting <math>\geq 90\%</math>*</b>	48	73	81	73
<b>1c</b>	<b>% of facilities with no missing monthly values in the year *</b>	77	100	100	100
<b>2</b>	<b>Extreme outliers (green <math>&gt; 95\%</math>)</b>				

2a	% of monthly values that are not extreme outliers (mean, national)*	97	100	100	98
2b	% of Region with no extreme outliers in the year*	77	96	100	85
3	Consistency of annual reporting (green>85%)				
	Ratio ANC1 – penta1 numbers (national)	1.14	1.11	1.09	1.07
3a	% of Region with ANC1-penta1 ratio between 1.0 and 1.5	92	92	75	83
	Ratio Penta1 – penta3 numbers (national)	1.09	1.1	1.08	1.11
3b	% of Region with penta1-penta3 ratio between 1.0 and 1.5	100	100	100	100
	Annual data quality score (mean indicator 1a to 3b)	82	82	82	82

\* Assessment done for antenatal care visit, delivery care, immunization and outpatient visits

## Reporting rate

Figure 1 shows the data reporting rate for selected indicators at national level over time. Regions whose reporting rate was below 90% decreased over time, declined from 54% in 2018 to 31% in 2019 and 2020, and slightly increased to 39% in 2021 for family planning and from 46% in 2018 to 15% in 2021 for delivery. Reporting rate of inpatient admission has also improved significantly over time; percentages of regions with less than 90% reporting rate reduced from 77% in 2018 to 39% in 2021. The low reporting rate in 2018 is likely related to delayed roll out of DHIS2.



**Figure 1: Reporting rate of selected indicators in Ethiopia, 2018-2021****Report on adjustments and corrections**

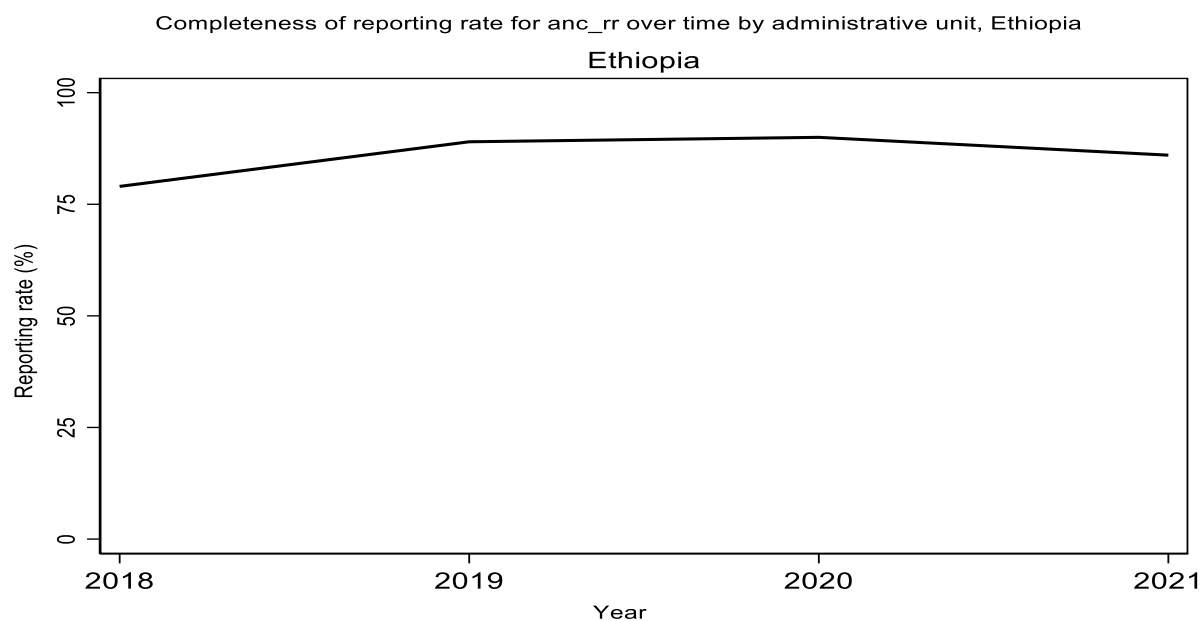
The assessment and adjustments were made using common rules. Data quality checks were performed using aggregated data, mainly at regional and national level.

Reporting completeness of health facilities was computed as a proportion of facilities that submitted their report in a given period divided by the total expected health facilities. It was aggregated and analyzed at regional and national levels. For all the regions, we adjusted for incomplete reporting by considering the completeness of reports by facilities and the level of service provision expected from non-reporting facilities.

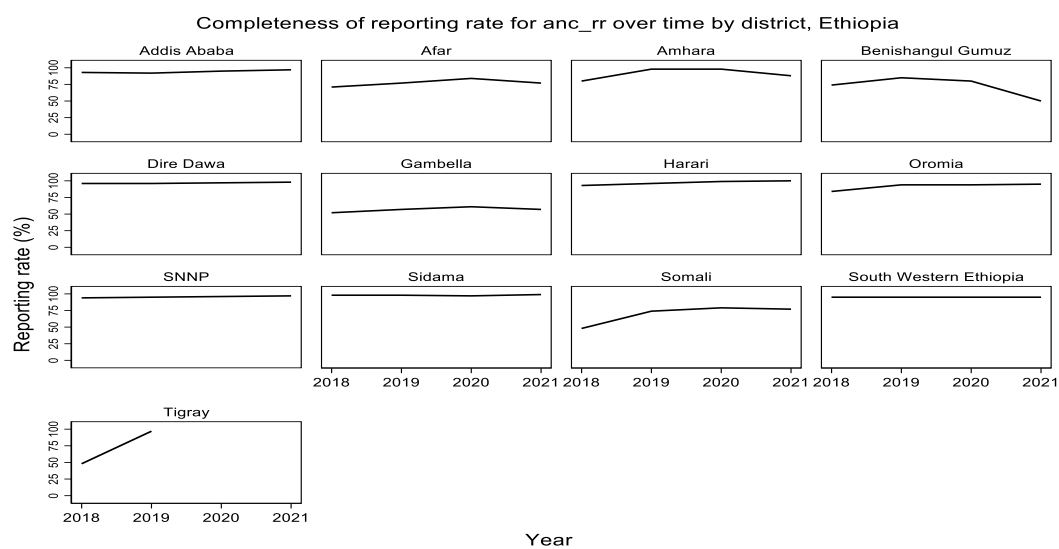
For the later, we use an adjustment factor ranging from 0 to 1, where 1 means similar level of services as reporting facilities and 0 assumes that non-reporting facilities provided no services.

Decision on this adjustment factor is guided by knowledge of service provision and distribution of facilities in the country, the default adjustment factor of 0.25 was selected based on expert opinion on the most appropriate factor for each intervention.

In case of missing values, the median value of the calendar year was used, unless otherwise there was a reason to believe that it was a true zero. Figure 2 and 3 presents the percentage of completeness of reporting at national and regional level using first antenatal care visit.

