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

TANZANIA

A brief synthesis report based on an endline analyses

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Background

This brief report describes the data, methods, and results of an analysis of the health facility (and other) 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 administrative units in countries.

The aim of this 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 (maintained in DHIS2 software) a clean data set is created for the endline review. This is done through a systematic approach, with major 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:

A. Description of the data set: describes the number of facilities and key indicators
B. Data quality assessment and adjustment: presents the data quality score card and adjustments made to develop a clean data set for the endline analysis
C. Denominators or target populations: assesses the population projections and DHIS2 denominators, and applies a facility data derived denominator method; presents the annual coverage trend by year for the main indicators of the endline analysis
D. Private sector bias: aims to assess the potential size of a private sector reporting bias
E. Subnational analyses: a comparison of regional coverage (using indexes) between the TDHS 2016 and the DHIS2 statistics and an assessment of the extent to which inequalities between regions have changes from 2017 to 2021
F. Potential further analyses: analysis of subnational progress and performance using health system inputs and coverage; analysis of the facility data on maternal mortality, stillbirths; analysis of the outpatient and inpatient data.

A Description of the data set

Tanzania mainland has 26 regions and 184 councils (municipal, town or district). According to the DHIS2 database there are 10,210 health facilities.

Monthly district data, extracted from DHIS2 were analysed for 16 indicators with data for the period January 2017 to December 2021. After data quality assessment and adjustment, the monthly district data were aggregated to annual regional data for this analysis.

Survey data were used for assessment of the denominators of the facility data derived coverage statistics and for external comparison of the coverage statistics. The main surveys conducted from 2016 were TDHS 2016, TPHIA 2017 (HIV), TMIS 2017 (malaria), TNNS 2018 (nutrition). The last census was conducted in 2012.

Table 1: Health facility data summary

Indicator	
Administrative organization	
Number of provinces / regions / counties	26
Number of districts/councils	184
Health facilities	
Number of health facilities in country	10,210
Data on core health professionals	No
Data on hospital beds	Yes
Facility data analysis period	
First month and year with health facility data	1st January 2017
Last month and year with health facility data	31st 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

B Data quality assessment and adjustment

The data quality score card shows that the quality of the DHIS2 health facility data was high (Table 2). The completeness of reporting was at least 90% across the years for seven indicators: ANC, FP, Institution deliveries, OPD, IPD, PNC and child vaccination. Extreme outliers were few and the consistency of reporting of different indicators was good.

Reporting rates were high for all interventions and also the percent of districts with low reporting rates (below 80%) was small for all indicators (Figure 1). An adjustment was made for incomplete reporting by assuming that the non-reporting facilities provided some services (k=0.25, i.e., a quarter of the service volume compared to those facilities that did report).

Extreme outliers in the data were corrected (example in Figure 2), and consistency between ANC1 and penta1 and penta1 and penta3 was high (Figure 3). Outliers in the monthly values were corrected by imputing a value based on the median value of the calendar year.

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

	<60%
	60%-80%
	≥80%

No		2017	2018	2019	2020	2021
1	Completeness of monthly facility reporting (green >80%) *					
1a	% of expected monthly facility report (mean, national) ¥	94	95	95	96	97
1b	% of districts with completeness of facility reporting >80%¥	94	96	97	97	98
1c	% of facilities with no missing monthly values in the year ¥	100	100	100	100	99
2	Extreme outliers (Green: >95%)					
2a	% of monthly values that are not extreme outliers (mean, national) *	100	100	100	99	97
2b	% of districts with no extreme outliers in the year *	97	98	97	96	86
3	Consistency of annual reporting (Green >85%)					
	(Ratio ANC1-Penta1 numbers; national)	1.06	1.1	1.09	1.2	1.18
3a	% of districts with ANC1-Penta1 ratio between 1.0 and 1.5	63	77	68	69	70
3b	Ratio of Penta1-Penta3 numbers (national)	1.11	1.1	1.09	1.09	1.1
	% of districts with Penta1-Penta3 ratio between 1.0 and 1.5	91	93	85	88	88
	Annual data quality score (Mean indicator 1a to 3b)	91	94	92	92	91

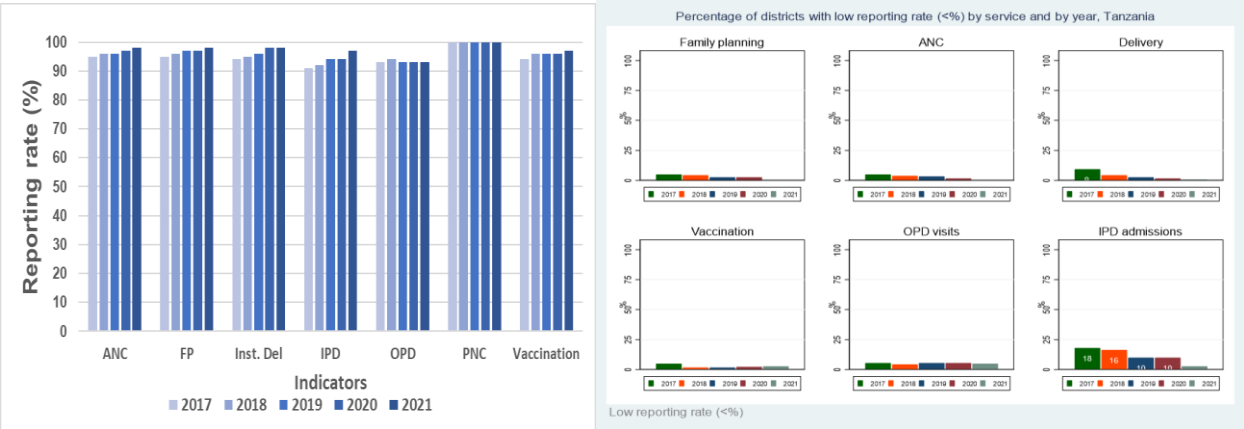


Figure 1: Completeness of reporting (mainland) and percent of district with low reporting rates (<80%).

