IMMUNIZATION COVERAGE AND EQUITY IN UGANDA (2016)

VERSE Equity Assessment

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The Vaccine Economics Research for Sustainability and Equity (VERSE) project produces measures of efficiency (*vaccine coverage*) and equity to track the progress made by immunization programs worldwide. As equity measures, the present report features concentration indices (Wagstaff and Erreyger) and the absolute equity gap accounting for key unfair factors (as a **composite** measure, see VERSE Methods) or socioeconomic status only (the traditional **wealth** measure).

This analysis was jointly produced by Johns Hopkins Bloomberg School of Public Health and Makerere University School of Public Health.

Highlights

Key highlights from the DHS data

- The past two decades have seen significant improvements in vaccine coverage and equity in Uganda (see reports for 2000, 2006, and 2011), thanks to the efforts to strengthen routine immunization and ongoing supplementary immunization activities (SIA) such as the Family Health Days.
- While maintaining the regular provision of vaccines to all regions, efforts should be made to alleviate the impact of low maternal education and literacy on vaccination uptake. Such demand-side constraints affect the coverage of essential vaccines such as the measles-containing vaccine (MCV).
- An in-depth tracking of coverage and equity in Uganda since 2000 is available: Ssebagereka et al. (preprint). Equity in vaccine coverage in Uganda from 2000 to 2016: Revealing the multifaceted nature of inequity.

National overview

Vaccines scheduled at birth or within six weeks after that, all show high coverage (~90%), a direct result of extended maternal and child healthcare efforts. Vaccines provided later, such as the third dose of DPT, POLIO, and PCV (14 weeks) and the first dose of MCV, see significant drops in coverage. With a prevalence of 2% in 2016, zero-dose status is less of a priority in Uganda than ensuring children do not drop out of the expanded program for immunization (EPI). Only 41% of children received their full course of vaccines (FULL) scheduled for their age. Furthermore, only 39% of children two years old or older received all their scheduled vaccines (COMPLETE), indicating that children may receive their vaccines late or miss them altogether.

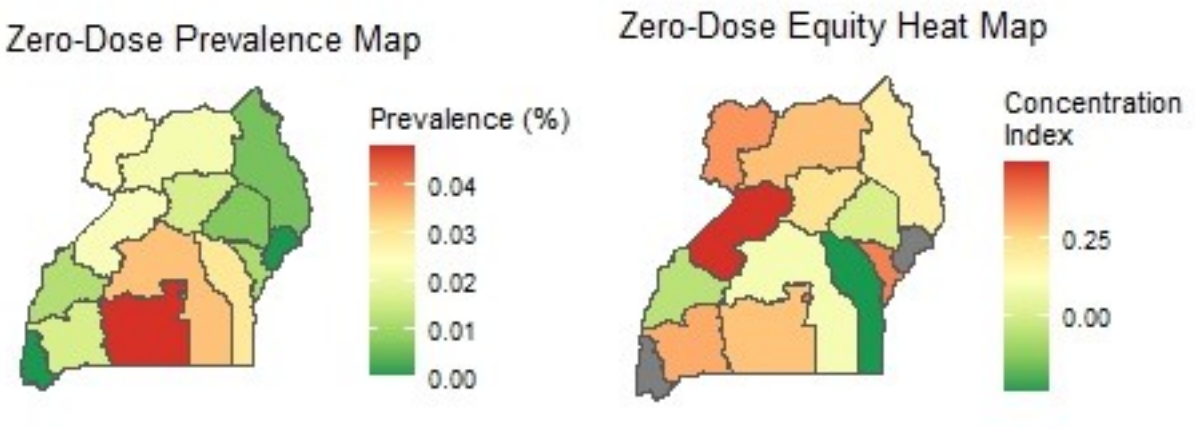
Coverage and equity level estimates for Uganda (2016)

		Concentration indices (95% confidence interval)				Absolute Equity Gap
Vaccine	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)	Composite
ZERO	2.16%	0.439 (0.359; 0.519)	0.025 (-0.055; 0.105)	-0.078 (-0.091; -0.065)	-0.227 (-0.24; -0.214)	0.027 (0.019; 0.035)
FULL	40.76%	0.109 (0.093; 0.125)	0.177 (0.161; 0.193)	-0.043 (-0.054; -0.032)	-0.125 (-0.136; -0.114)	0.233 (0.202; 0.264)
COMPLETE	39.05%	0.142 (0.114; 0.17)	0.221 (0.193; 0.249)	-0.044 (-0.063; -0.025)	-0.128 (-0.147; -0.109)	0.271 (0.218; 0.324)
BCG	94.22%	0.022 (0.014; 0.03)	0.083 (0.075; 0.091)	-0.071 (-0.084; -0.058)	-0.206 (-0.219; -0.193)	0.099 (0.083; 0.115)
DTP1	92.66%	0.023 (0.015; 0.031)	0.082 (0.074; 0.09)	-0.062 (-0.075; -0.049)	-0.181 (-0.194; -0.168)	0.107 (0.085; 0.129)
DTP2	86.80%	0.036 (0.027; 0.045)	0.115 (0.106; 0.124)	-0.052 (-0.064; -0.04)	-0.151 (-0.163; -0.139)	0.146 (0.121; 0.171)
DTP3	76.83%	0.053 (0.042; 0.064)	0.145 (0.134; 0.156)	-0.042 (-0.053; -0.031)	-0.123 (-0.134; -0.112)	0.184 (0.155; 0.213)
POLIO1	89.74%	0.026 (0.018; 0.034)	0.09 (0.082; 0.098)	-0.058 (-0.07; -0.046)	-0.169 (-0.181; -0.157)	0.106 (0.082; 0.13)
POLIO2	82.53%	0.043 (0.033; 0.053)	0.132 (0.122; 0.142)	-0.051 (-0.063; -0.039)	-0.148 (-0.16; -0.136)	0.153 (0.126; 0.18)
POLIO3	65.92%	0.068 (0.055; 0.081)	0.161 (0.148; 0.174)	-0.048 (-0.059; -0.037)	-0.138 (-0.149; -0.127)	0.188 (0.157; 0.219)
PCV1	81.38%	0.048 (0.039; 0.057)	0.149 (0.14; 0.158)	-0.049 (-0.061; -0.037)	-0.143 (-0.155; -0.131)	0.177 (0.15; 0.204)
PCV2	74.56%	0.064 (0.055; 0.073)	0.175 (0.166; 0.184)	-0.043 (-0.054; -0.032)	-0.124 (-0.135; -0.113)	0.219 (0.19; 0.248)
PCV3	64.14%	0.072 (0.06; 0.084)	0.164 (0.152; 0.176)	-0.035 (-0.046; -0.024)	-0.101 (-0.112; -0.09)	0.201 (0.17; 0.232)
MCV1	82.71%	0.059 (0.048; 0.07)	0.14 (0.129; 0.151)	-0.029 (-0.04; -0.018)	-0.086 (-0.097; -0.075)	0.181 (0.15; 0.212)