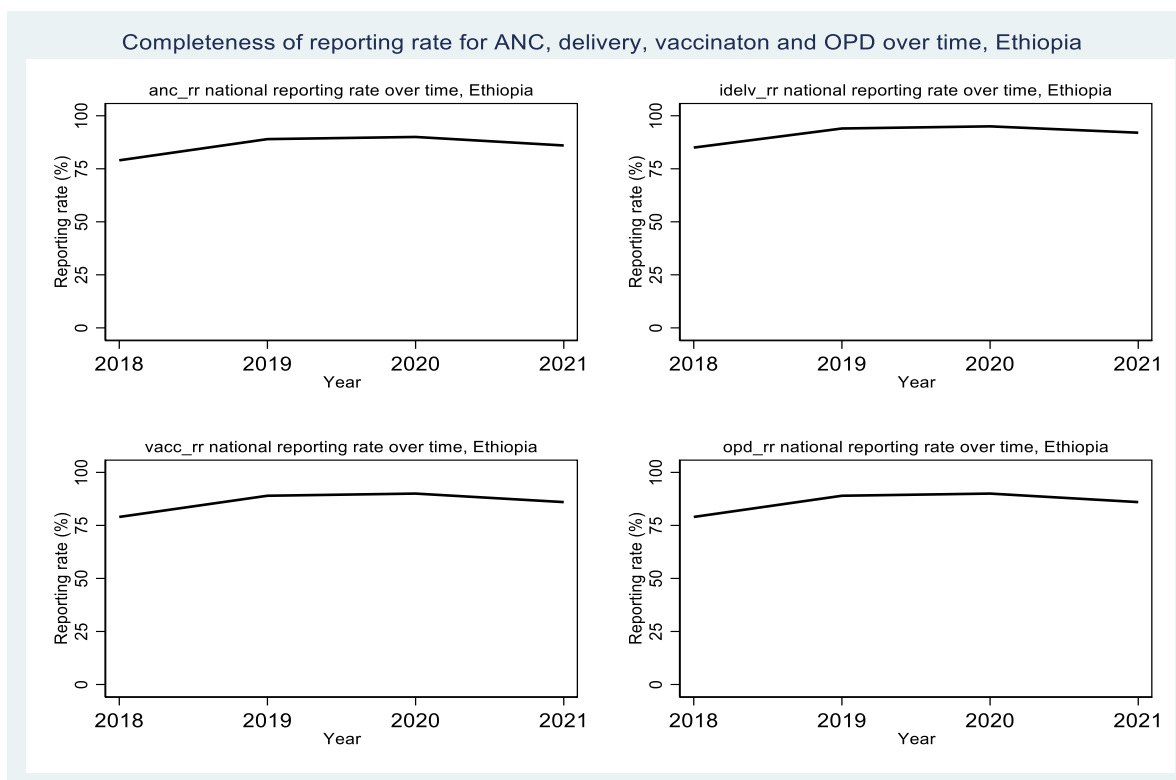


**Figure 2: Completeness of ANC1 reporting rates at national level (adjusted), 2018 to 2021**



**Figure 3: Completeness of ANC1 reporting rates by regional level over time (adjusted), 2018 to 2021**

Figure 4 shows the national level completeness of selected indicators over time. Data suggest that the national level report completeness was over 75 %, and the trend of completeness has increased for all indicators assessed overtime.



**Figure 4: Completeness of selected indicators over time (adjusted), 2018-2021**

Figure 5 below depicts the comparison of the reported vs adjusted number of ANC1 at national level. It shows that there was no considerable difference between the reported and adjusted number of ANC1 and the pattern was consistent across all regions. It is worth noting that only two years of data were used for analysis for the Tigray region (Figure 5).



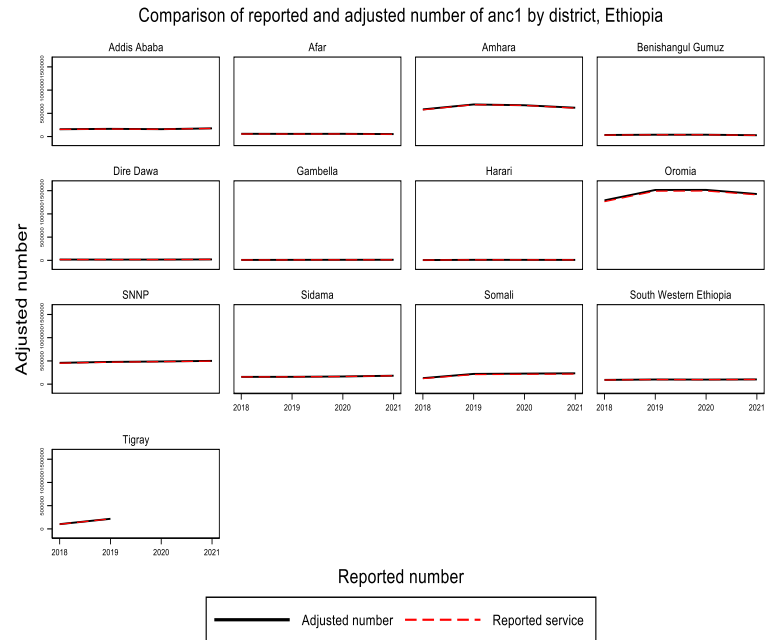


Figure 5: Completeness of selected indicators over time (Comparison between reported and adjusted)

### Assessment of outliers by indicators and regions

The assessment of ANC1 outliers in regions showed that there are no outliers, however a relatively wider variation on the distribution of ANC1 was observed in the two most populous regions, namely Oromia and Amhara.

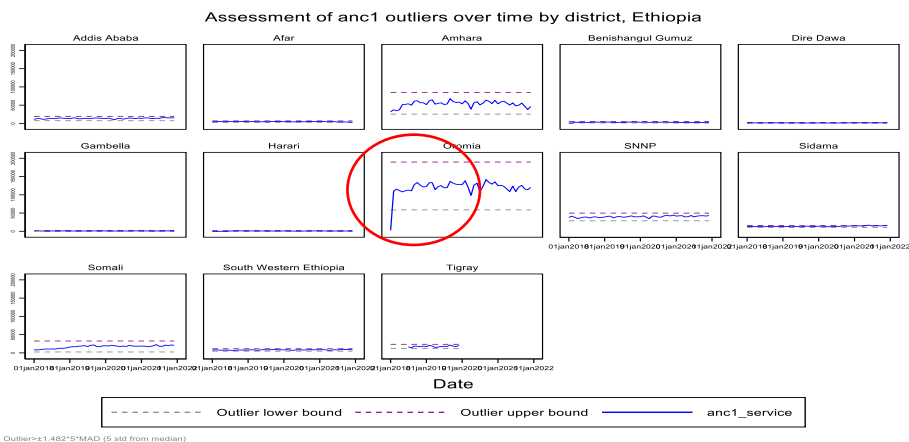


Figure 6: Assessment of ANC 1 outliers over time by district

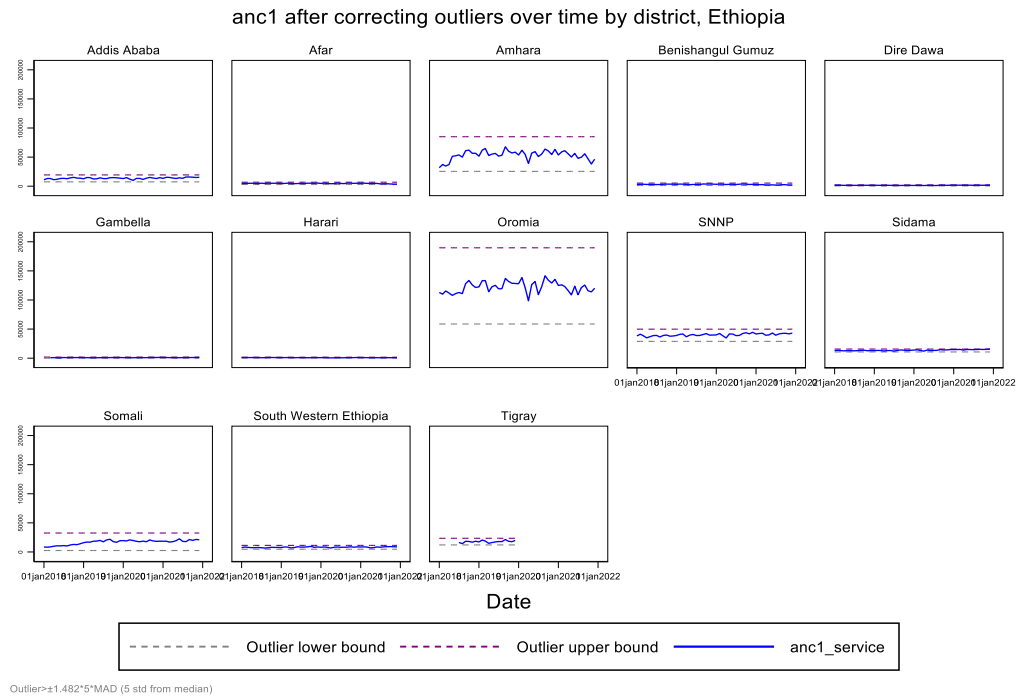


Figure 7: Assessment of ANC 1 outliers over time by district with outlier correction

Figure 7 and 8 showed that there was no major outlier for ANC 1 and Penta 1 over the years, by region.