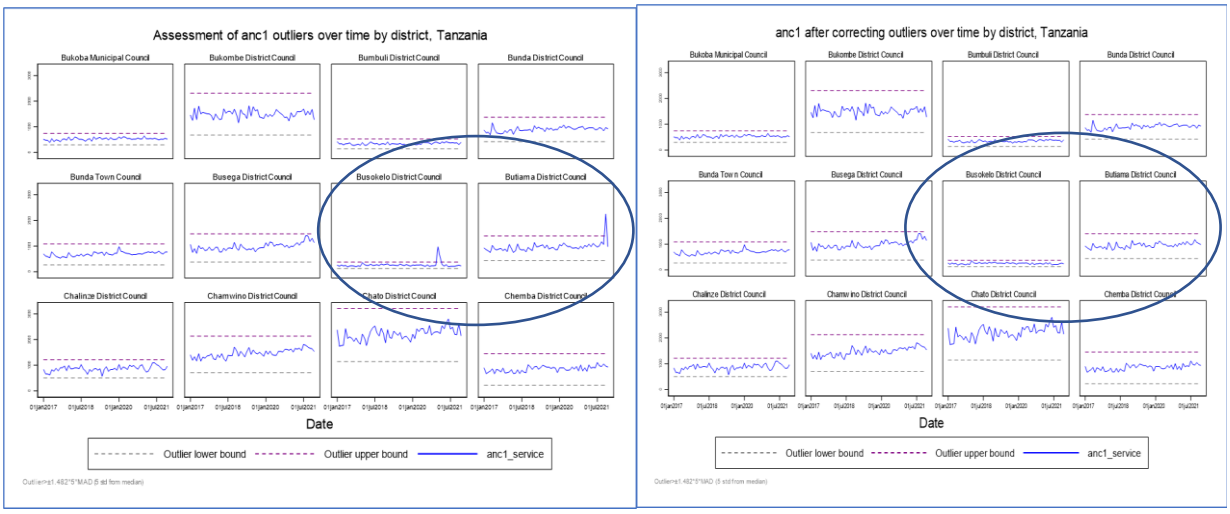


Figure 2: Example of adjustment for outliers for ANC first visit in two districts before and after correction.

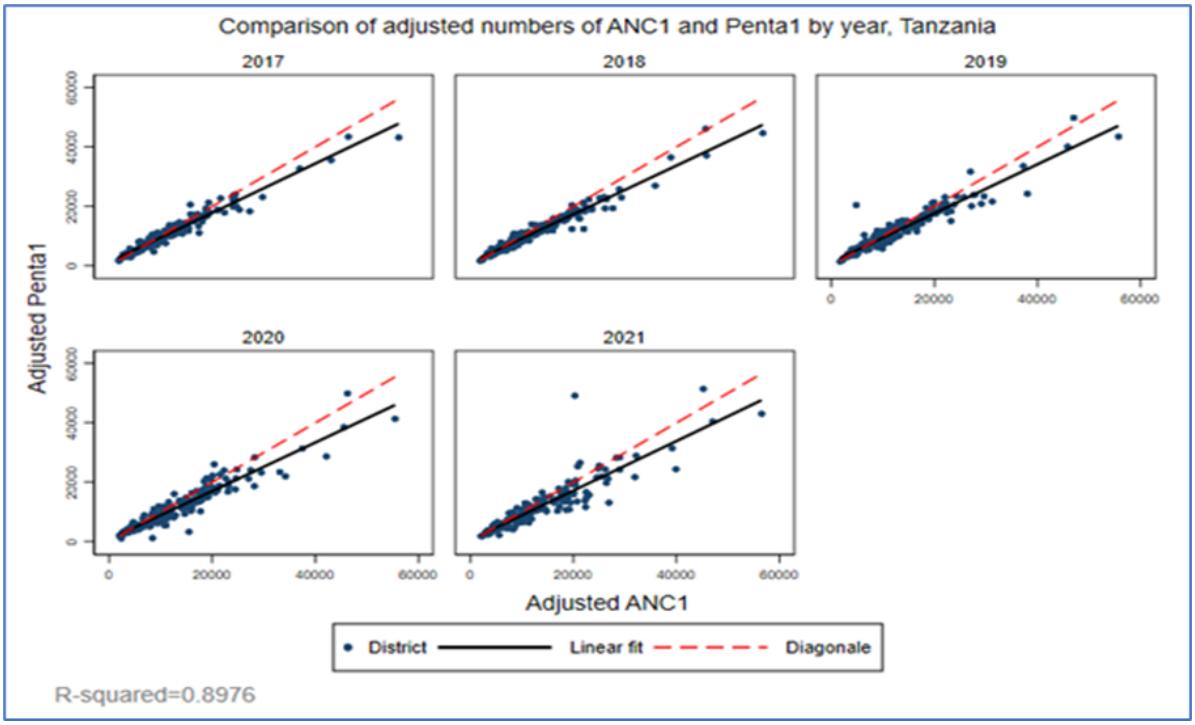


Figure 3: Comparison of the ANC1 and penta1 numbers, mainland totals, after adjustments

C Denominators / target populations

The denominators based on the 2012 census population projections were not considered adequate for estimation of target populations for the coverage indicators. The alternative denominator based on the health facility data reports for high coverage interventions provided plausible results for most indicators.