ZERO: Zero-dose status is defined as the child not receiving either DPT, BCG, Polio, or MCV within the first year of life. FULL: Full immunization for age is defined as the child having received all scheduled vaccines for their current age (at the time of the survey). COMPLETE: Child is over two years old and has received all scheduled vaccines.

Zero-dose children

Zero-dose status is defined as the child not receiving either DPT, BCG, Polio, or MCV within the first year of life.



The EPI successfully reaches most children in Uganda. South and North Buganda could still reduce their low prevalence (currently below 5%). They are followed by Busoga, West Nile, Bunyoro, and Acholi districts. All the other districts showed a prevalence of zero-dose status below 2%.

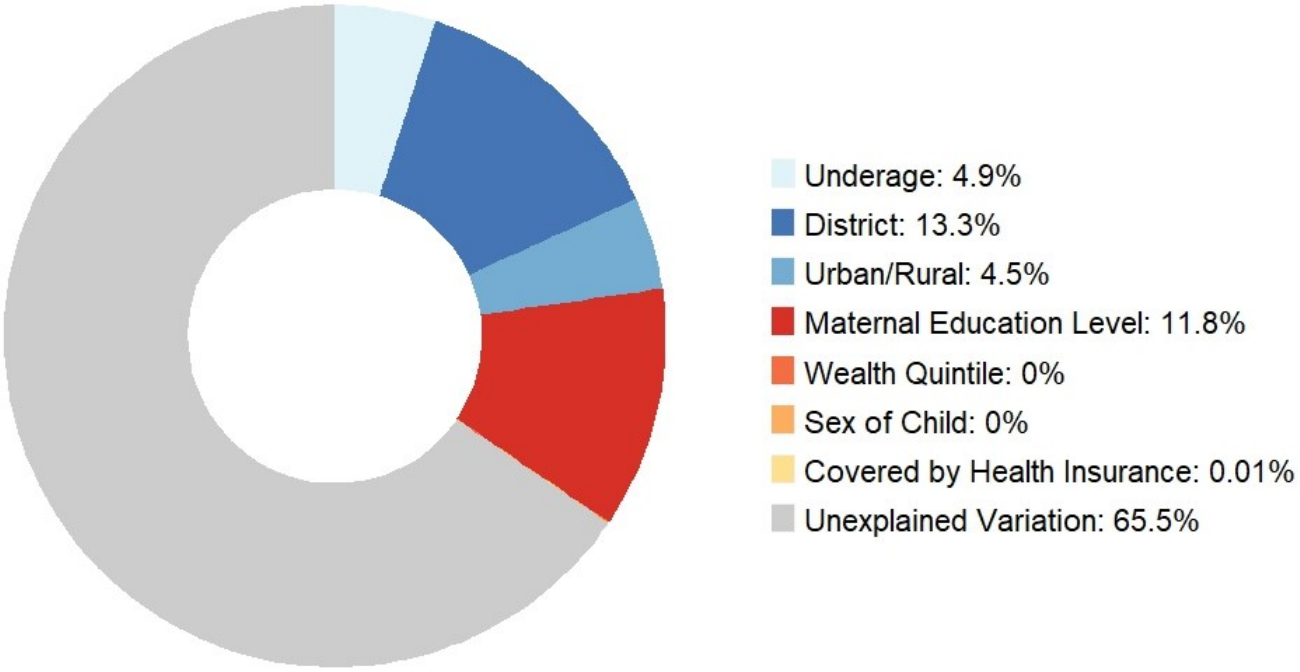
Zero-dose prevalence and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
South Buganda	**4.8%**	0.286	0.037	0.086	0.348
North Buganda	**3.5%**	0.097	0.009	0.055	0.194
Busoga	**3.0%**	-0.243	-0.019	-0.015	-0.043
West Nile	2.5%	0.354	0.024	0.049	0.100
Bunyoro	2.3%	0.488	0.028	0.108	0.283
Acholi	2.2%	0.291	0.016	0.143	0.246
Lango	1.6%	0.227	0.010	0.062	0.119
Ankole	1.6%	0.322	0.013	0.048	0.151
Tooro	1.2%	-0.051	-0.002	0.062	0.193
Bukedi	1.1%	0.384	0.011	0.036	0.088
Kampala	0.7%	0.383	0.007	0.002	0.046
Teso	0.7%	0.006	0.000	0.070	0.149
Karamoja	0.6%	0.185	0.003	0.002	0.003
Bugisu	0.0%			-0.010	-0.027
Kigezi	0.0%			0.029	0.092

Subnational regions as presented in the 2016 DHS for Uganda.