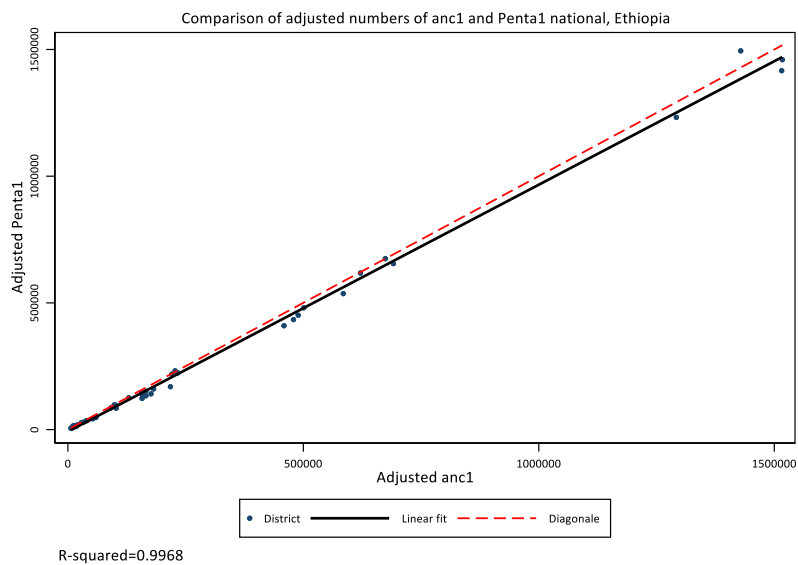


Figure 7: Comparison of the ANC1 and penta1 numbers, after adjustments

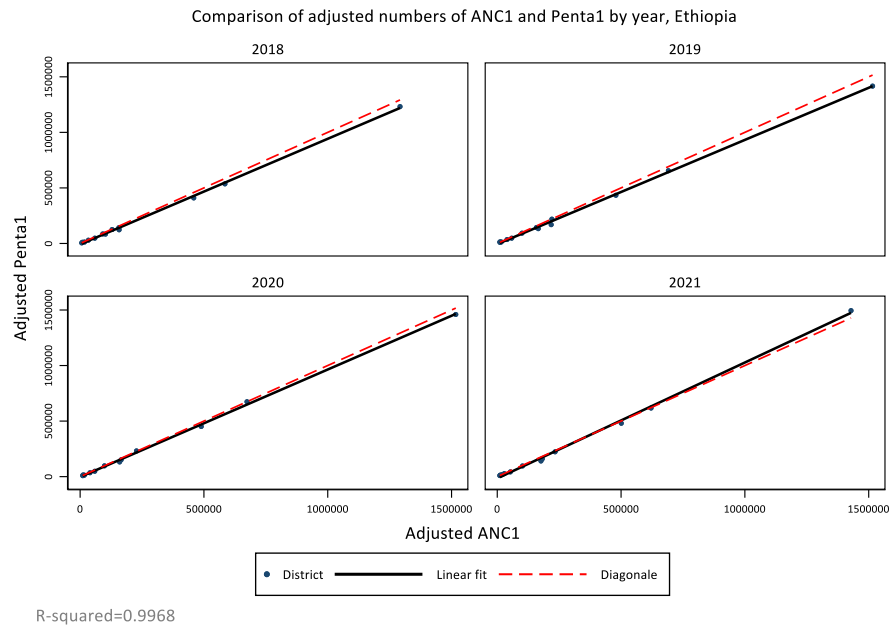
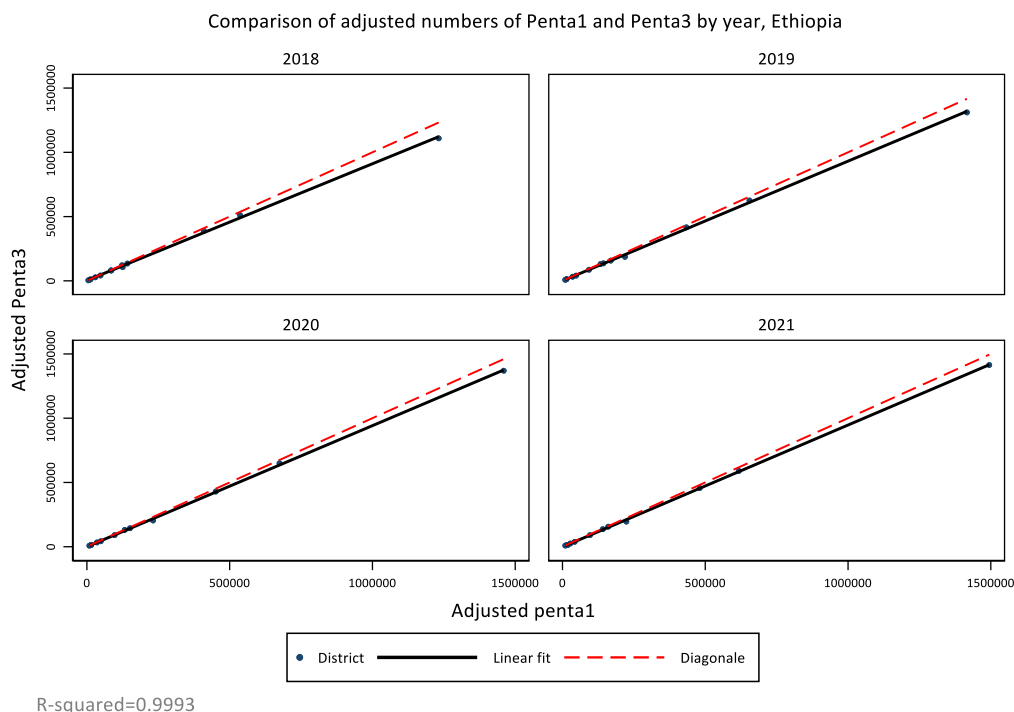


Figure 8: Comparison of adjusted number of ANC1 and Penta 1 by year

The consistency between the number of Penta 1 and penta 3 also showed consistency and no major outlier was observed over the years. (Figure 9 below)



**Figure 9:** Comparison of adjusted number of Penta 1 and Penta 3 by year

### Denominators or target populations

#### Assessment of the population projections in DHIS2

Ethiopian Ministry of Health used population data from the Central Statistical Agency (CSA) projection based on census that was conducted in 2007. The population data in DHIS2 is populated based on the conversion factors for different population groups such as total live births, surviving infants, total under 5 children, women in the reproductive age and etc..