Population projections for denominators

The projections in DHIS2 were unstable and not internally consistent (Table 3). For instance, in 2019 the population growth rate was 3.1% and the crude birth rate was 32.7 per 1,000 population. This means that the crude death rate would have to be 1.7 per 1,000 population which is not possible. The population growth increased in 2020 and decreased in 2021, to return to the 5-year average of 3.1% per year.

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

Demographic Parameter	2017	2018	2019	2020	2021
Total population (× 1000)	51020	52619	54265	56430	57724
Population growth rate (%)	-	3.1	3.1	3.9	2.3
Age/sex population proportions					
(% of total population)					
Under 1 year	3.8	3.7	3.7	3.6	3.7
Under 5 years	17.5	17.4	17.2	16.9	17
Women 15-49 years	24.4	24.4	24.6	24.5	24.8
Crude Birth rate (per 1000 population)	28.5	32	32.7	32.4	31.4
Crude Death Rate (per 1000) = CBR minus - pop.growth rate *10		1	1.7	-6.6	8.4

The comparison of the DHIS2 demographic indicators with the UN Population projections also show the deviations in 2020 and 2021 (Figure 4, if the ratio is 100 the two values are the same).

Important for the RMNCH analyses is the number of (live) births. The ratio of DHIS2 to UN estimates of livebirths was 71.6% in 2017 then increased to 81.3% in 2018 and remained at that level. This indicates that the numbers were much too low in DHIS2. (Figure 4).

As a result, the coverage rates for ANC1, BCG and first pentavalent vaccination were all well over 100% for all years, which is not possible.

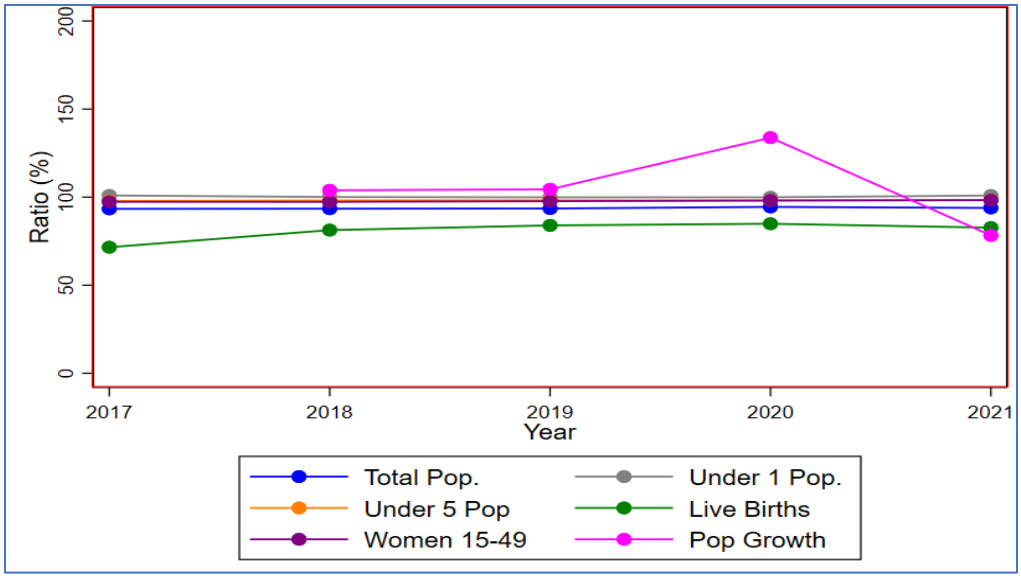


Figure 4: Comparison of the population indicators in DHIS2 with the UN (ratio 100 means the same)

Facility data derived denominators

According to the TDHS 2016 (and other surveys), the coverage of selected interventions is close to 100%. ANC1 98%, penta1 97%, BCG 97%. Coverage of these interventions is high in all regions of the mainland.

This means that the number of reported ANC1 visits to the facilities reported in the DHIS2 should be close to the number of pregnant women at about 4-5 months (the timing of the 1st visit) 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 this method the denominators or target populations are derived from the reported numbers in the facility data. We added those who never use the services (2% for ANC1 and BCG, 3% for penta1).

To obtain live births from these denominators we subtract from the total number of women pregnant at 4-5 months obtained from ANC1 numbers, pregnancy loss (5% abortion, 2% stillbirths) and add twins (1.5%). To obtain live births from the immunization numbers, we use penta1, add the percent that never used the services (3%) and add 3% for neonatal deaths. (BCG is also possible, but the numbers seem to be too high in Tanzania, probably due to recording of revaccination of infants in case the BCG scar is not visible).