For mathematical reasons, when the prevalence/coverage outcome is low, the Wagstaff and Erreyger indices may produce conflicting results in terms of order of magnitude: for instance, the Wagstaff (composite) index could report a value of 0.312 (significant inequity) whereas the Erreyger-corrected index would report 0.033 (very equitable distribution). Both indices are positive: privileged people benefit most.

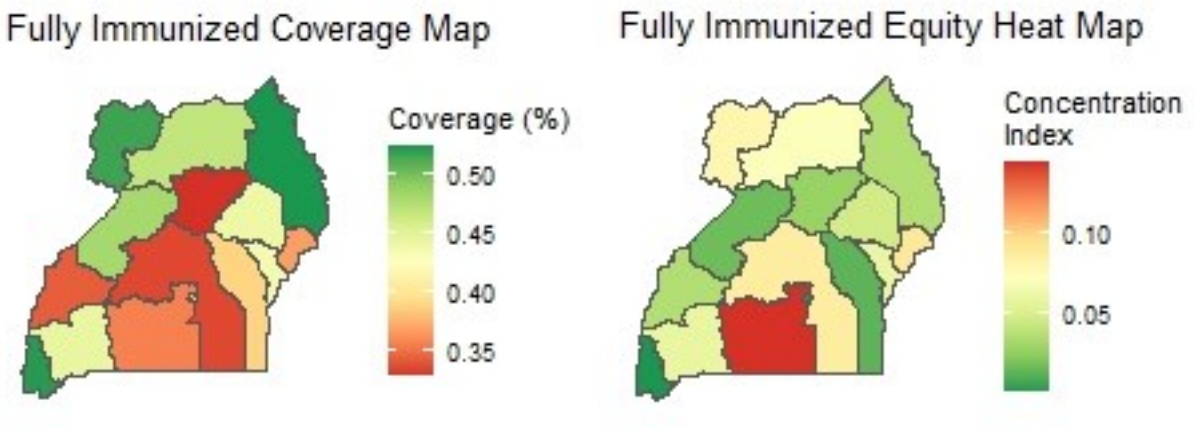
Decomposition of Zero-Dose Inequity



Where the household resides (district and whether in an urban or rural setting) influences most of the variation in zero-dose status prevalence in the country, indicating potential vaccine shortages or lack of outreach in specific districts. Accounting for regional differences, maternal education level contributes significantly to the variation in zero-dose status. Efforts to facilitate and encourage facility-based delivery and any initiative to reach out to marginalized households would help further reduce the prevalence of zero-dose children.

Full immunization

Full immunization for age is defined as the child having received all scheduled vaccines for their current age (at the time of the survey).



Ensuring that children complete their vaccine schedule without delays, thus achieving full immunization for age, is a priority for the Government of Uganda. Seven of the 15 districts' coverage fell below the national average of 41%, ranging from 33% (Lango) to 40% (Kampala, the capital city). Karamoja, Kigezi, and West Nile show the best coverage, with slightly more than half of the children receiving all the vaccines scheduled for their age. South Buganda shows a significantly less equitable distribution (CI composite = 0.145).

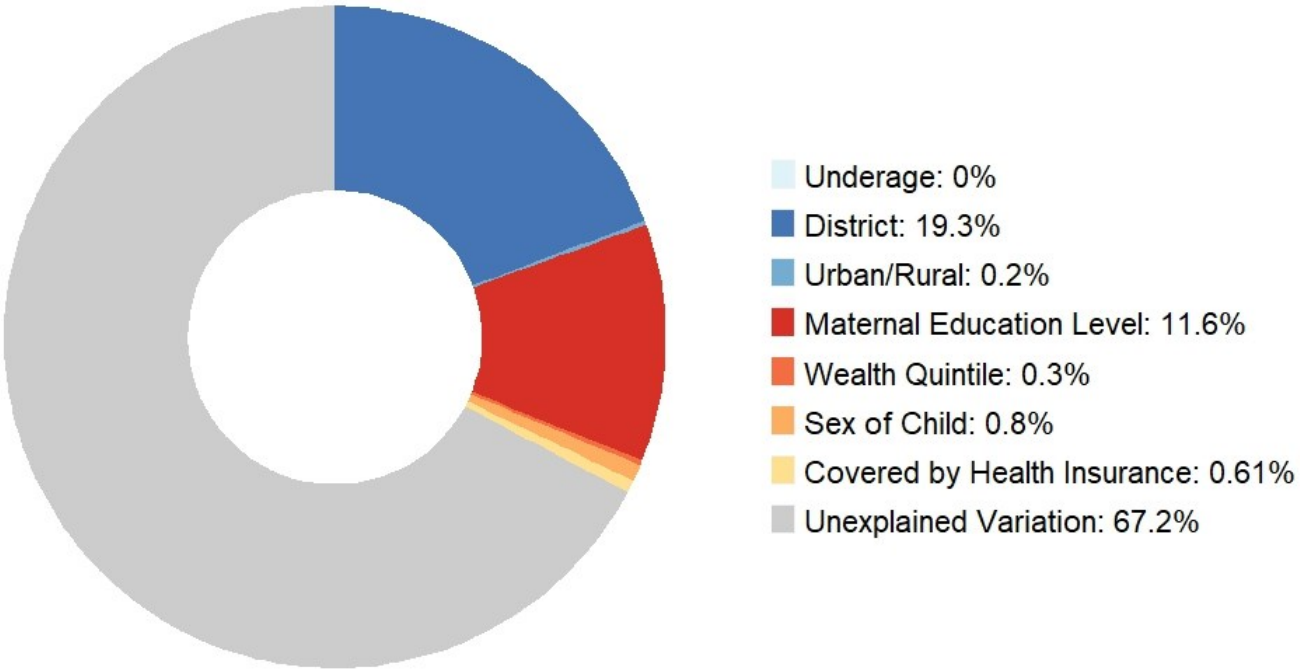
Fully immunized status coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Lango	**32.7%**	0.028	0.036	0.034	0.065
North Buganda	**33.4%**	0.087	0.117	0.041	0.146
Tooro	**34.1%**	0.036	0.050	0.041	0.128
South Buganda	35.5%	0.145	0.206	0.053	0.212
Bugisu	36.6%	0.091	0.134	0.003	0.008
Busoga	38.8%	0.013	0.021	0.000	-0.001
Kampala	39.5%	0.002	0.003	0.002	0.030
Bukedi	43.5%	0.060	0.105	0.037	0.090
Teso	44.0%	0.047	0.083	0.078	0.166
Ankole	44.3%	0.060	0.106	0.025	0.079
Acholi	46.8%	0.071	0.132	0.076	0.131
Bunyoro	48.0%	0.017	0.033	0.064	0.168
West Nile	51.6%	0.080	0.166	0.059	0.118
Kigezi	52.1%	0.001	0.003	0.012	0.038
Karamoja	52.3%	0.036	0.075	0.010	0.013

