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

UGANDA

A 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. It focuses on national and subnational (regions/sub-regions and in some instances districts) administrative units in Uganda.

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

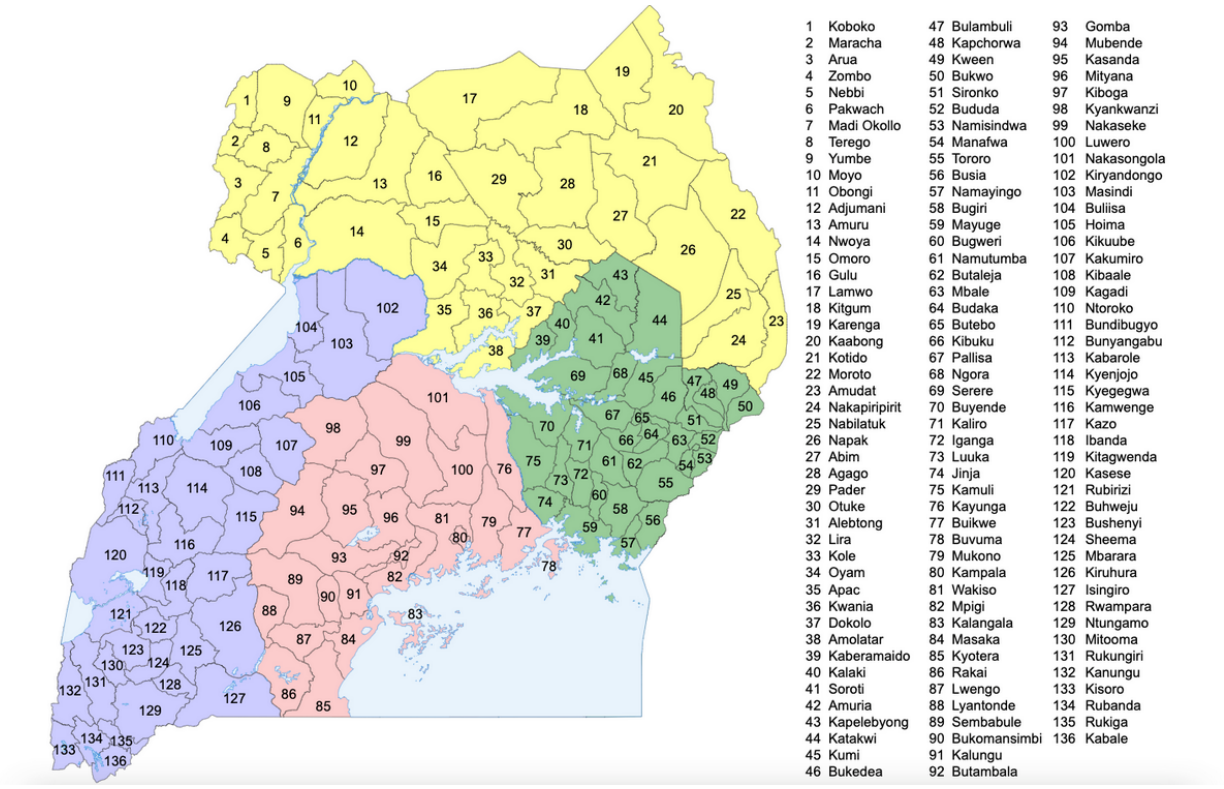
This report has the following sections:

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

1. Description of the data sets

Uganda is divided into four regions (Northern, Central, Eastern and Western), which are also subdivided into 15 sub-regions and 136 districts. Through the Ministry of Health (MoH), Uganda approved and adopted DHIS2 in 2011/2012 and has since used it as a national platform for reporting health data. This was rolled out in all districts, Regional Referral Hospitals, and a few Health Sub-districts and Health Units.

Figure 1: Map of Uganda showing the distribution of districts by region



The data used for all this assessment and analysis were obtained from the monthly district data extracted from the DHIS-2 from April 2017 to December 2021 across different health facilities in the country. Table 1 further shows a summary of the health facility data that was used.

Table 1: Health facility data summary

Indicator	
Administrative organization	
Number of sub-regions	15
Number of districts	136
Health facilities	
Number of health facilities in country	Number
Data on core health professionals	No
Data on hospital beds	No
Facility data analysis period	
First month and year with health facility data	April 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**
UDHS	2016
PMA	2020/2021
UMIS	2015/2016
Population projection data in DHIS2	
Indicator	
Total population for every year	No
Live births for every year	No
Population under 1 year for every year	No

2. Data quality assessment and adjustments

2.1 Assessing the reporting rate

Between 2017-2019, reporting rates (RR) for OPD and all reproductive health indicators are close to 90% and 100% for the years 2020 and 2021 (Figures 2a and 2b). From 2017-2019, RR for in-patient admission was below 50% but this increased to almost 100% in 2020 and 2021 (Figure 2b).

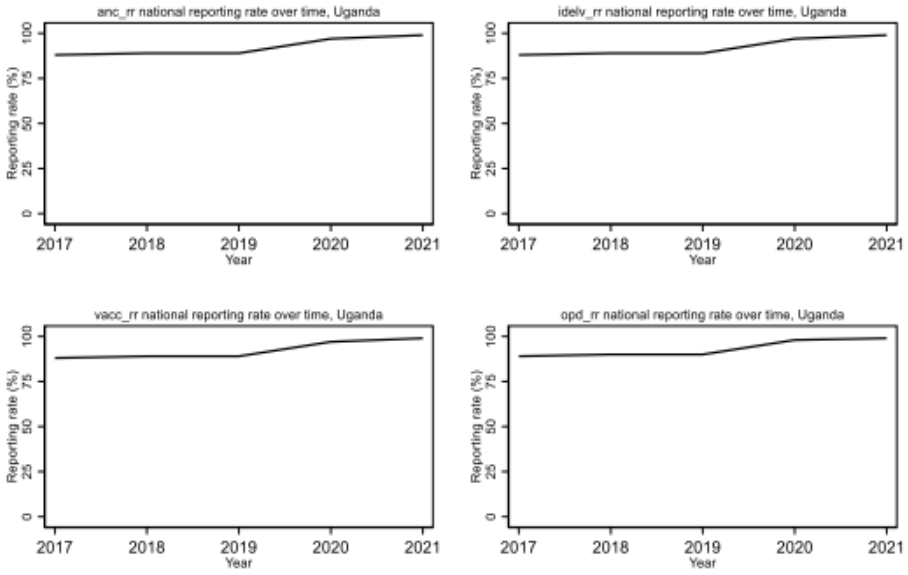


Figure 2a: Completeness of reporting rate for OPD, Immunization and maternal related indicators over time, Uganda