Population data in DHIS2 was compared with UN population estimates for Ethiopia for the period 2018 to 2021. The result showed the following:

- There was consistent growth of population over time (both DHIS2 and UN pop projection)
- The gap between DHIS2 pop and UN pop was consistent over time
- UN pop was higher than DHIS2 pop over all the years in all projected populations

#### Population projections for denominators

- The projections in DHIS2 showed that the population growth rate was 2.18%, 3.477%, and 2.1822% in 2019, 2020, and 2021 respectively.
- Table 3: Assessment of the population projection figures used in DHIS2, 2017-2021

Demographic Parameter	2018	2019	2020	2021
Total Population (x1000)	98526.5	100676	97235.3	99380.5
Population growth rate (%)		2.15806	3.47716	2.18221
% of total population				
• Under 1 year	3.11995	3.11992	3.11409	3.11408
• Under 5 year	14.6728	14.6747	14.6815	14.6834
• Women 14-49 years	23.3581	23.3575	23.3497	23.3491
Crude birth rate (per 1000 population)	33.6677	33.6674	33.6247	33.6245
Crude death rate (per 1000 population)	33.6677	12.0869	-1.14698	11.8025

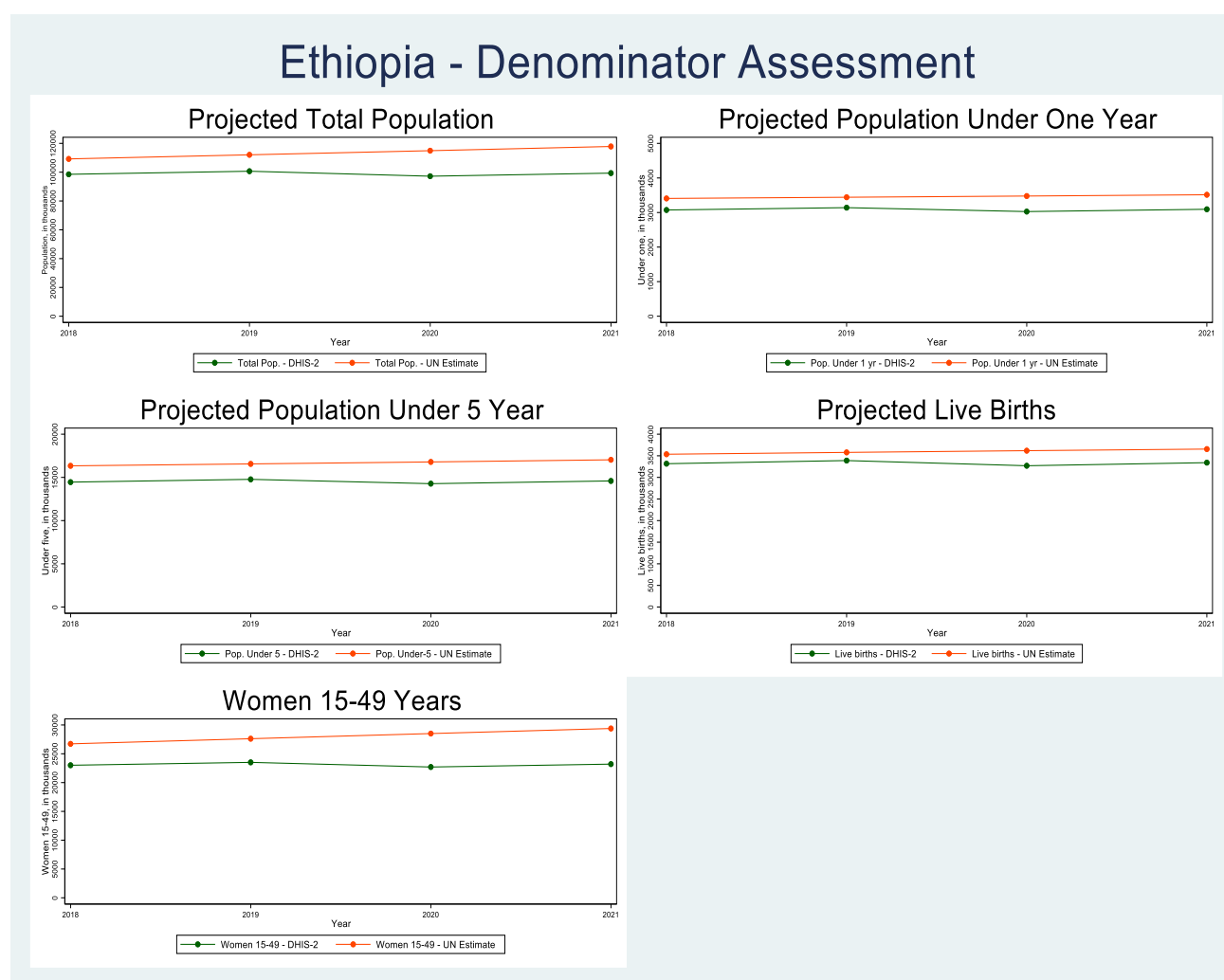


Figure 10: Projected population

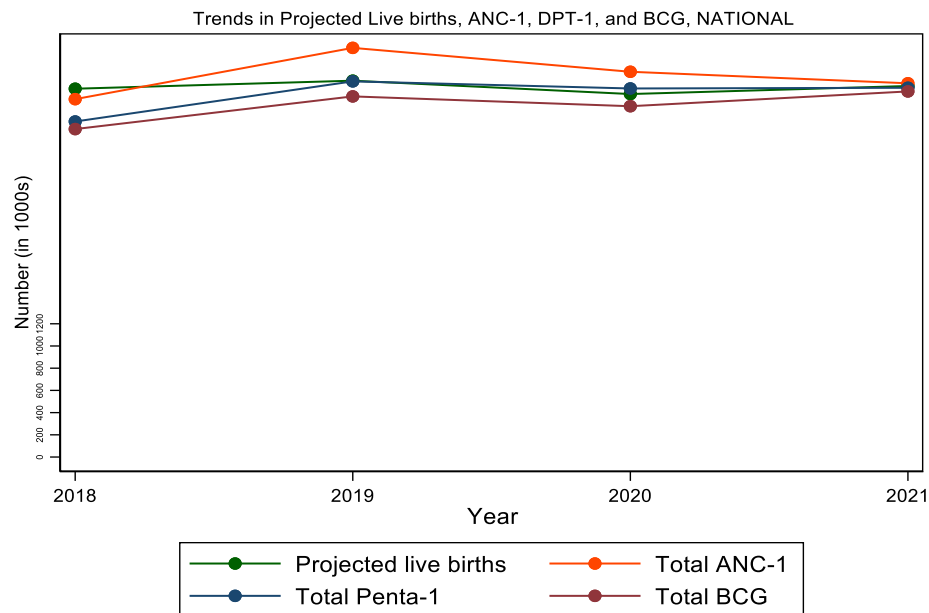
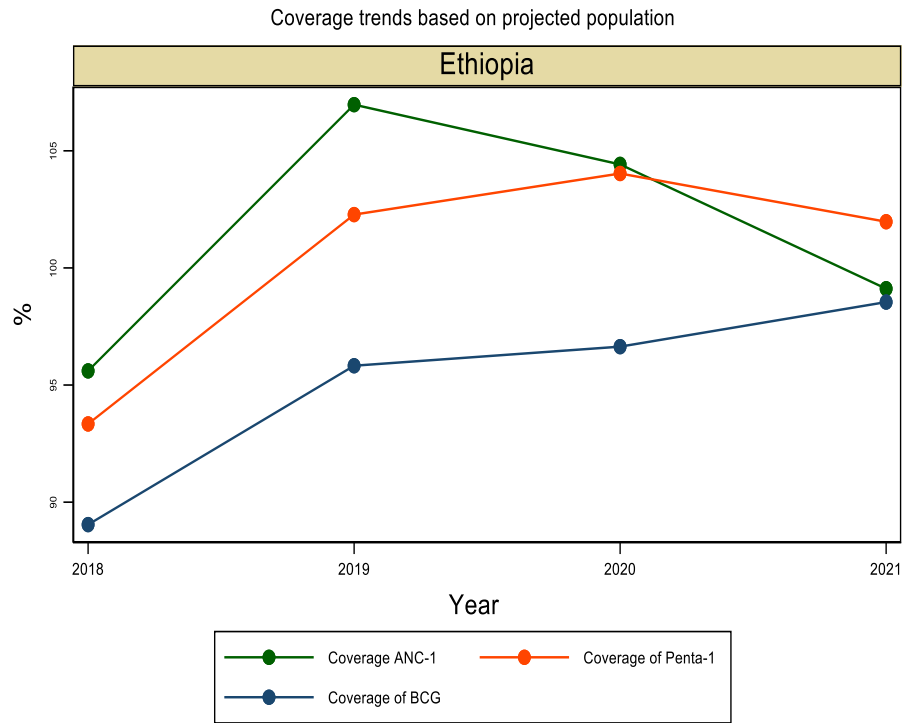