Subnational regions as presented in the 2016 DHS for Uganda.

Regional differences (District: 19.3%) contribute most to the variation in full immunization for age, indicating potential shortfalls in vaccine supply and delivery. Maternal education level (11.6%) has a significant influence on coverage. No other sociodemographic factor significantly affects the coverage for full immunization for age.

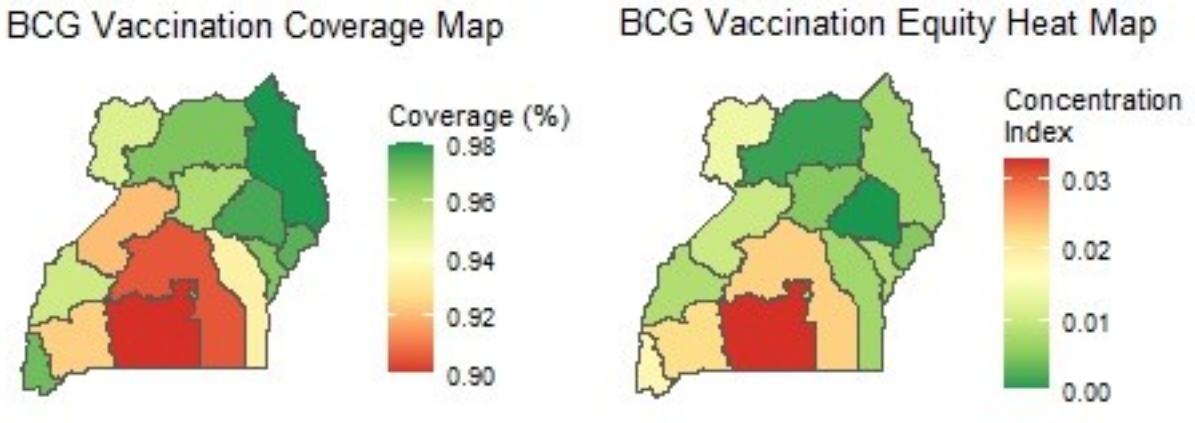
Decomposition of Fully Immunized for Age Equity



Individual vaccines

BCG immunization

The BCG vaccine is given at birth in Uganda and protects against Tuberculosis.



The BCG vaccine provided at birth fully benefits from improved maternal and child healthcare, providing essential neonatal care nationwide. The lowest coverage of 90-91% is found in South and North Buganda. The BCG vaccine delivery also appears to be equitable.

BCG immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
South Buganda	**90.00%**	0.033	0.119	0.083	0.335
North Buganda	**90.50%**	0.023	0.083	0.053	0.187
Bunyoro	**92.10%**	0.010	0.039	0.103	0.269
Ankole	92.40%	0.022	0.081	0.058	0.183
Busoga	93.40%	0.007	0.024	-0.004	-0.011
West Nile	95.20%	0.014	0.053	0.056	0.112
Tooro	95.50%	0.008	0.030	0.064	0.199
Lango	96.10%	0.005	0.021	0.055	0.106
Kampala	96.80%	0.009	0.034	0.002	0.038
Bukedi	96.90%	0.008	0.032	0.038	0.093
Acholi	96.90%	0.001	0.004	0.141	0.243
Kigezi	97.10%	0.018	0.069	0.034	0.107
Bugisu	97.40%	0.005	0.021	-0.006	-0.015
Teso	97.60%	0.000	0.000	0.072	0.153
Karamoja	98.00%	0.007	0.027	0.006	0.009

Subnational regions as presented in the 2016 DHS for Uganda.