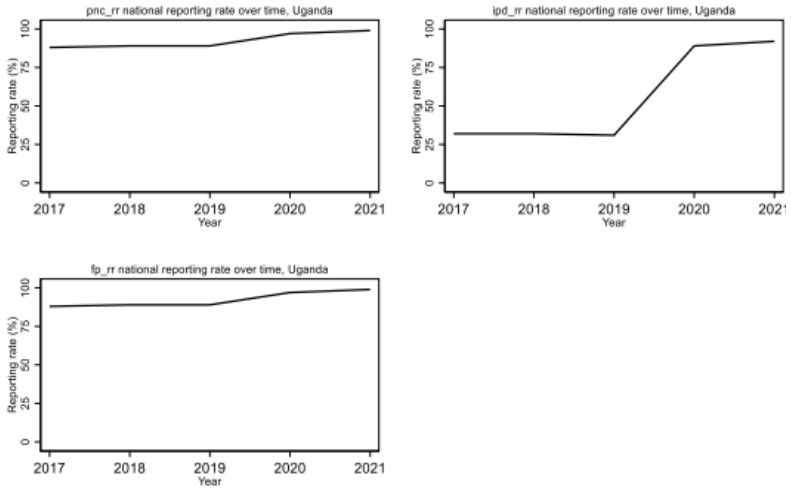


Figure 2b: Completeness of reporting rate for PNC, IPD admission and Family planning over time, Uganda

For reproductive health indicators, immunization, and OPD, 40% of the districts had a reporting rate of at least 90% from 2017 to 2019. From 2020, a reduction close to 0 is observed (Figure 2c). For IPD, close to 100% of the districts had a reporting rated of less than 90%, for the period 2017-2019 though this drastically reduced by at least 60% point in 2020+ (Figure 2c).

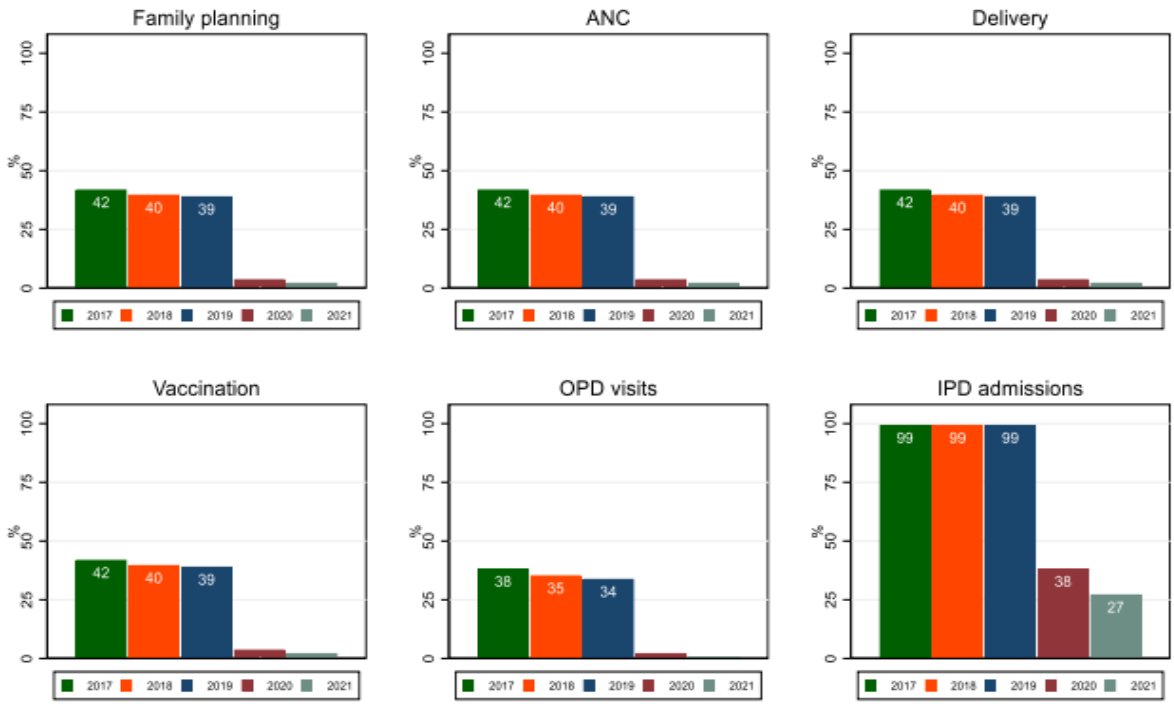


Figure 2c: Percentage of districts with low reporting rate (<90%) by service and by year

Table 2 presents the assessment of data quality for the DHIS-2 health facility data. For the year 2017-2021, all the districts (100%) district had non-missing in all of the indicators reported. All district-reported values (100%) for each of the indicators had no extreme outliers. Close to 60% of the districts had a ratio of Penta 1 and ANC 1 which is between 1-1.5 (Table 2). Overall, the national data quality score is at least 85% ranging from 85% in 2017 to 92 in 2021. The improvements in the quality of data in the DHIS-2 could be used in monitoring national, subnational, and district coverage. Presentation of findings on the quality of data could further improve the data quality.

Table 2: Data quality score card summary, DHIS-2 data Uganda, 2017-2021

No	Completeness of monthly facility reporting	2017	2018	2019	2020	2021
1a	Reporting rate (%) by year (National average of ANC, delivery, vaccination, opd)	**88**	**89**	**89**	**97**	**99**
1b	Percentage of districts with reporting rate >= 90% by year (National average of ANC, delivery, vaccination, opd)	**58**	**60**	**61**	**97**	**97**
1c	Percentage of districts with no missing monthly values by year (National average of ANC1, ANC4, delivery, Penta1, Penta3, opd)	**100**	**100**	**100**	**100**	**100**
2a	Percentage of monthly values that are not extreme outliers	**100**	**100**	**100**	**100**	**98**
2b	Percentage of districts with no extreme outliers in the year	**96**	**97**	**98**	**96**	**90**
3a	Percentage of districts with an adequate ratio between ANC1 and Penta1 (between 1.0 and 1.5) by year	**58**	**68**	**60**	**78**	**72**
3b	Percentage of districts with an adequate ratio between Penta1 and Penta3 (between 1.0 and 1.5) by year	**94**	**88**	**91**	**88**	**87**
	Overall data quality score (%) by year (Average DQ1a, DQ1b, DQ1c, DQ2a, DQ3a, DQ3b - National - an average of ANC, delivery, vaccination, opd)	**85**	**86**	**85**	**94**	**92**

2.2 Internal data quality assessment

We noted some minimal outliers, which were assessed as

$$\text{Median} - 1.4826 * 5 * \text{MAD} \; < \; \text{Xi} \; > \; \text{Median} + 1.4826 * 5 * \text{MAD}$$

For analysis units like districts, we generated median and MAD - excluding missing data points. We then replaced the missing and outlier data points with the median. Figure 2d shows the difference before and after adjustment.