Table 4 and Figure 5 present the results for key coverage indicators based on the facility data derived denominators for the period 2017-2021.

Table 4: Coverage statistics based on facility-data-derived denominators (ANC1, fixed at 98%, or penta1 fixed at 97%), DHIS2 data, 2017-2021, mainland Tanzania

	2017	2018	2019	2020	2021
ANC1*	98	98	98	98	98
ANC4	44	58	74	83	96
Institutional births	69	75	78	79	79
IPT2	65	80	86	78	77
Postnatal care < 48 hrs	54	61	68	70	71
Penta1	97	97	97	97	97
Penta3	87	88	90	90	90
Measles	97	97	96	95	94

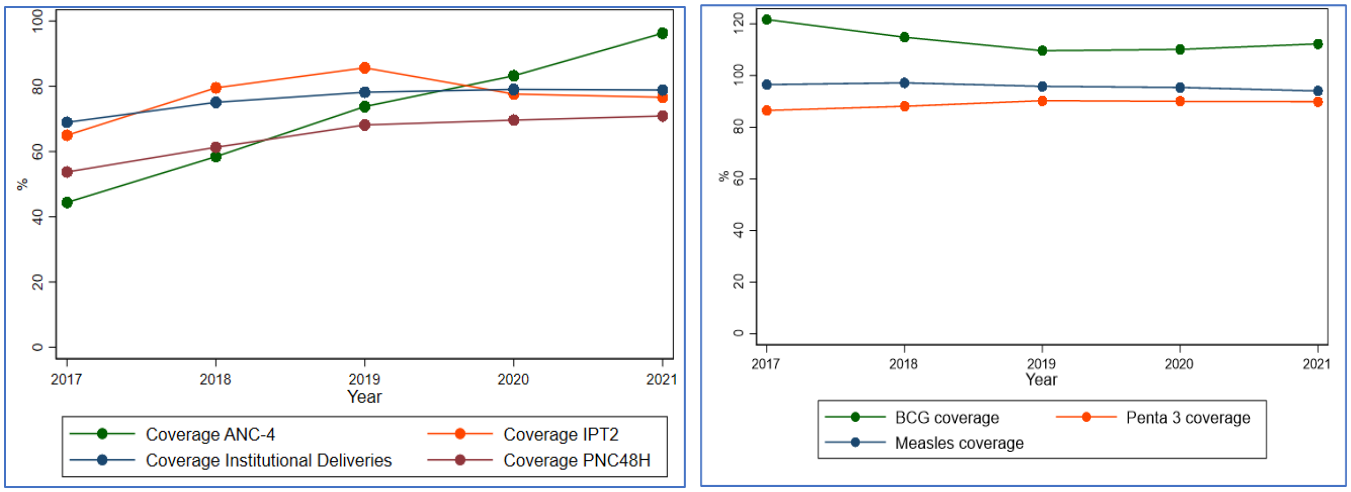


Figure 5: Coverage of maternity indicators (ANC4, IPT2 & institutional deliveries) & based on ANC1 denominator and immunization based on penta1 denominator

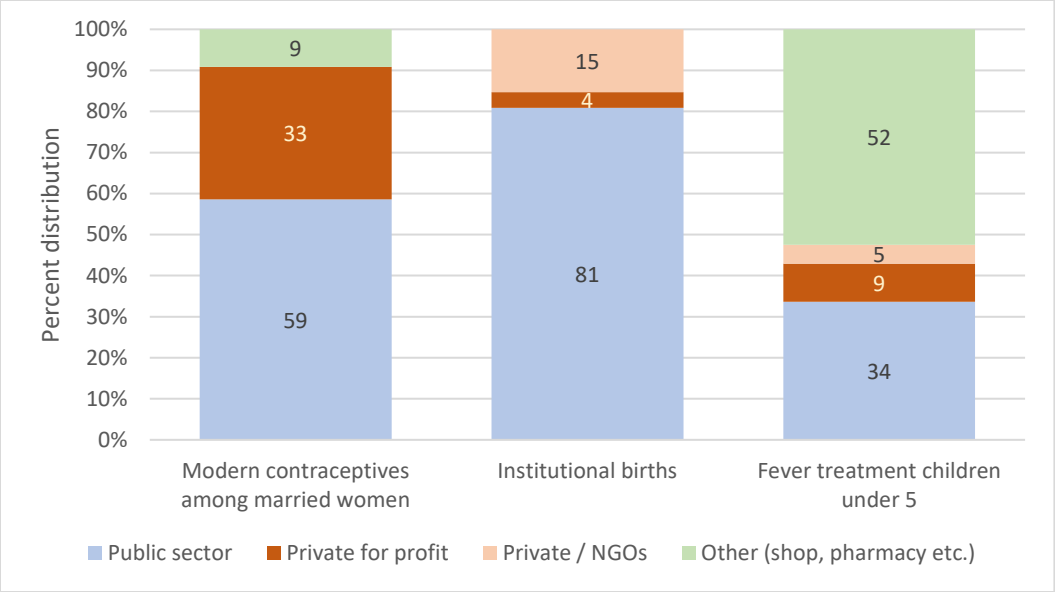
D Examining the private sector bias in the health facility data

The private sector health facilities should report through the DHIS2, but often is under-reporting. The extent to which this affects the completeness of DHIS2 data can be evaluated through (1) the share of the private sector in service provision of specific services (2) the share of the private sector in the master list of facilities, for urban and rural and possibly by region (3) the completeness of the master facility list in terms of including the private sector.