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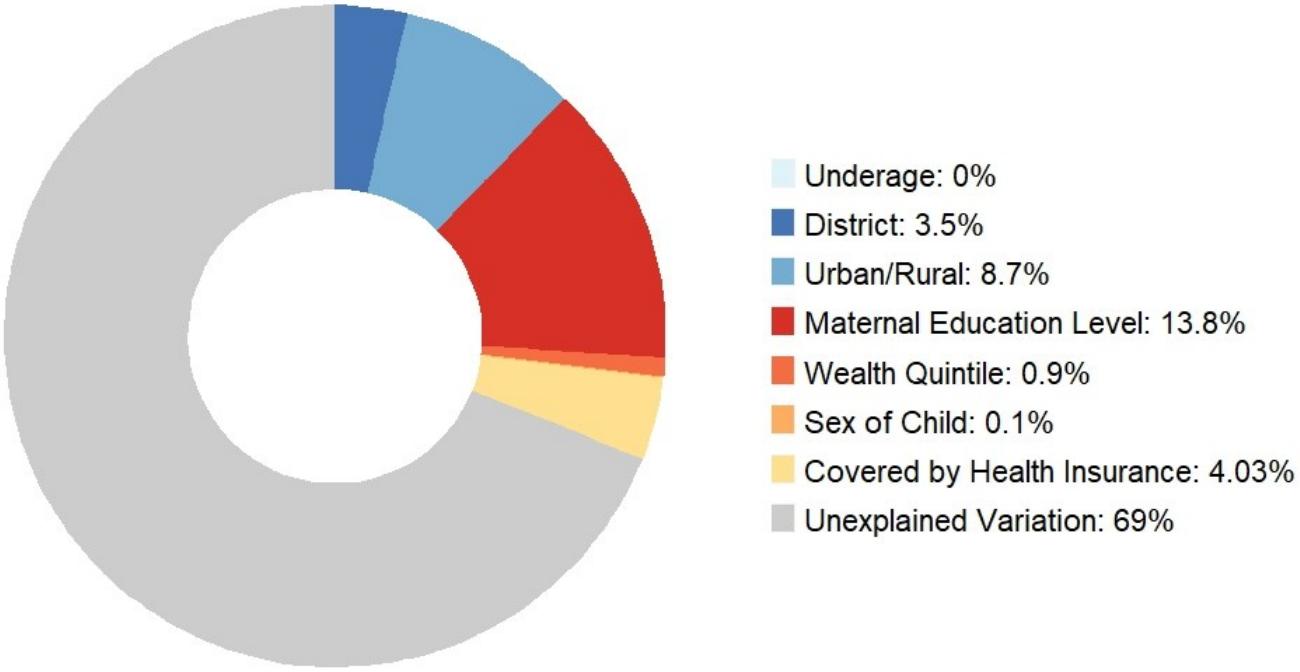
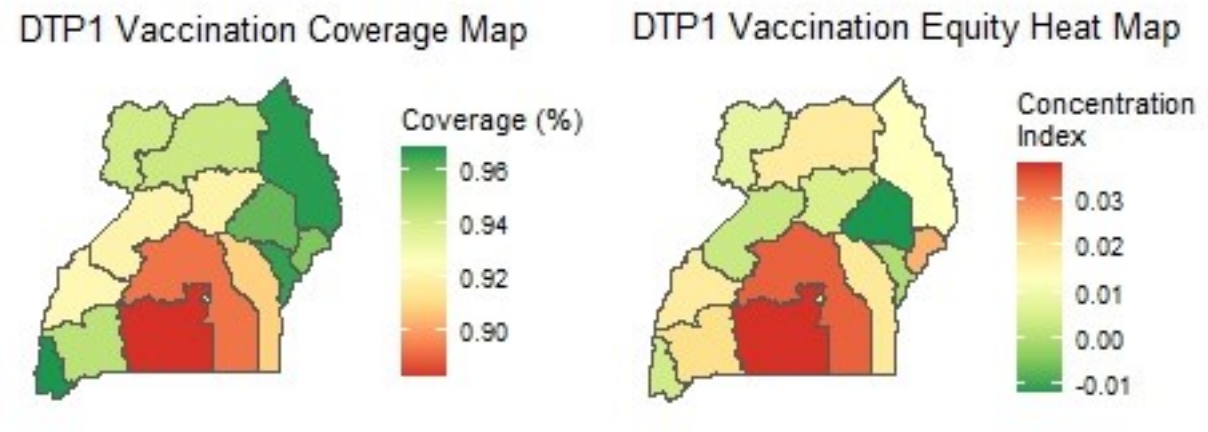
Decomposition of BCG Coverage Equity



DTP1 immunization

The first dose of the DTP vaccine is given six weeks after birth as part of the Pentavalent vaccine (DTP-HepB-Hib) in Uganda which provides protection against Diphtheria, Whooping Cough (Pertussis), Tetanus, Hepatitis B, and Haemophilus influenza type B.