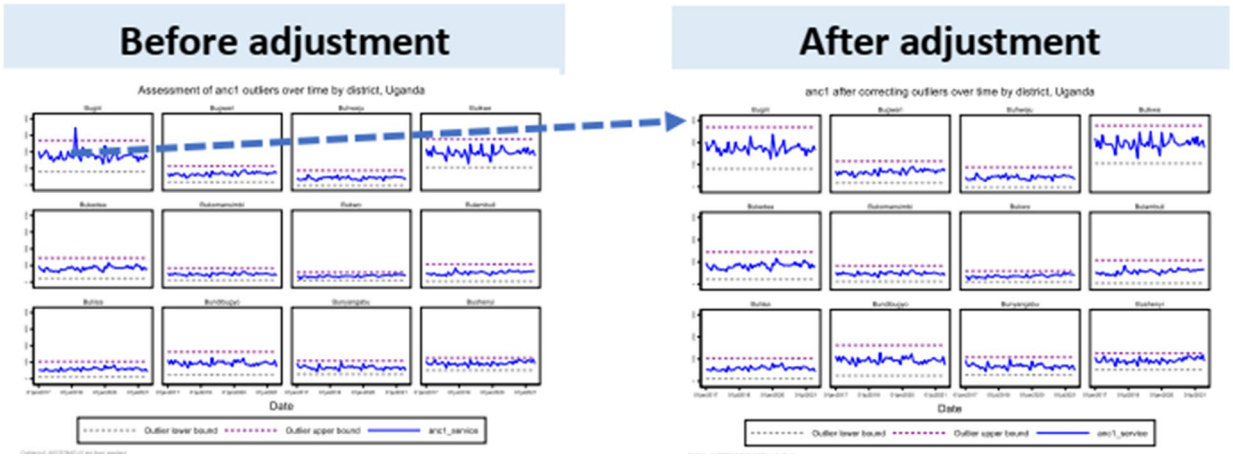


Figure 2d: Assessment and adjustment for outliers for ANC first visit by district, Uganda

therefore, generated adjusted reporting (N_{adj}) based on:

$$N_{adj} = N_{reported} + N_{reported} * (1/c - 1) * k$$

Figure 2e presents the difference in the reported and adjusted number of ANC first visits that were recorded by the district.

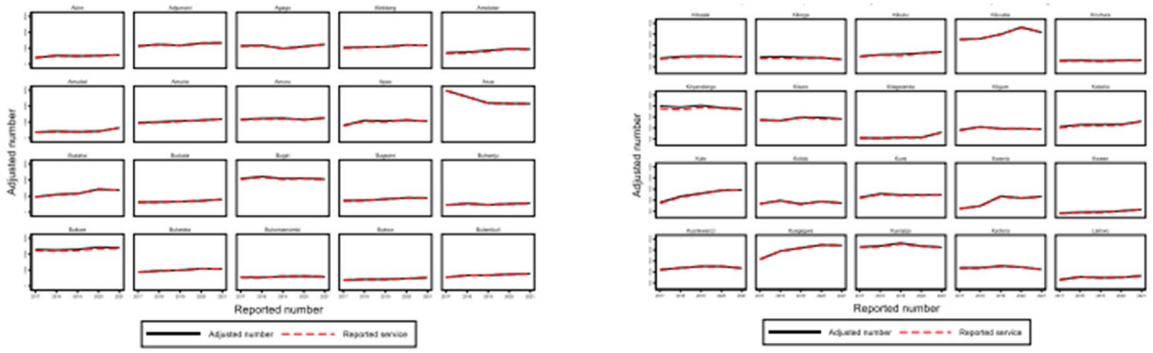
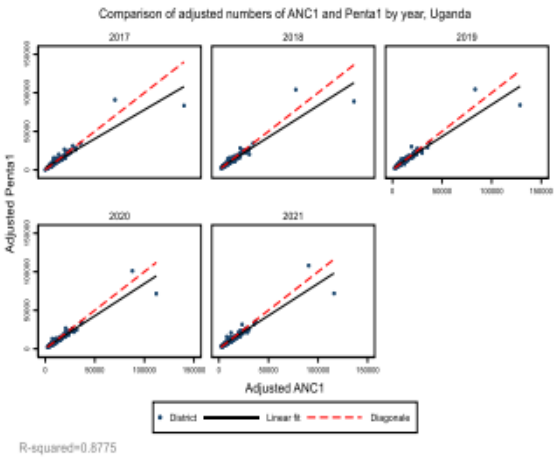
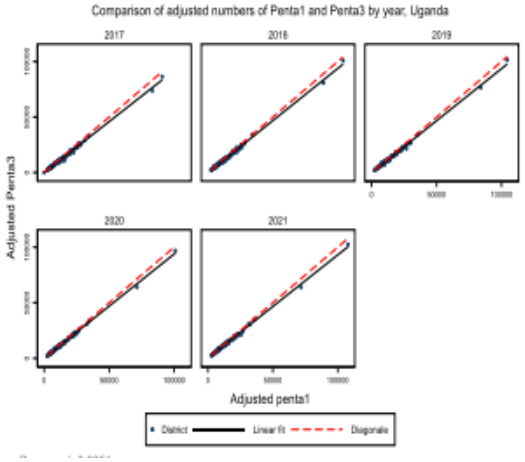


Figure 2e: Comparison of reported and adjusted number of ANC first visit by district, Uganda

2.3 Internal consistency between services

This was assessed between the number of events for ANC1 to DPT1 and for DPT1 to DPT3. Consistency was calculated as the ratio ANC1 / Penta1 numbers; and the ratio Penta1/Penta3 numbers.





A perfect correlation between Penta 1 and ANC 1 is observed, despite the modest inconsistencies (Figure 2f). We also observe a perfect match between Penta 1 and Penta 3.

3. Denominators or target populations

3.1 Assessment of the population projections in DHIS2

We made an assessment on the comparison of UN projected, and DHIS-2 reported population for Uganda. The reported DHIS-2 population are captured from the national census and annual projections. From the results, it was shown that the UN population projections do not match the population reported in the DHIS-2. However, a modest gap in the population differences for under-one total population and population growth was observed (Figure 3a).