The percent of health facilities that are private (for profit or not-for-profit) is large according to the DHIS2 master facility list: 39%. Many of these smaller facilities are likely limited to curative services.

The TDHS 2016 provides insights on the share of the private sector in modern contraceptives, institutional births and treatment of fever in children under 5 years (Figure 6).

The private sector plays an important role in the provision of modern family planning methods – 33% are provided by private-for-profit facilities and another 9% by NGO facilities. For deliveries the private sector plays a much smaller role, especially the private-for-profit facilities (4% of all births). 15% of births take place in NGO facilities and 81% in public facilities. For treatment of fever in children under 5 more than half of mothers used treatments from the shops. The private facilities account for 14%, 9% to private for profit and 5% to NGO facilities, compared to 34% in public facilities.



*For contraceptives no distinction between private for profit and NGOs was made.

Figure 6: Source of services: percent distribution of public, private for profit, private not for profit (NGOs) and other sources (shops, pharmacies) for modern contraceptives (among currently married women), institutional births and treatment of fever among children under 5 years, TDHS 2016

The DHIS2 data for 2021 showed that only 5% of contraceptives were provided by the private sector facilities, 15% of institutional births and 24% of treatment of pneumonia cases. These figures seem fairly consistent for institutional births and treatment of sick children (excluding those treated in non-formal health facilities), suggesting good coverage of the private sector by the DHIS2, but not for family planning.

E Subnational analysis

How do the regions perform and did inequalities reduce during HSSP IV? First, we take a look at the inequalities by region in the TDHS 2016. To capture the big picture for the regions, we calculated coverage index as an average in five mother and child health indicators: ANC4, institutional birth coverage, postnatal care, pentavalent and measles vaccination coverage. The RMNCH coverage index ranged from 41% in Katavi to 82% in Dar es Salaam region. In addition to Katavi, Tabora, Geita, Shinyanga and Simiyu had a CCI below 50% (and three of the five were relatively new regions) (Figure **7**).