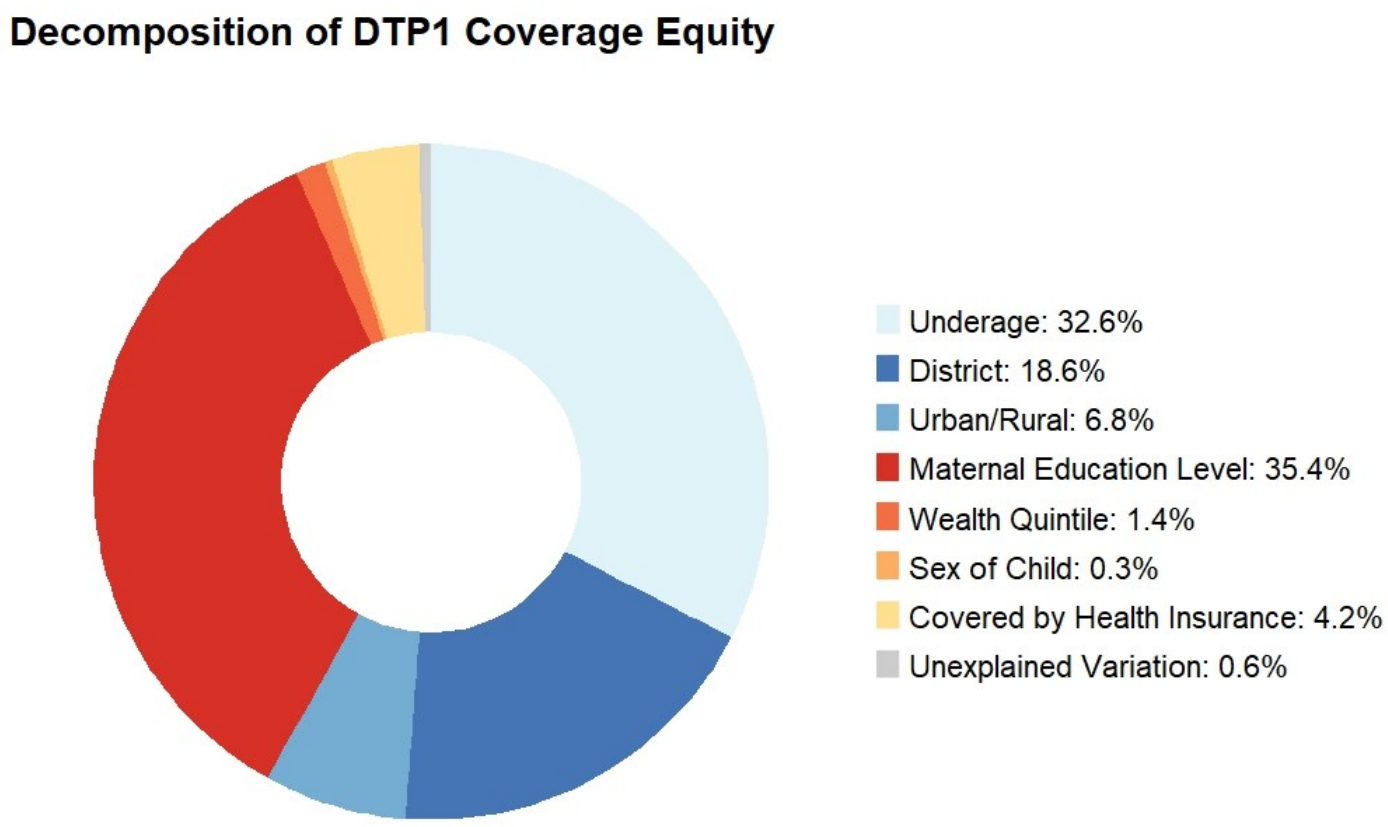


The first dose of DPT vaccine also shows high coverage, with the lowest coverage at 88-91% found in South and North Buganda and Busoga. The delivery of the first dose of the DPT vaccine is also very equitable. When accounting for factors beyond wealth, the vaccine appears equitably distributed, moreover, slightly "pro-disadvantaged" distributed in Teso district (-0.012).

DTP1 immunization coverage and equity by district

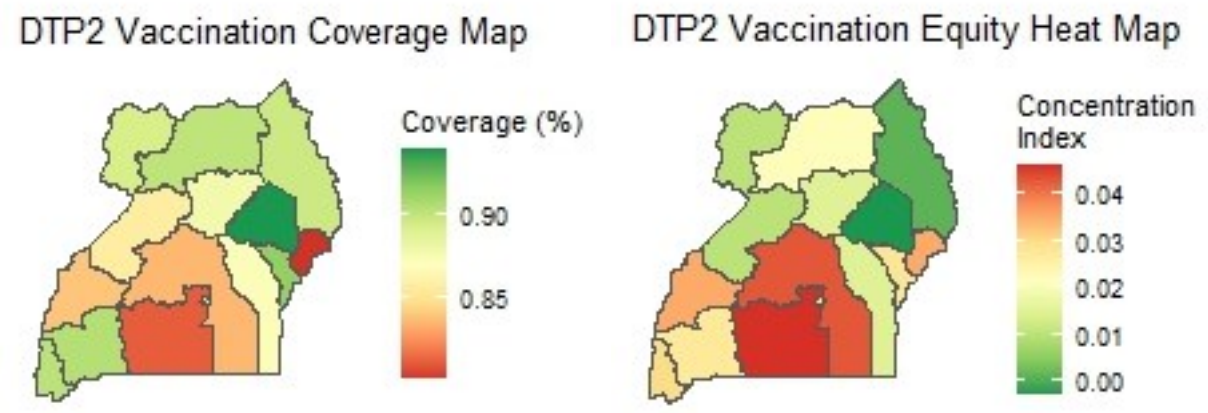
		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
South Buganda	**88.20%**	0.038	0.127	0.071	0.284
North Buganda	**89.20%**	0.034	0.113	0.056	0.198
Busoga	**90.80%**	0.019	0.064	-0.001	-0.004
Lango	91.90%	0.005	0.017	0.063	0.120
Bunyoro	92.00%	0.003	0.010	0.090	0.236
Tooro	92.20%	0.018	0.064	0.054	0.168
Kampala	93.10%	0.009	0.031	0.002	0.034
West Nile	94.10%	0.008	0.029	0.048	0.097
Acholi	94.20%	0.018	0.063	0.130	0.225
Ankole	94.50%	0.021	0.076	0.051	0.161
Bugisu	95.60%	0.026	0.095	-0.001	-0.003
Teso	96.00%	-0.012	-0.045	0.054	0.115
Bukedi	96.60%	0.000	0.000	0.033	0.081
Karamoja	96.70%	0.013	0.046	-0.011	-0.015
Kigezi	96.80%	0.004	0.014	0.030	0.096

Subnational regions as presented in the 2016 DHS for Uganda.



DTP2 immunization

The second dose of the DTP vaccine is given ten weeks after birth as part of the Pentavalent vaccine (DTP-HepB-Hib) in Uganda.