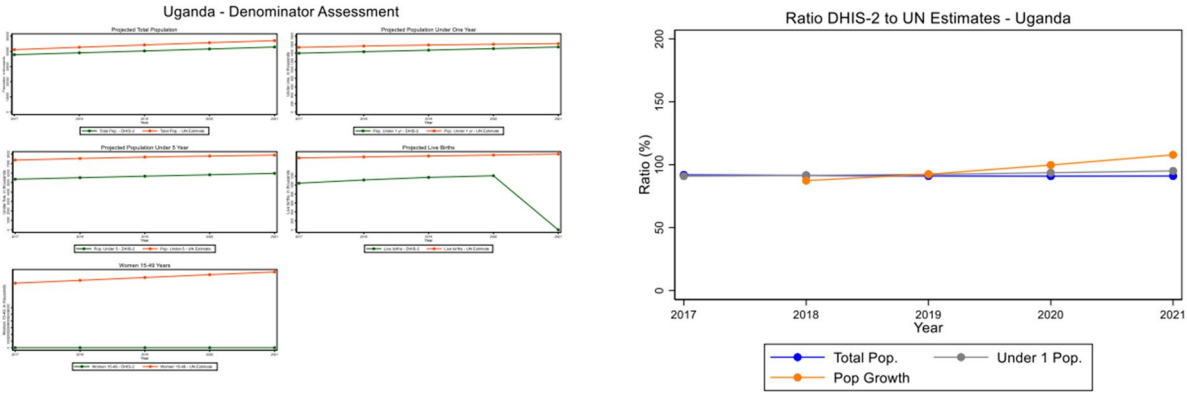


Figure 3a: Comparison of UN projected, and DHIS-2 reported population, Uganda

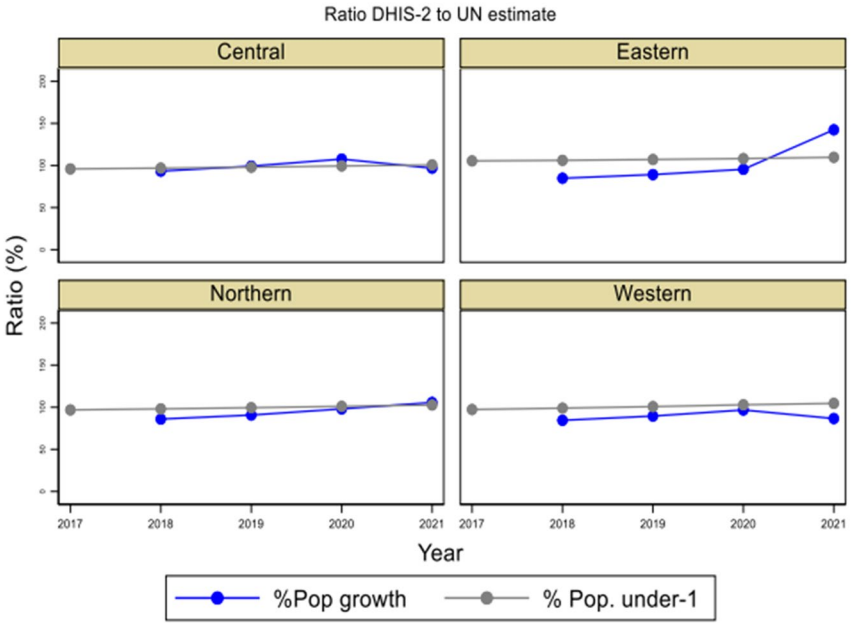


Figure 3b: DHIS-2 to UN population estimates by region, Uganda

The variation in UN population projections and DHIS-2 reported population extends further to regions. Almost similar population differences for the under-one total population and population growth were observed for the Central and Northern regions. A modest gap was noted for the Eastern and Western regions (Figure 3b).