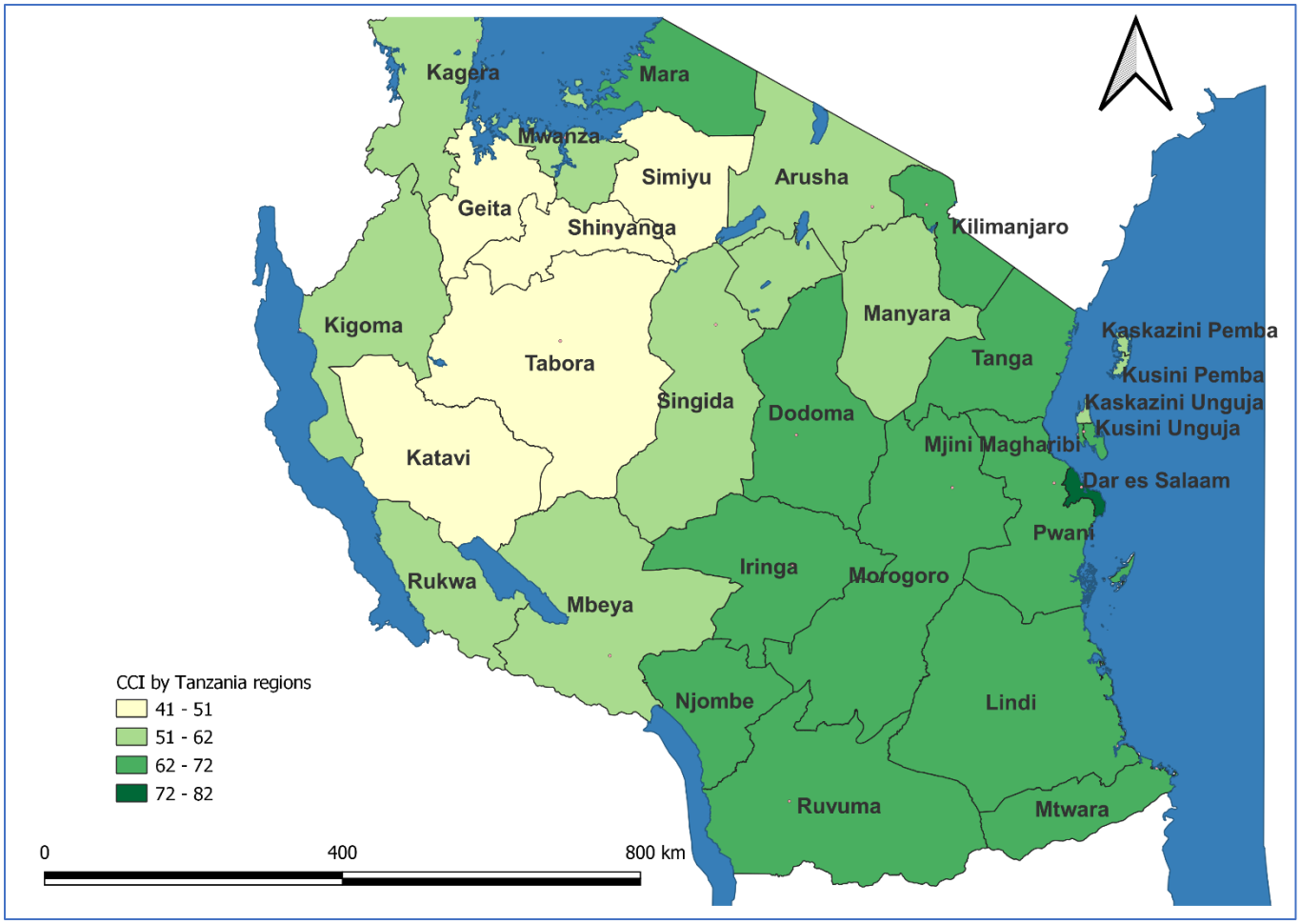


Figure 7: RMNCH Composite coverage index (CCI) by each region, TDHS 2016

Based on the lengths of the equiplot (Figure **8**), two indicators with the highest level of inequality in terms of coverage across regions in Tanzania are: ANC4 and institutional deliveries. Postnatal care is observed to have missing information in many regions, only 7 regions had data on postnatal care.

Indicators with low level of inequality in terms of coverage across regions in Tanzania are: Pentavalent and measles vaccination coverage (Figure **8**).

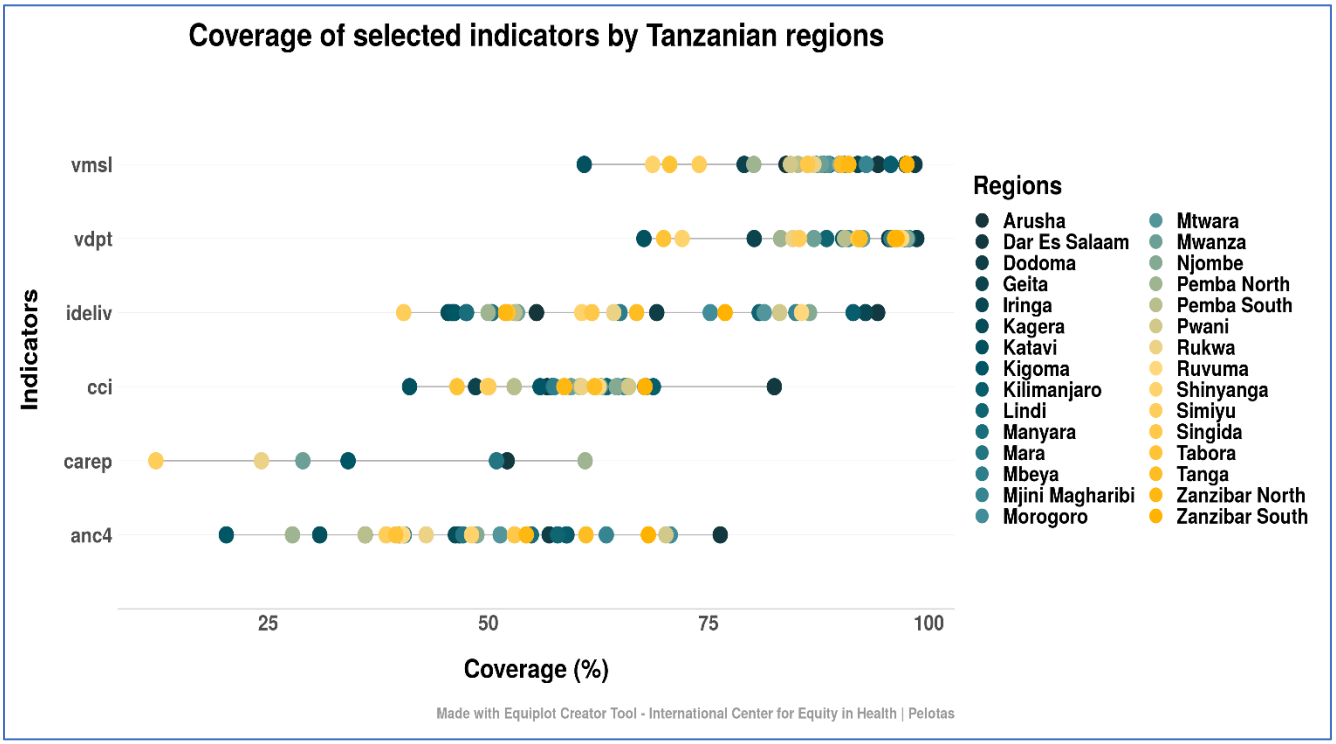


Figure 8: Coverage of individual indicators and CCI for RMNCH by region, TDHS 2016

Second, we summarize the coverage for selected indicators based on the health facility data: ANC4, institutional birth coverage, IPT2, postnatal care with 48 hours (all based on the ANC1 derived denominator) and pentavalent 3rd dose and measles vaccination coverage (based on the penta1 derived denominator), in 2017 and comparing to 2021(Figure **9**). Large inequalities exist for postnatal care within 48h, institutional deliveries and IPT2 in 2017 and 2021. While pentavalent third dose and measles vaccination coverage were observed to have low levels of inequality in 2017 and 2021.