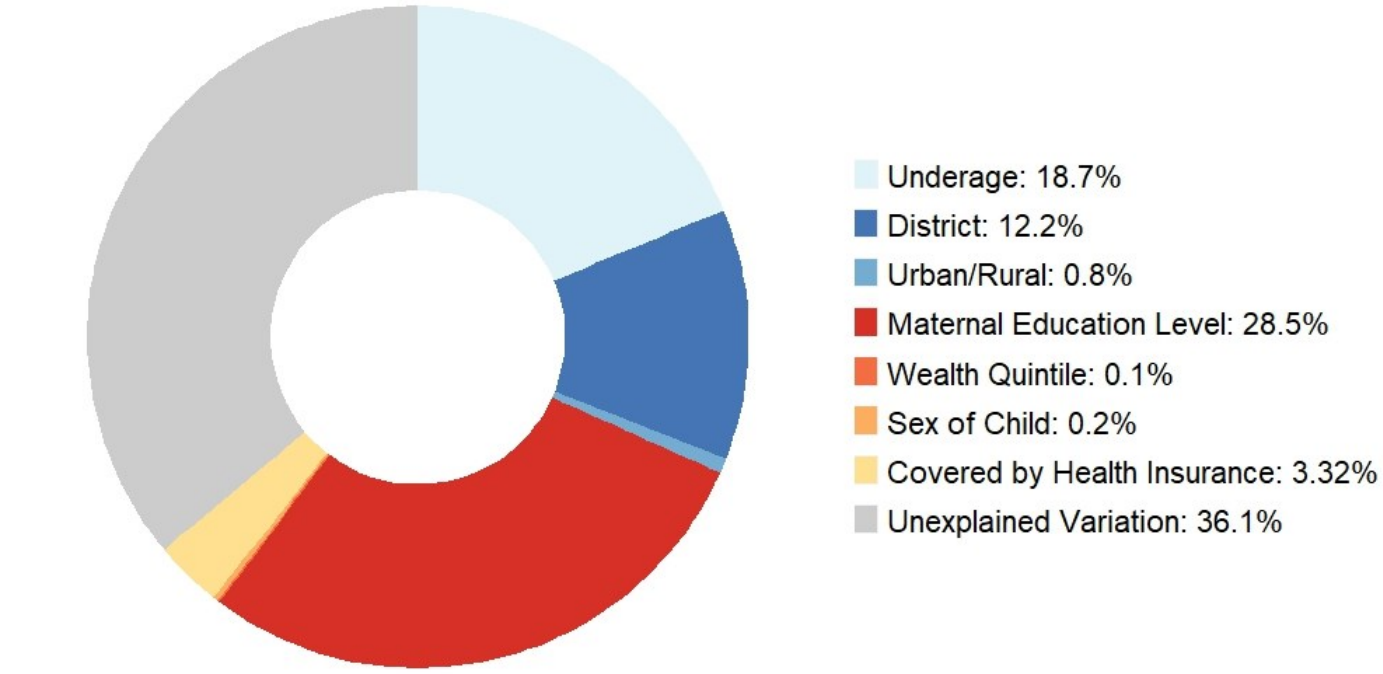


DTP2 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Bugisu	**80.10%**	0.035	0.102	0.003	0.007
South Buganda	**81.10%**	0.046	0.135	0.061	0.247
North Buganda	**83.60%**	0.043	0.133	0.056	0.198
Tooro	84.00%	0.035	0.110	0.059	0.182
Bunyoro	85.70%	0.010	0.032	0.082	0.214
Kampala	86.00%	0.028	0.092	0.002	0.040
Busoga	87.30%	0.015	0.048	0.002	0.004
Lango	87.80%	0.015	0.048	0.052	0.099
West Nile	89.40%	0.010	0.033	0.046	0.092
Karamoja	89.80%	0.001	0.004	-0.017	-0.023
Acholi	90.20%	0.022	0.074	0.106	0.182
Kigezi	90.30%	0.030	0.097	0.027	0.087
Ankole	90.50%	0.027	0.088	0.049	0.155
Bukedi	91.60%	0.028	0.093	0.037	0.089
Teso	94.00%	-0.003	-0.011	0.054	0.115

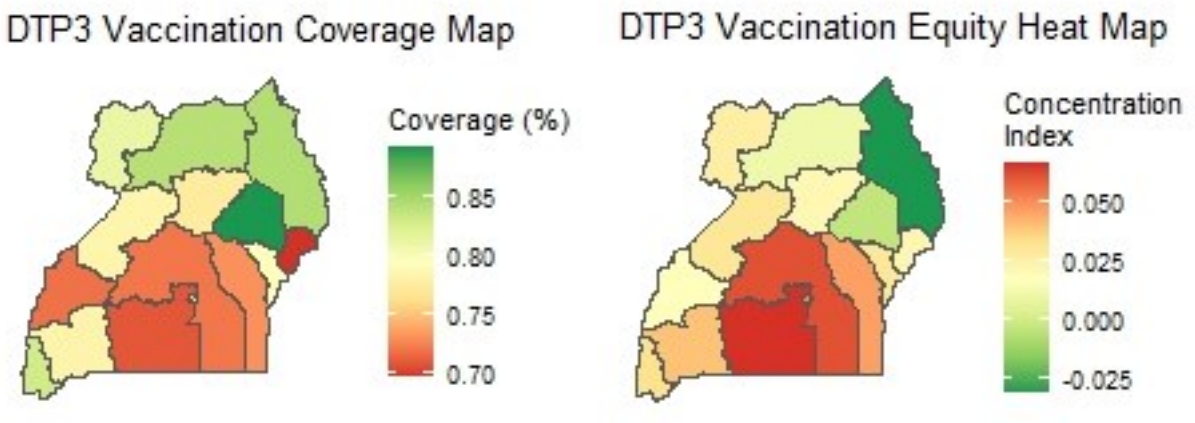
Subnational regions as presented in the 2016 DHS for Uganda.

Decomposition of DTP2 Coverage Equity



DTP3 immunization

The third dose of the DTP vaccine is given 14 weeks after birth as part of the Pentavalent vaccine (DTP-HepB-Hib) in Uganda.



Vaccination coverage for the third dose of the DPT vaccine drops significantly compared to the first two doses. Bugisu, South and North Buganda, Tooro, and Busoga districts show 70-73% coverage, the lowest in the country. DPT3 coverage is good to excellent in most other districts, with Teso district leading with 89%. Despite low coverage, there is no significant inequity in the vaccine's distribution.