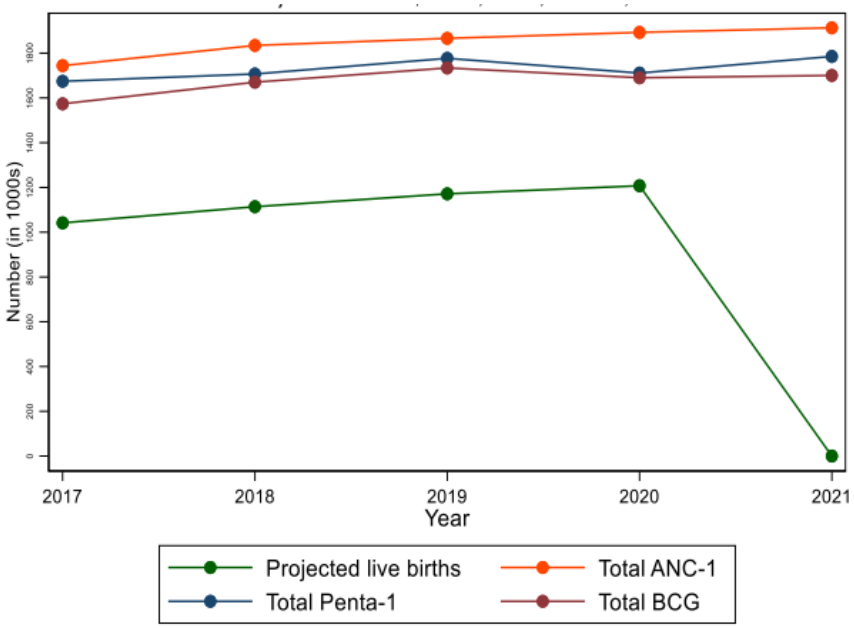


Figure 3c: Trends in Projected Live births, ANC1, DPT-1 and BCG, NATIONAL

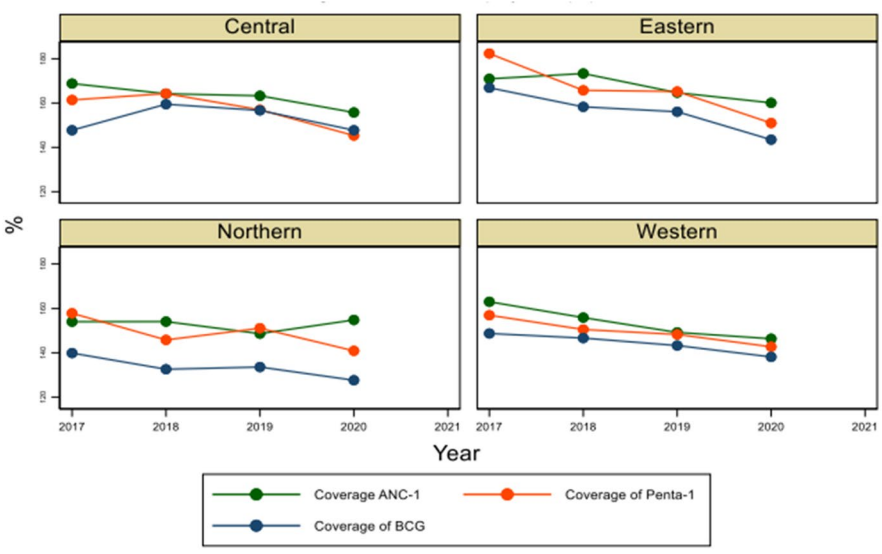


Figure 3d: Coverage trends based on projected population

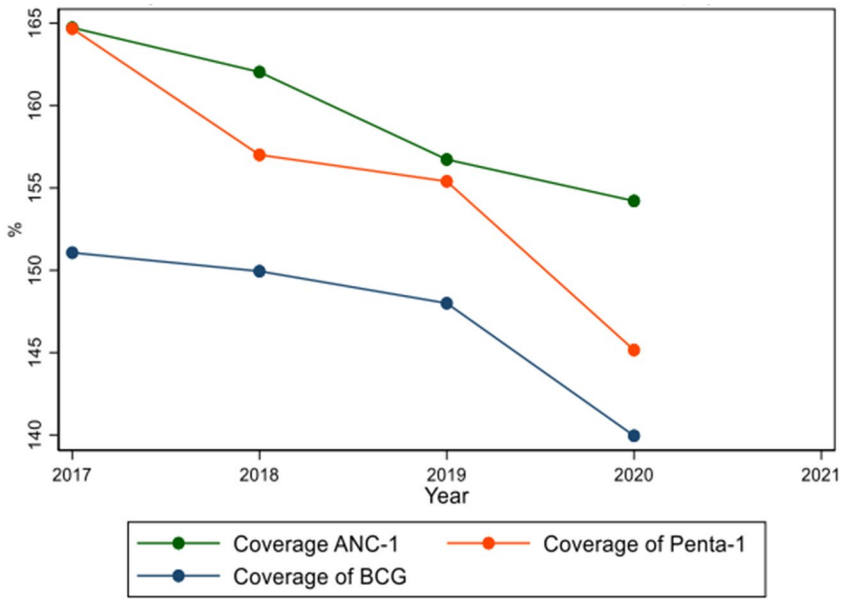


Figure 3e: Coverage of ANC-1, DPT-1 and BCG, DHIS-2 data, NATIONAL, Based on projected births

Using population projections, the projected number of BCG and Penta1 is nearly equal but slightly lower than ANC 1 (Figure 3c & 3d). The difference between the projected number of live birth and other related measures (ANC1, penta1 and BCG) is significantly high (Figure 3c). We observe improbable estimation (>100%) in the coverage of Penta 1, BCG, ANC-1 on projected births (Figure 3e).

3.2 Testing facility data derived denominators

Based on the current 2016 UDHS report, ANC-1 attendance is estimated at 98%, and Penta 1 at 96%**.**

In using ANC-1 as a denominator derived from DHIS-2, results show that; As of 2017, ANC-4th attendance is estimated at 40% which is inconsistent with UDHS reported proportion (63%) (Figure 3f). However, a consistent trend was observed thereafter for both denominators. As of 2017, institutional delivery is 60% Vs 73% in UDHS for both denominators. All immunization indicators are consistent with the UDHS report for both denominators.