Figure 10: Coverage of selected indicators based on projected population

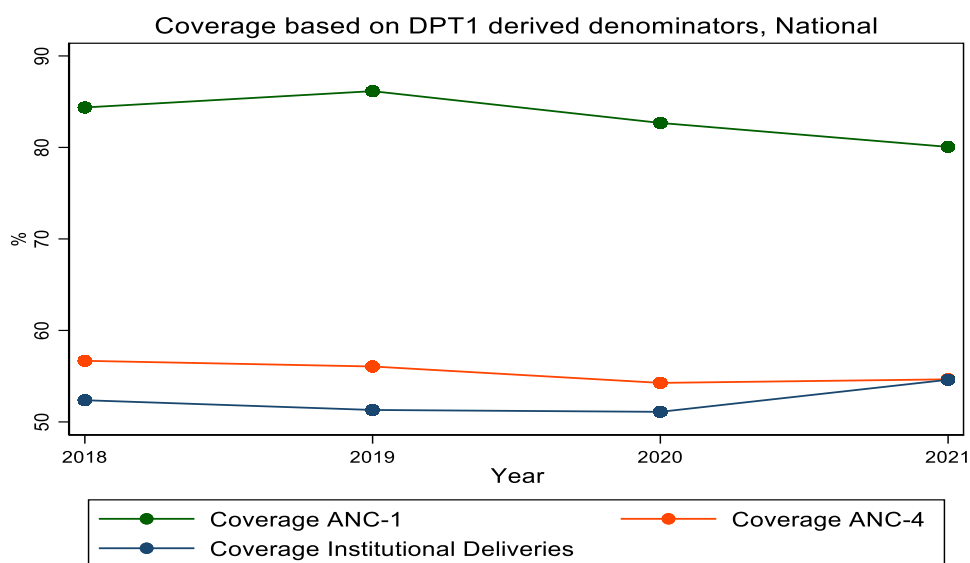
### Coverage Maternal and child Health Indicators: DPT1 based and ANC11 based derived denominators

The coverage of different maternal and child health indicators was computed based on DPT1, ANC 1 derived denominators, and the results showed that:

- Maternal health indicators (ANC 1, ANC4 and institutional delivery) showed a consistent trend across the years based on DPT 1 derived denominators. However, these indicators showed a noisy trend (steeply increment in recent years) when we use ANC1 derived indicators. For immunization indicators, a similar finding was observed in-terms of sharp increment in recent years. This shows that there should be a logical relation between the indicators to be used while computing denominators.

In DPT 1 derived denominators, coverage of maternal health and child health indicators showed increment over time (Figure 11a &b).

- The coverage of ANC1 declined from 2019 to 2021, ANC4 declined through time, and institutional deliver reduced from 2018 to 2020 and showed a slight increment in 2021.
- The coverage of measles and Penta three also increased throughout time, however Coverage of BCG declined until 2020 and rised up in 2021.



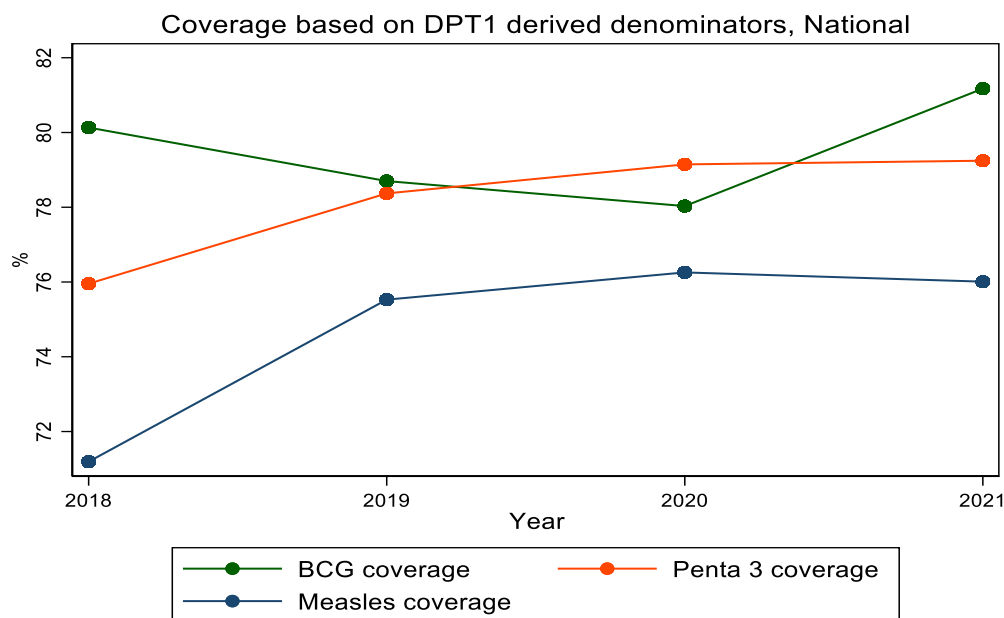


Figure 11a &b: Coverage of selected indicators based on DPT1 derived indicators

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In ANC1 derived denominators, coverage of maternal health and child health indicators showed increment over time (Figure 12a &b).

- The coverage of ANC1 increased from 2018 to 2019 while it decreased to 2020 and 2021 while BCG is increased through time, Penta 1 increased until 2020 while decreased in 2021
- In 2019, the performance has decreased because of internal conflict in Oromia , Amhara and Benishangul Gumuz regions
- ANC 4 coverage based on ANC1 derived denominator is slightly higher than to the 2019 DHS result (54 Vs 43)
- Institutional delivery based on ANC 1 derived denominator is almost equal to survey result (50 Vs 49)#
- Coverage of BCG, Penta 1, Penta 3 and Measles all showed increased throughout time, however, Coverage of Penta 1 and BCG coverage decreased in 2019.