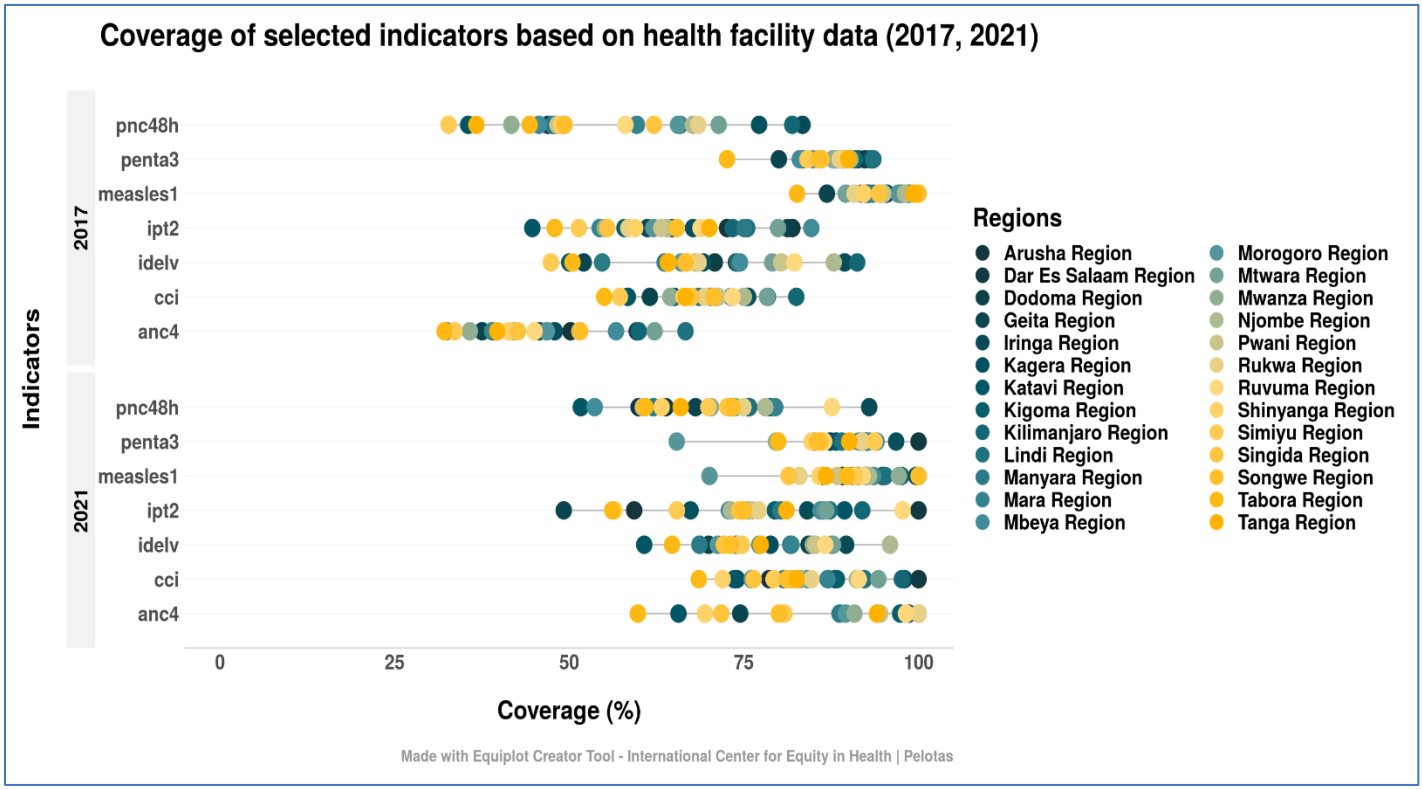


Figure 9: Coverage by region for selected indicators of RMNCH in 2017 and 2020, based on health facility data analysis, Tanzania mainland

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.

We combined six indicators to compare the regional results based on the facility data analysis with the TDHS 2016 results and to assess whether the inequalities between regions had changed over time.

The six indicators were ANC4, institutional birth coverage, IPT2, postnatal care with 48 hours (all based on the ANC1 derived denominator) and pentavalent 3rd dose and measles vaccination coverage (based on the penta1 derived denominator).

Based on the same indicators, we plotted a scatter plot with the composite coverage index by region from survey results in 2015/16 on the X-axis and the facility data (from 2017) on the Y-axis (Figure **10**).

A R-squared of 0.32 is equivalent to a correlation coefficient of approximately 0.6 which signifies moderate correlation. The scatter plot also identifies regions with high coverage (Dar es salaam and Kilimanjaro) and those with low coverage (Katavi, Simiyu and Tanga).