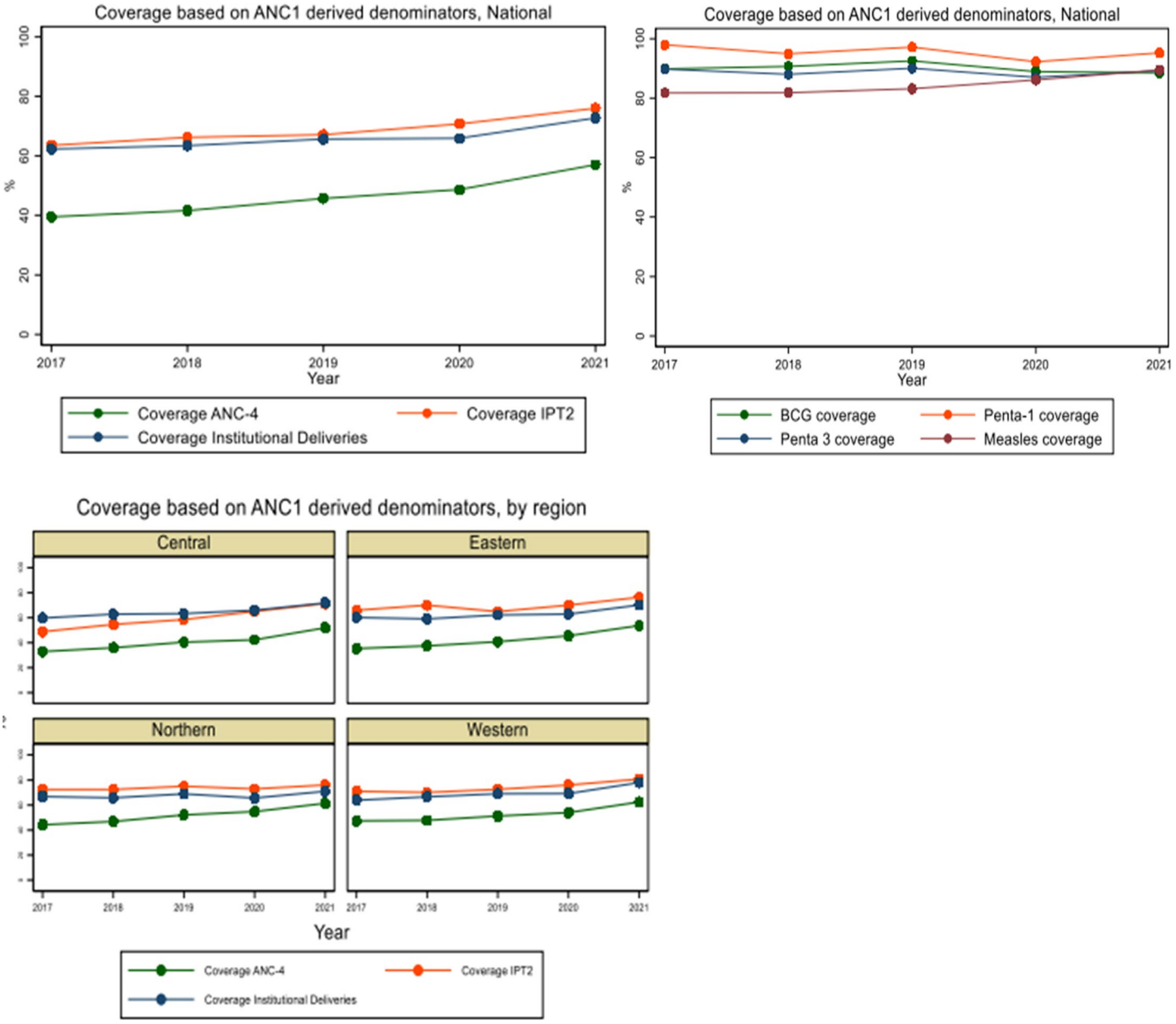


Figure 3f: ANC-1 as the denominator

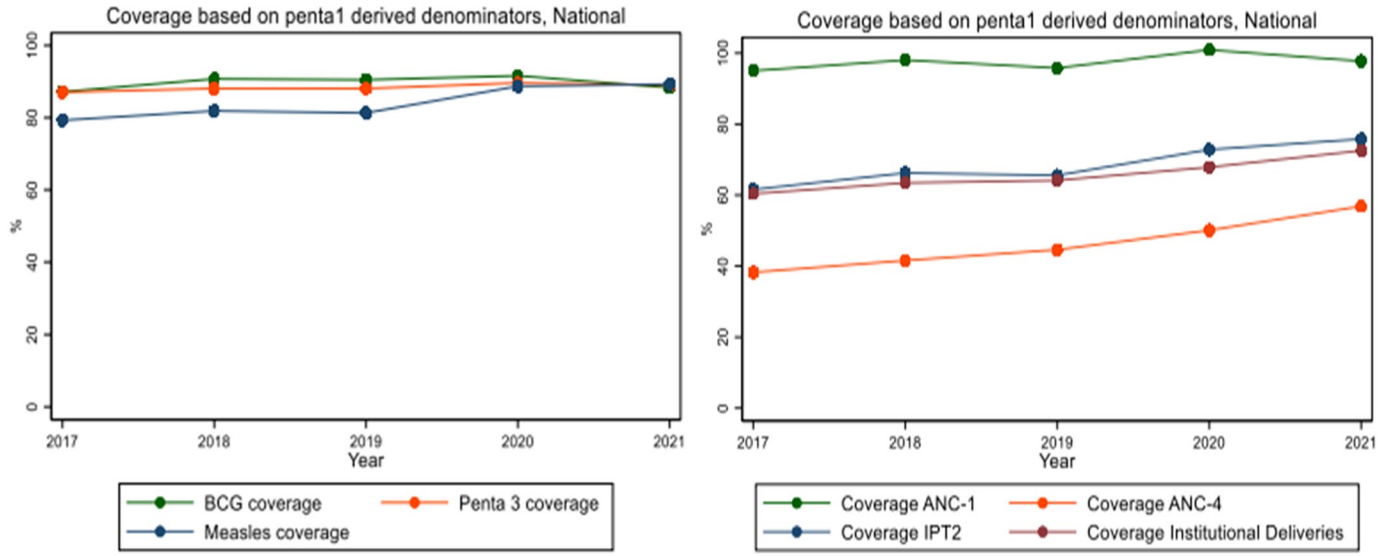


Figure 3g: Penta1 as the denominator

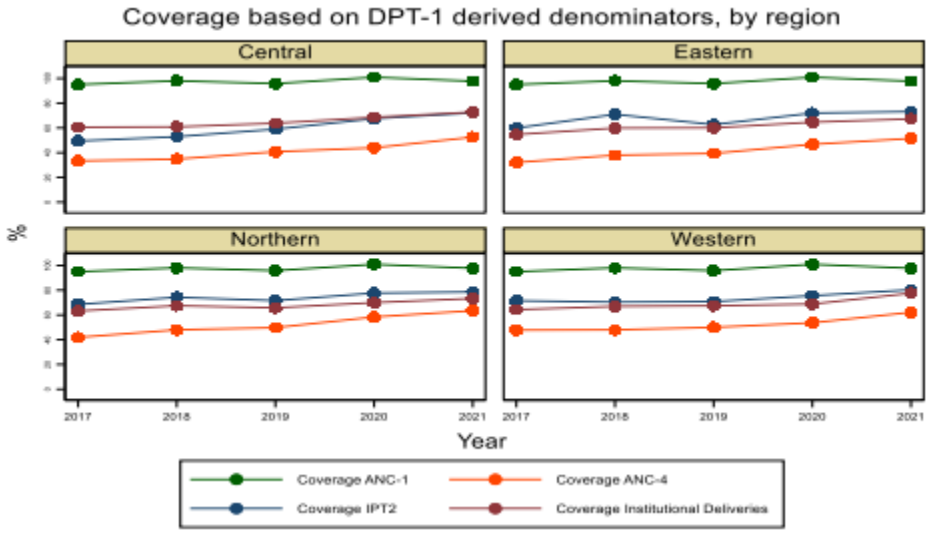


Figure 3h: DPT-1 as the denominator

Conclusion

Despite the differences between UDHS and DHIS-2 estimates, Penta 1 and ANC-1 could be reliably used as the denominator. Nonetheless, we recommend checking if BCG would give better estimates if used as a denominator since it is close to universal (98%).

4. Survey coverage trends and equity

We calculated the composite coverage index (CCI) for each sub-region in Uganda for the analysis of coverage and inequalities of RMNCH using 2016 UDHS data. We weighted eight interventions on family planning, maternal and neonate care, vaccines, and care-seeking for childhood illnesses.

This indicator is based on aggregated estimates of for example economic status, subnational region, education, and place of residence. We applied the following formula:

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

Where; DFPSm: demand family planning satisfied; ANC4: 4+ ANC; BCG immunization among one-year-olds, DPT3: 3 doses of DPT; MSL: 1 measles; ORS: oral rehydration salts for diarrhoea; CPNM: care for pneumonia symptoms

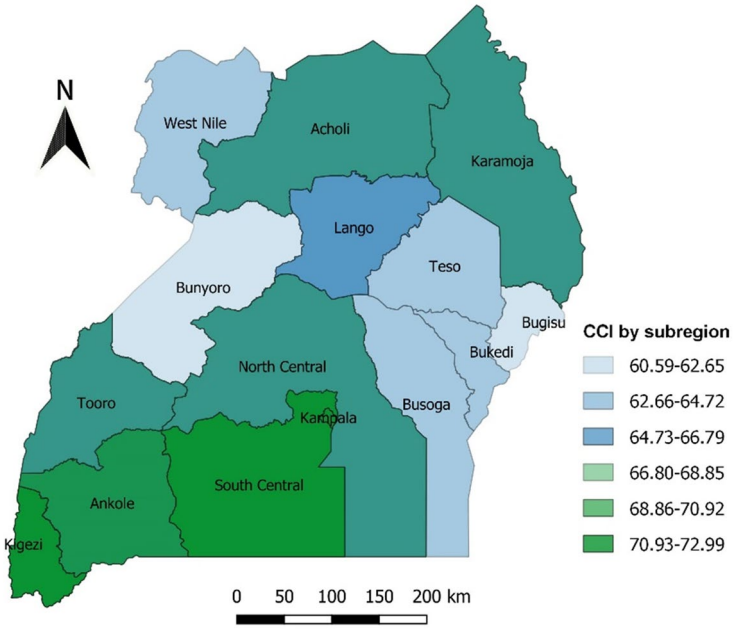


Figure 4a: Composite coverage index (CCI) by sub-region, Uganda

The CCI score ranges between 60.6% and 73%. Kigezi and South Central sub-regions have the highest CCI while Bugisu and Bunyoro registered the lowest (Figure 4a).