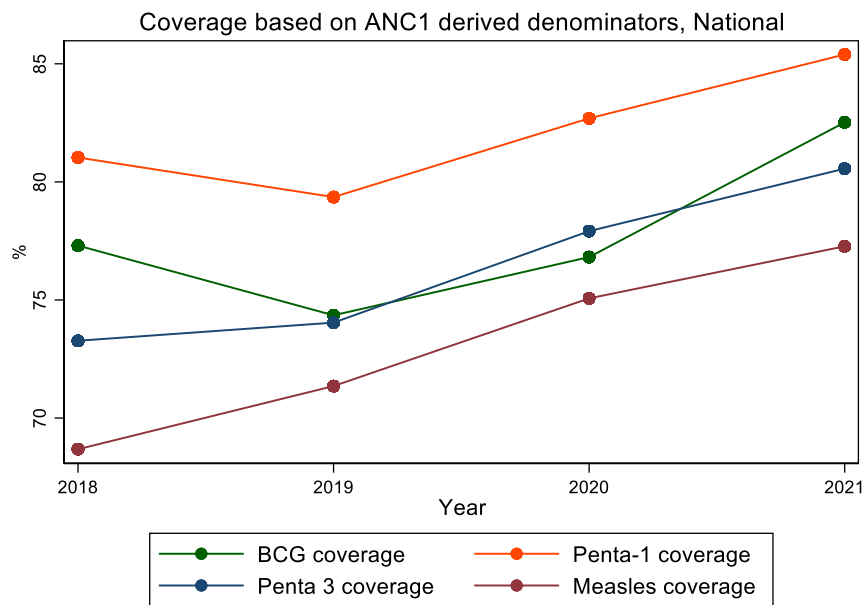
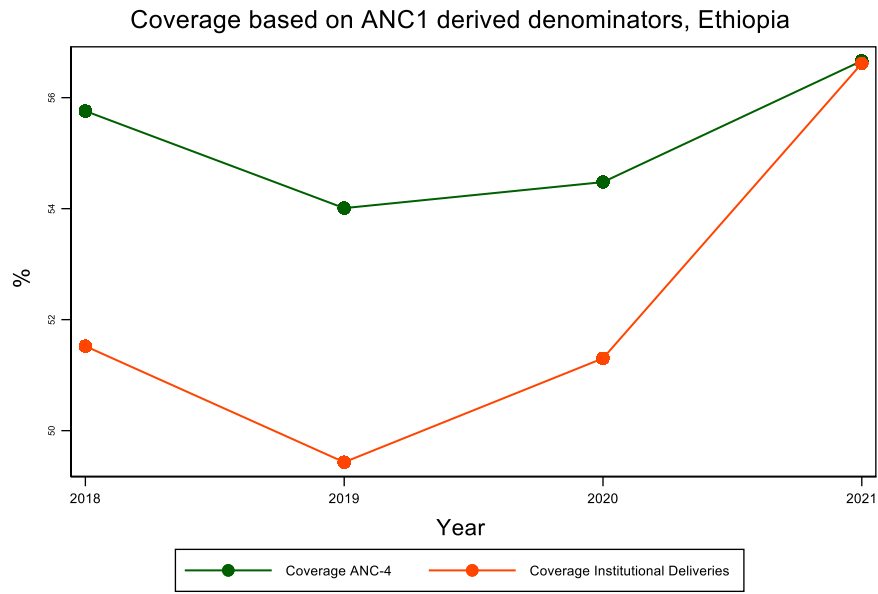


Figure 12a &b: Coverage of selected indicators based on ANC1 derived indicators

### Comparison between facility denominators based indicators and DHS findings

- Comparison between the DPT1 coverage versus EDHS in 2019 showed that the survey result was much lower. Based on DPT1 derived denominators, coverage of Maternal Health indicators decreased while child health indicators showed increment over time.
- For all the indicators, coverage based on UN and DHIS2 showed consistent change over time. However, the coverage based on UN projection was lower than the facility derived coverage as shown in the figure below.
- For all the indicators, DHS coverage was much lower than the UN based and facility derived coverages. For example, ANC 1 coverage was 74% based on DHS 2019 but the coverage was 102% and 106% based on UN based and facility derived denominator projection, respectively. In addition, Penta 3 coverage based on DPT 1 derived denominator was 78.4% but penta 3 coverage based on EDHS 2019 was 61%
- The UN Estimate is better to use as a denominator to estimate coverage

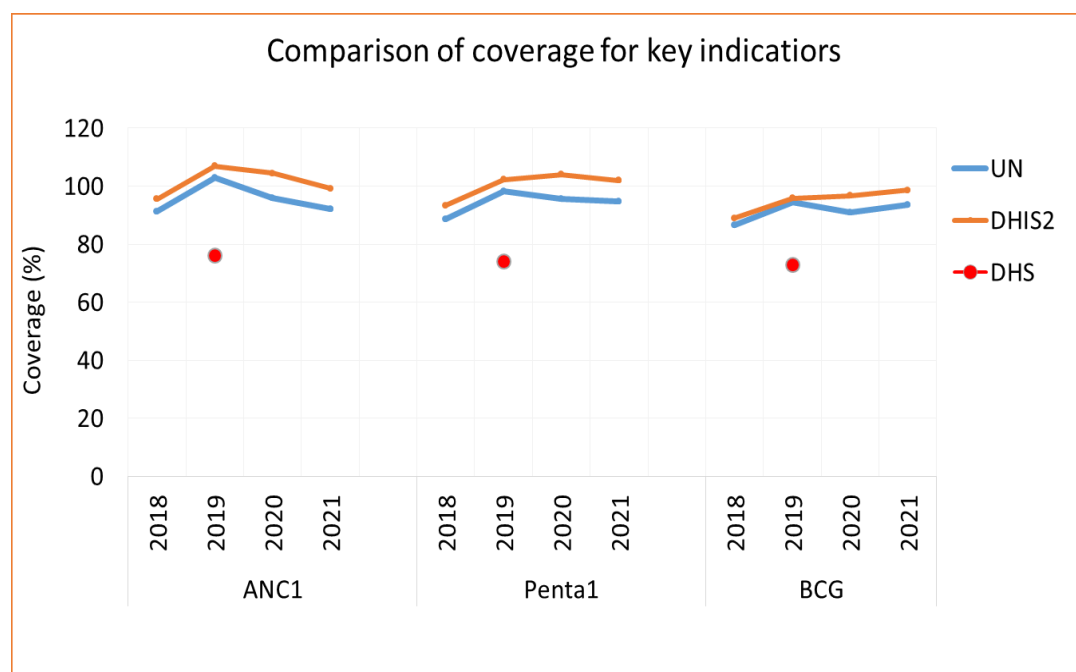


Figure 13: Comparison between facility denominators based indicators and DHS findings

### Coverage trends, equity analysis and subnational progress and performance

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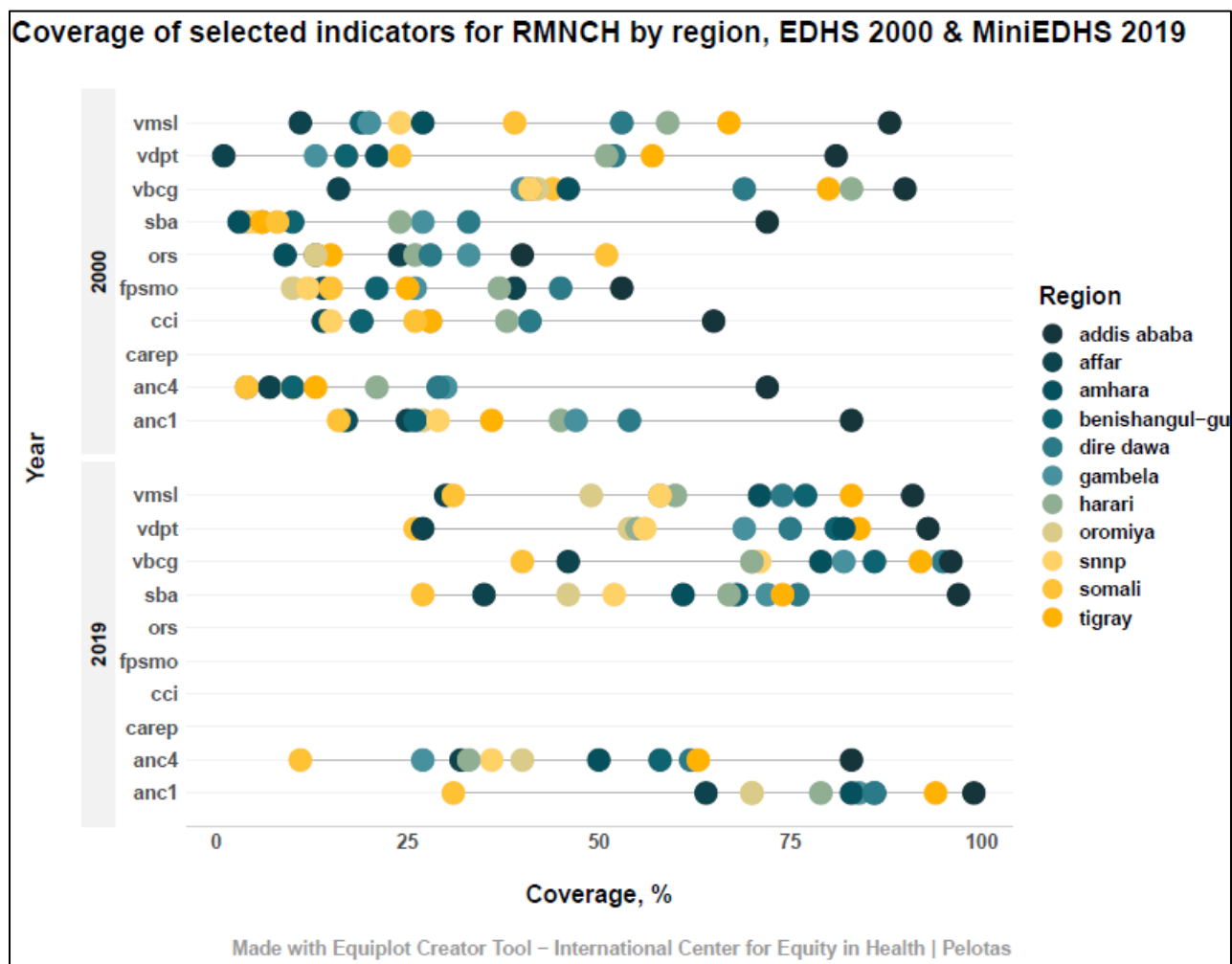
This analysis focused on the coverage and inequalities of selected RMNCH indicators based on Mini-EDHS -2019 and based on DHIS2 data from 2018 to 2021. First, Survey (Mini-EDHS 2019) was used to capture the big picture for the country by using the Countdown composite coverage index (CCI). The CCI includes eight indicators in four equally weighted intervention areas for RMNCH: family planning, maternal and newborn care, child immunization and treatment of sick children, based on the following formula:

$$CCI = 1/4 \left( DFPSm + \frac{ANC4 + SBA}{2} + \frac{BCG + 2DPT3 + MSL}{4} + \frac{ORS + CPNM}{2} \right)$$

The figure below showed there are inequalities in all indicators in all regions in maternal related indicators such as ANC visits, and institutional delivery. Inequalities also existed in child health care, such as child immunization. The summary index CCI for mini-EDHS 2019 was not calculated due to lack of data on some indicators on Mini-EDHS 2019.

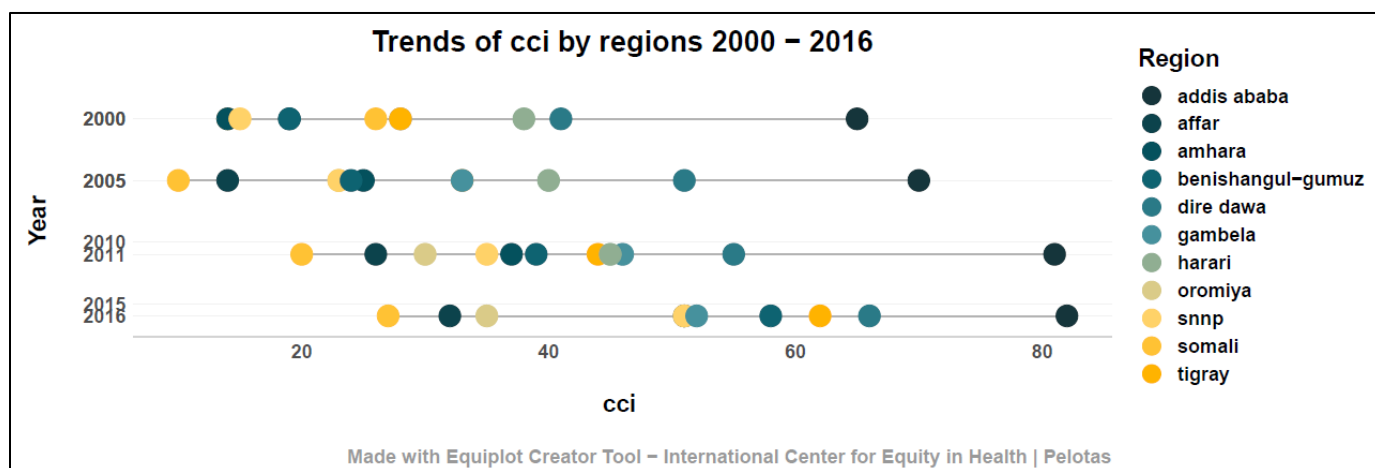
Based on the lengths of the equi-plot (Figure 14), all indicators showed a higher level of inequalities. Among the indicators, dpt3, measles, ANC4, and ANC1 showed the highest level of inequality in 2000. The gap in inequalities reduced in almost all indicators but the gap in inequalities increased in 2016 on measles, dpt3, family planning satisfied with modern contraceptive, and ANC visits.

**Figure 14:** Coverage of RMNCH indicators by each region, which compares the coverage of health indicators in EDHS 2000 & Mini-EDHS 2019



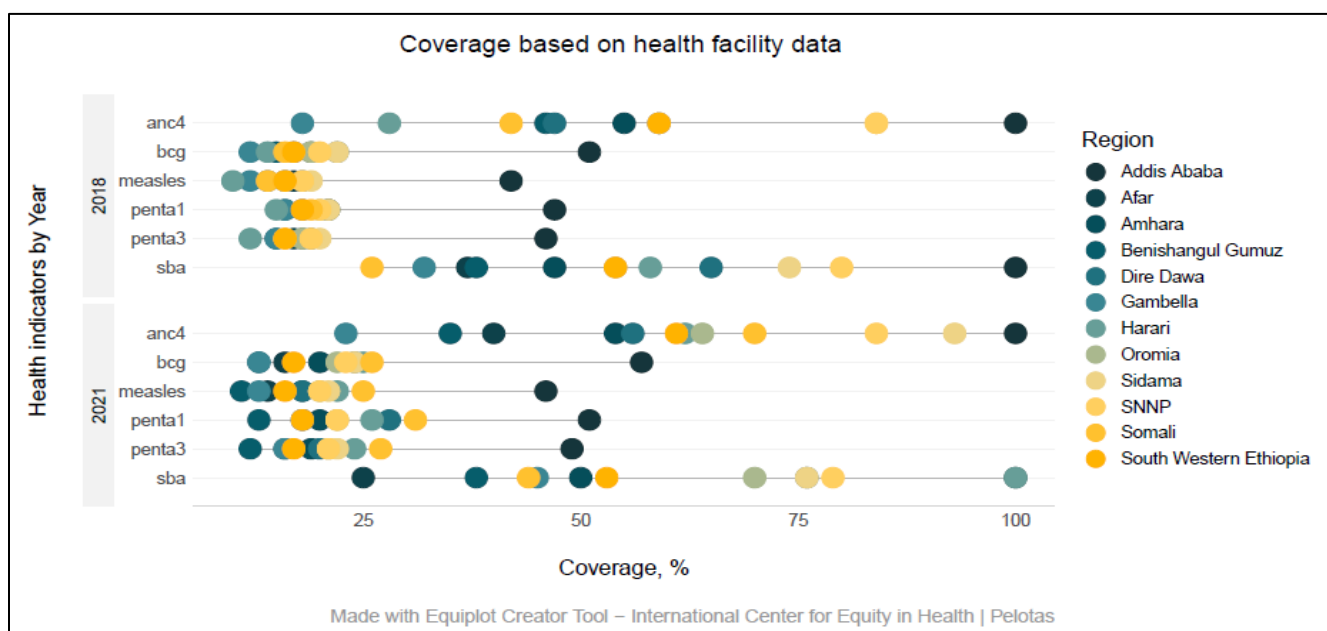
The composite coverage index also showed improving throughout time.

- In 2000, the lowest CCI were from the two most populous regions Amhara and Oromia regions, 14 for each. While the highest was from Addis Ababa, 65. The absolute difference of the CCI between the best performing and lower performing regions are 51.
- In 2016, the lowest CCI was from Somali, which was 27, and the highest was from Addis Ababa, which was 82. The absolute difference of the CCI between the best performing and lower performing regions are 55.