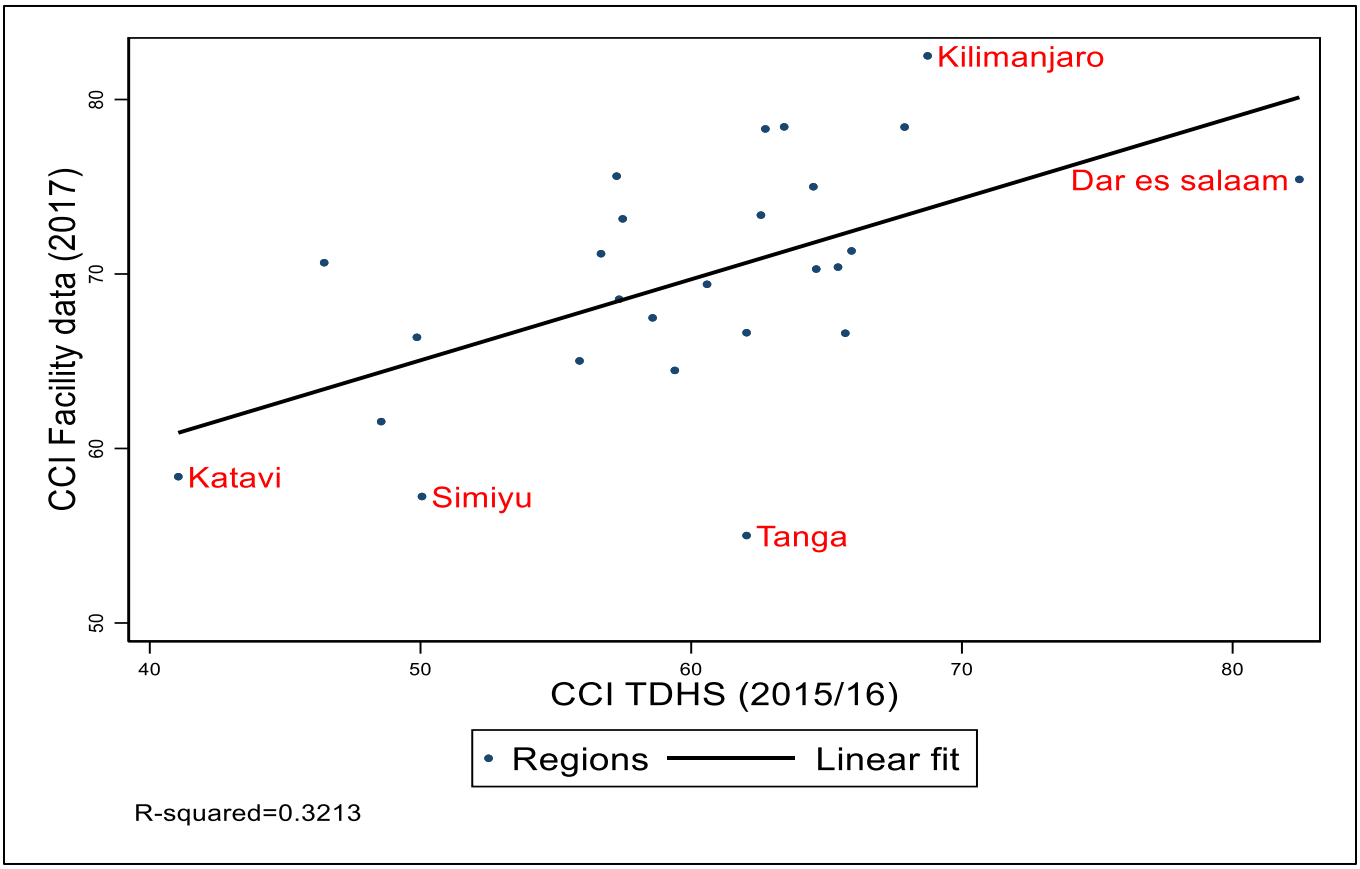


Figure 10: Comparison of facility data derived coverage index to coverage index derived from DHS

F Potential further analyses with the data set from the workshop

Progress and performance assessment

Using an index of coverage for the regions, progress and performance can be assessed in multiple ways:

- Simple comparison of coverage and changes over time (ranking) – equity, effectiveness
- Stratified ranking of outputs by level of socioeconomic development – meaningful ranking
- Stratified ranking of outputs – strength of the health services / system – requires computation of a measure of health system inputs measures, e.g. core health professionals per 10,000 population or a measure of health infrastructure, or a combined measure
- Analysis according to program effort/prioritization of subnational units, e.g. GFF priority area

Maternal mortality and stillbirth rates

- Maternal mortality in health facilities – number of deaths divided by the number of live births times 100,000 – is a useful indicator of overall maternal mortality and the of the quality of care, especially now that high proportions of women deliver in health facilities in most settings. The reporting is often problematic and the numbers will need to be scrutinized for data quality. (ratios between 100 and 300 are expected in most settings).
- Stillbirth rates can be analyzed as a whole (number of stillbirths per 1,000 births in the health facilities) or with fresh and macerated separate. Fresh stillbirth rates are considered as a good indicator of intrapartum mortality.

OPD visits per child (0-4 years) per year

There are no good indicators of population treatment coverage in the health facility data. It would be possible to obtain the number of children who have presented with a specific health issue, or are diagnosed with a certain condition (such as lab confirmed malaria) and include information on the number of diagnosed children who have received treatment. The challenge is however that the denominator is not known: the number or proportion of children with the condition in the population. There will be children who have not used the health services and these numbers are needed to compute treatment coverage.

OPD visits per child per year is an indicator of service access and utilization. In general, we expect the rate to not fluctuate too much over time, and not vary much by region/province unless there are differences in access. If not, there may be data quality issues and these need to be flagged.

In-patient data for children: admission and case fatality rates

The number of children under-5 years admitted to hospital per 1,000 population under-5 years is both an indicator of both the burden of disease among under-fives and the access to in-patient services. Therefore, subnational comparisons are of interest. Case fatality rates are an indicator of the quality of care for sick children and do not need population denominators, as these are defined as the number of under-fives who died in health facilities divided by the number of under-fives admitted. Numbers may be small for subregional units and combining years may help address this problem.