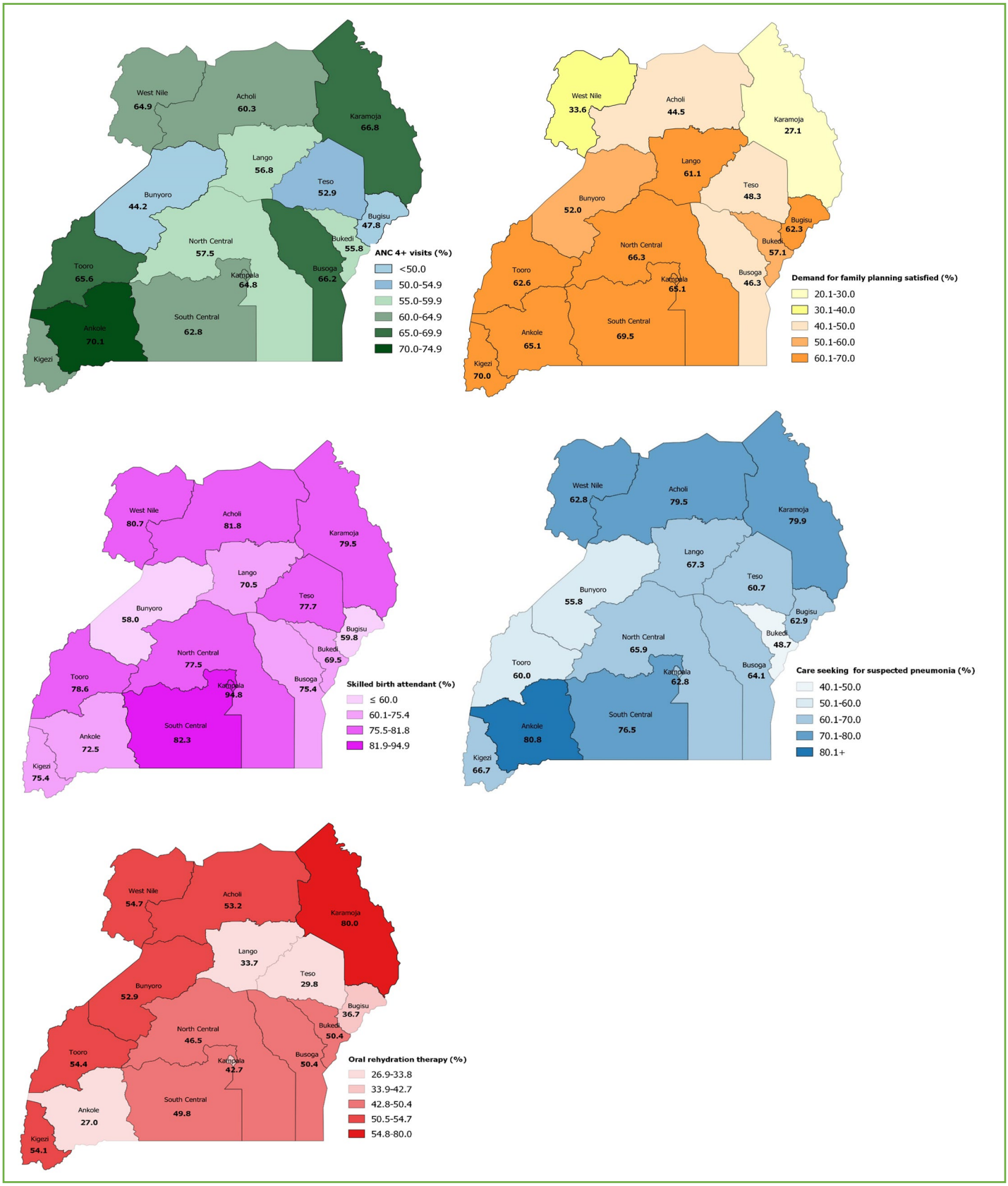


Figure 4b: Sub-regional inequalities in RMNHC indicators, Uganda

Figure 4b shows a disparity in some of RMNHC indicators. There is a big inequality gap for at least four ANC visits between Ankole (70%) and Bunyoro (44%) or Bugisu (48%). Low demand for family planning is noted in Karamoja (27%) and West Nile (34%). This is much lower compared to Kigezi and South-Central region (70%). Seeking oral rehydration therapy is lowest in Kigezi (27%) and Teso (30%), though the regions reported her proportions for pneumonia treatment among children (Figure 4b). From the results still, BCG vaccination is close to universal in all sub-regions while DPT3 and measles vaccination of children also registered high proportions (Table 4a).

Table 4a: Coverage of BCG, DPT3 and measles vaccination across sub-regions

Subregion	BCG vaccine	DPT3	Measles vaccination
Acholi	98.74	85.96	84.63
Ankole	96.65	83.42	82.03
Bugisu	98.73	73.13	79.82
Bukedi	97.83	76.89	77.31
Bunyoro	93.77	80.84	84.09
Busoga	96.68	71.24	70.25
Kampala	99.3	80.93	82.77
Karamoja	98.88	86.8	91.26
Kigezi	98.27	88.1	95.63
Lango	95.95	82.55	74.51
North Central	94.49	75.47	73.3
South Central	92.48	75.55	75.7
Teso	98.6	90.7	87.19
Tooro	96.28	75.19	86.88
West Nile	95.9	83.07	81.97

Simple measures of inequalities

We also computed simple measures of inequalities in form of difference and ratio. The difference is an expression of the absolute inequality that exists between subgroups; that is, the mean value of a health indicator in one subgroup with the lowest score is subtracted from the mean value of that health indicator in another subgroup with the highest score. The ratio on the other hand is an expression of the relative inequality that exists between two subgroups; that is, the mean value of a health indicator in one subgroup with the highest score divided by the mean value of that health indicator in another subgroup with the lowest score. The highest inequality was

observed in oral rehydration therapy followed by demand satisfied by family planning, and skilled birth attendants. There was notably improved coverage for BCG vaccination (Table 4b)

Table 4b: Simple measures of inequality for the RMNHC indicators

Indicator	Difference between the region with the highest and lowest coverage	Ratio of the region with the highest to that of lowest coverage
Demand for family planning satisfied	42.97	2.59
At least 4 ANC visits	25.93	1.59
Skilled birth attendant	36.86	1.64
BCG vaccine	6.81	1.07
Measles vaccine	25.38	1.36
DPT vaccine	19.46	1.27
Oral rehydration therapy	52.98	2.96
Care-seeking for suspected pneumonia	32.17	1.66
Composite coverage index	12.40	1.20

5. Private sector bias

While the private sector health facilities are required to report through the DHIS-2, there is always a problem with under-reporting which affects the completeness of the data. Nevertheless, even then, the DHIS-2 does not stratify the data based on the facility ownership as well as the different facility levels. This limits our analysis of assessing the private sector share using DHIS-2. We, therefore, recommend a revision of this for better strategic planning and implementation.