**Figure 15:** Composite coverage index (CCI) by region, EDHS 2000 - 2016

### Facility data derived coverage trends and equity

How do the regions perform and did inequalities during the HSTP – I periods? Second, this analysis focused on the coverage and inequalities of selected RMNCH indicators based DHIS2 data from 2018 to 2021 using the ANC1 and penta1 derived denominators. Here nine indicators analyzed to compare the regional results based on the facility data analysis and to assess whether the inequalities between regions had changed over time. A comparison of the coverage of the regions according to the health facility data and the survey data is useful to obtain a general picture of quality of data and the consistency of the results between different data sources. Still large inequalities exist in anc4 and sba than other among regions. However, the coverage showed increment from 2018 to 2021.

**Figure 16:** estimated Coverage of selected RMNCH by region, based ANC1 and DPT1 based derived denominators

### Inequality measure: using simple and complex inequality measures

Table 4 summarizes the Inequality measure using simple and complex inequality measures for the following selected indicators: ANC4, SBA, and DPT3. Both measures show inequalities in the utilization of services among regions in Ethiopia. However, the magnitude was different. The simple inequality measures (absolute difference, ratio) picked inequality between two extreme values (the highest and the lowest regions), while the complex measure showed the average value of the country.

The inequality of ANC4 among regions using simple inequality measures showed that the absolute difference between the best and low performer is 72.2 percentage points (PP) and the ratio is 8 PP. The complex measure of inequality among regions, mean absolute difference (weighted) is 9, which showed inequalities in the coverage of ANC4. The weighted difference of Penta3 and SBA among regions are 14.3 and 9.7 percentage points, respectively. The mean absolute difference from the mean-weighted (MADMW) Penta 1 and ANC4 inequalities high in 2018 and decreased in 2020 while increased in 2021. However, there are inequalities on the coverage of Penta 1. Both simple and complex measure of inequality indicated the presence of inequalities among regions on selected indicators such as ANC4, SBA, and Penta3.

Table 4: Inequality measure using simple and complex inequality measures of selected indicators

Indicator	Ethiopia equity status			
	<i>Simple Measures</i>		<i>Complex measures of inequity</i>	
	<i>Absolute Difference</i>	<i>Ratio</i>	<i>Unweight mean absolute difference</i>	<i>Weighted mean absolute difference</i>
ANC4	72.8 PP	7.9	20.3 PP	8.8 PP
SBA	70.7 PP	3.6	20.3 PP	9.7 PP
DPT3	66.9 PP	3.63	25.2PP	14.3 PP

\*PP- percentage points

### Private sector bias

#### Master list of health facilities, December 2021

The master list is a complete list of all active health facilities in Ethiopia, with a total number of 26628 HFs classified into 5 main categories (specialized hospital, general hospital, primary hospital, health center and health post) and with designation of management authority as government and non-government. Tables 5 below provide the distribution of the health facilities by region and by facility type. Of the 26628 health facilities, 420 (1.6%) were hospitals (public and private), and 3731 (14.0%), 4916 (18.5%), and 17561 (65.9%) represent health centers, clinics and health posts respectively. Among all the facility types, 81.25% of them are public facilities. Among the 420 hospitals, 353 (84%) are government hospitals and 67 (16%) are non-government (private profit and private-for-not profit). Among the 3731 health centers, most of them are government; only a few of them (0.7%) are private. Among the 4916 clinics, 98.0% are private the remaining are NGO or government.

Health posts are community-based health institutions that are owned by the public and provide mainly health promotion and disease prevention services, but they also provide basic curative services such as treatment of malaria, treatment of diarrhoea and Acute respiratory infections for children under 5 years of age.

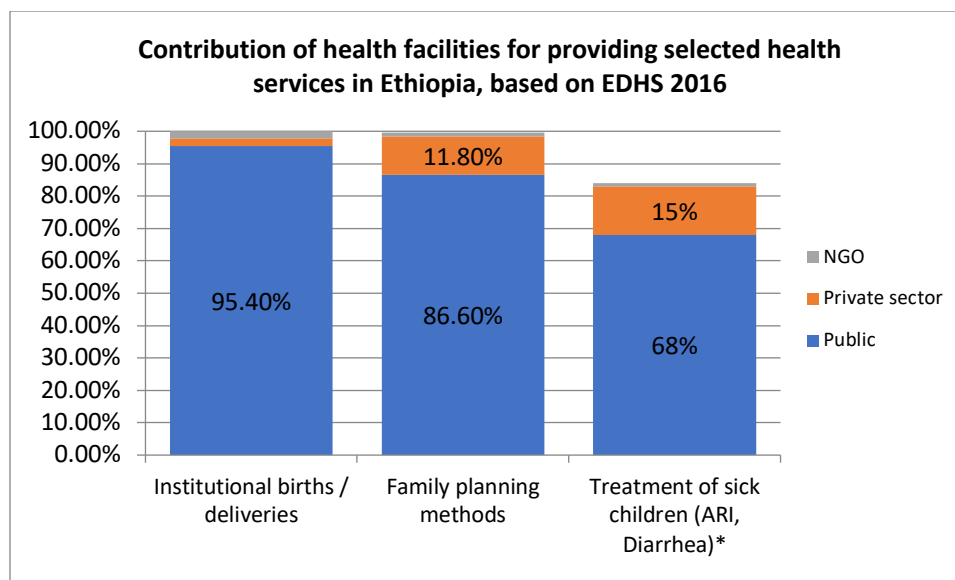
Table 5: Types of health facilities in Ethiopia

Type of facility	Public	Private-not-for-profit	Private-for-profit	Other	Total
Hospital	353 (84%)	4 (1%)	55 (13%)	8 (2%)	420
Health centres	3,706 (99%)	22 (1%)		3 (0.1%)	3731
Health posts	17,561 (100%)	NA	NA	NA	17561
Clinics	NA	80 (2%)	4836 (98%)	NA	4916
Total	21,620 (81%)	106 (0.4%)	4,891 (18%)	11 (0.04%)	26628
Total (excluding health posts)	4,059 (45%)	106 (1%)	4,891 (54%)	11(0.01%)	

The private sector plays an important role in the treatment of fever in children under 5 years -15% and provision of modern family planning methods – 12% are provided by private-for-profit facilities. For deliveries the private sector plays a much smaller role, especially the private-for-profit facilities (2.5% of all births) and 2.1 % by NGO facilities and 95.4% in public facilities. The majority of under 5 children sought treatment advice for ARI and diarrhea from the public facilities. Only 15% of children received treatment advice at private health facilities

In general, the share of the private sector for maternal and child health care was low, despite the high number of private health facilities in the country. This may be due to the fact that most RMNCH services are exempted from payment at public health facilities

Figure 17: Source of services: percent distribution of public, private for profit, private not for profit (NGOs) for modern contraceptives (among currently married women), institutional births and treatment of fever among children under 5 years.



### Conclusion and Recommendations

- In Ethiopia, data completeness has improved and consistency between related indicators has also improved over time in all the regions of Ethiopia
- DHIS2 based denominator was found to be similar with the UN based estimates and therefore can be used to compute coverage of RMNCH indicators
- The evidence generated based on the health facility data can be used for decision making to improve the health of mothers and babies
- There is a huge inequality in RMNCH service indicators based on different parameters. However, inequality has shown some improvement over time. To narrow the gap in inequality, multi-sectoral approach need to be implemented to improve population health outcomes
- The share of private sector for improving the coverage of indicators are not ignorable, but needs attention to improve the health of mother and baby

Based on the findings, we recommend the following key recommendations

- Conduct routine data quality check and provide feedback to sub-national level, to address data quality issues
- Perform regular data triangulation using data from different data sources and identify potential reasons for any discrepancies
- Conduct regular equity analysis using different equity parameters and monitor the change over time
- Implement phase based implementation approach to improve reporting from the private sector
- Engage program managers and policy makers to use evidence for program performance improvement.