Fortunately, the UDHS gives a provision to assess the share of the private sector on a number of indicators. To track this, respondents are asked to state the kind of source that was used for the service. These services are categorized into public, private sector and other (friend/relative, market, shop, and traditional birth attendant among others). In figure 5a, we present the share of the private sector on modern contraceptives among women of reproductive age, institutional births, and treatment of fever, ARI and diarrhea among children under-five years. Based on the 2016 UDHS estimates, 39% of women access modern contraceptives from private and for institutional deliveries, 14% was a share of private sectors. Furthermore, close to 6 out of 10 children with diarrhea, fever and ARI seek treatment in private facilities (Figure 5a)

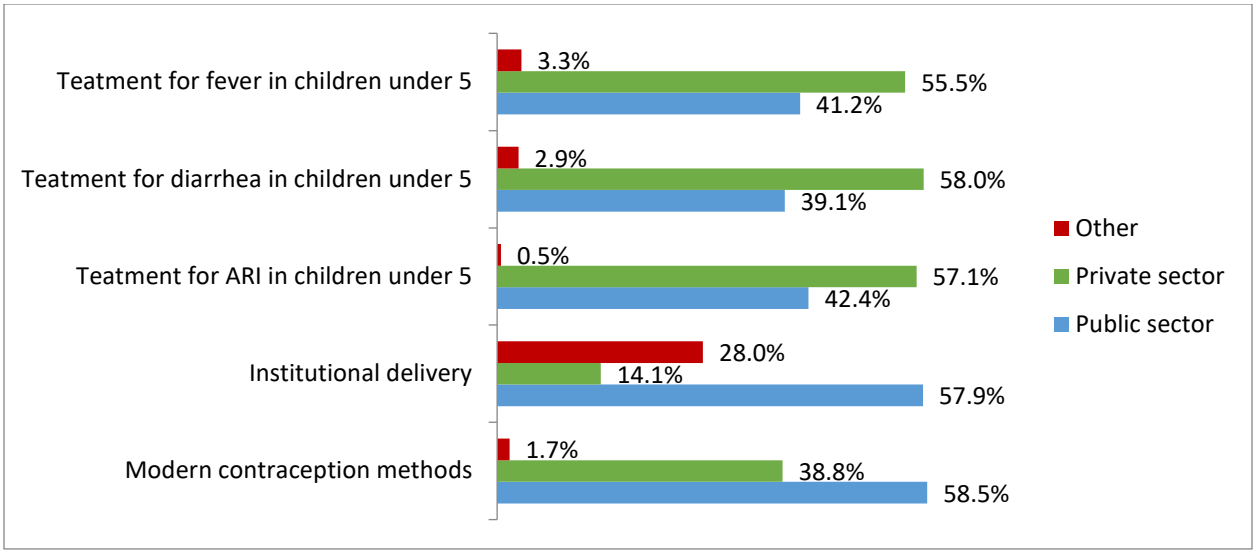


Figure 5a: Share of the service provision (%) by type of health facility, selected indicators, 2016 UDHS

The proportion of women that deliver within private facilities varies across sub-regions in Uganda. Figure 5b reports the proportion of women whose children were under 5 years at the time of the survey that had delivered within private facilities. South Central region (25%) takes the largest share of private facility deliveries. This is followed by Busoga (14%), North central (12%), Ankole (9%), and Kampala (9%) sub-regions. The lowest proportion of reported private facility deliveries was in Teso, Bugisu, Bukedi, Bunyoro, Lango, and Kigezi (Figure 5b).

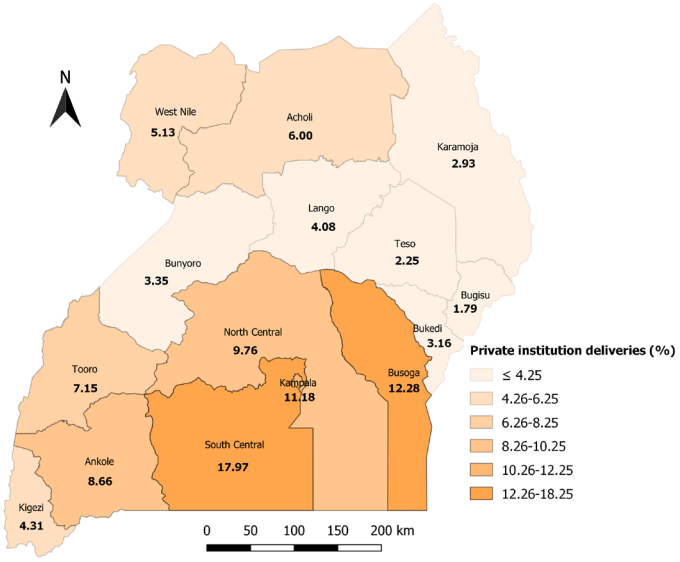


Figure 5b: Percentage (%) share of Private health facility deliveries by Sub-region, 2016 UDHS

The institutional deliveries reported by the 2016 UDHS within private facilities was more in rural (68%) than in urban setting (33%) as shown in Figure 5c.

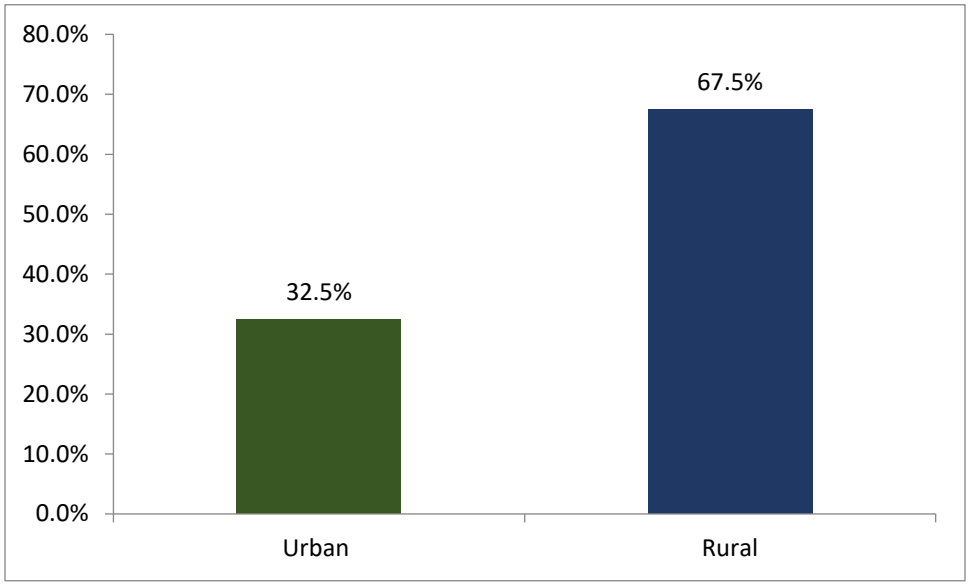


Figure 5c: Percentage (%) share of Private health facility deliveries by place of residence, 2016 UDHS

6. Potential further analyses

- Using DHIS-2 data for all child health indicators' coverage and inequality across districts and sub-regions
- Linking DHS-2 to national health surveys for more inferential statistics
- Assessing the DHIS-2 gaps in the documentation of the other data elements. For instance, registration of all health facilities, type and ownership of health facilities, and other population indicators, financing, human resource, facility set-up (related to readiness indicators), and community health indicators.