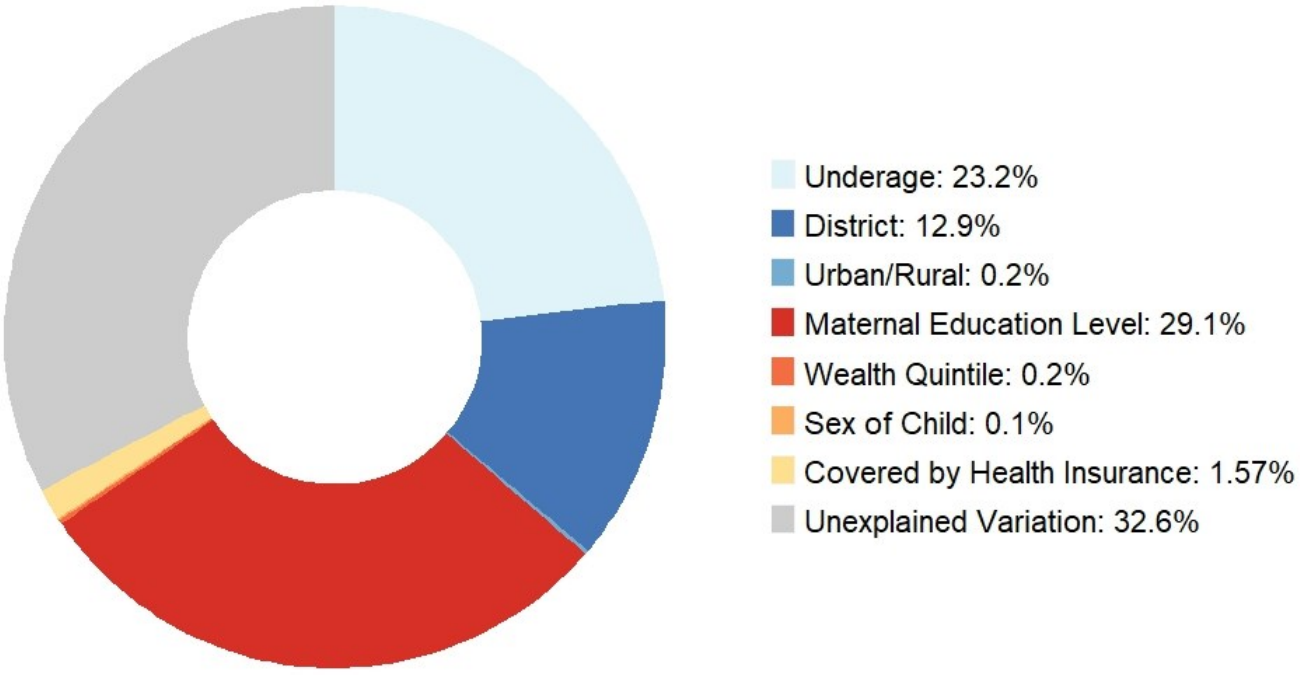
DTP3 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Bugisu	**69.7%**	0.022	0.053	0.015	0.039
South Buganda	**70.9%**	0.067	0.171	0.058	0.232
Tooro	**71.9%**	0.018	0.047	0.033	0.103
North Buganda	72.1%	0.062	0.162	0.055	0.193
Busoga	73.1%	0.047	0.123	0.005	0.014
Lango	77.5%	0.021	0.059	0.051	0.097
Kampala	78.3%	0.051	0.148	0.002	0.045
Ankole	78.3%	0.040	0.112	0.045	0.144
Bunyoro	78.4%	0.030	0.081	0.074	0.195
Bukedi	79.8%	0.030	0.084	0.032	0.079
West Nile	81.2%	0.026	0.075	0.047	0.094
Kigezi	83.1%	0.033	0.096	0.027	0.085
Acholi	84.3%	0.011	0.034	0.093	0.160
Karamoja	84.5%	-0.032	-0.094	-0.035	-0.047
Teso	89.3%	-0.004	-0.012	0.055	0.118

Subnational regions as presented in the 2016 DHS for Uganda.

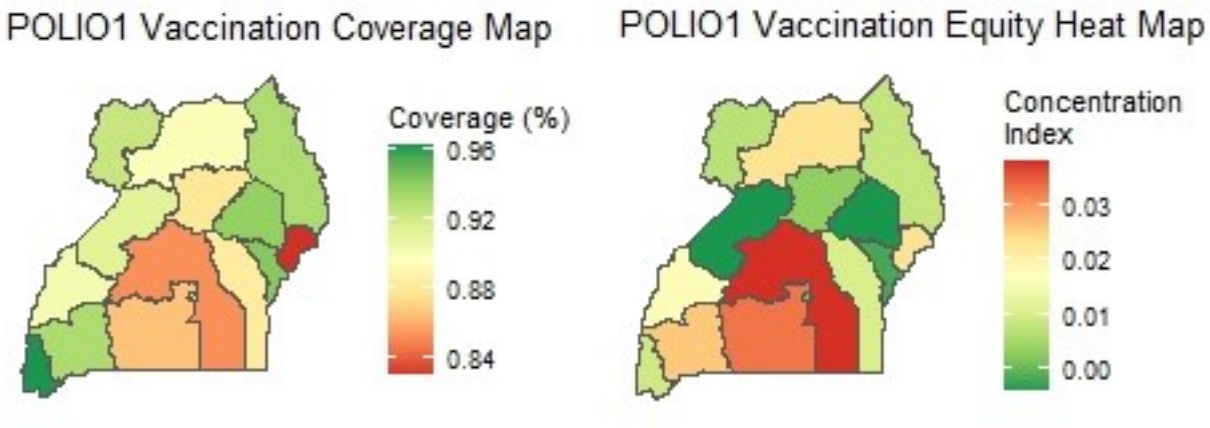
Maternal education level was the dominant factor (29.1%) contributing to differences in DPT3 receipt across Uganda, followed by regional differences (12.9%). A significant proportion of children in the DHS dataset were underaged for the vaccine (23.2%), explaining why they did not receive it (they are not included in the equity metrics calculations).

Decomposition of DTP3 Coverage Equity



POLIO1 immunization

The first dose of the polio vaccine is given six weeks after birth in Uganda.



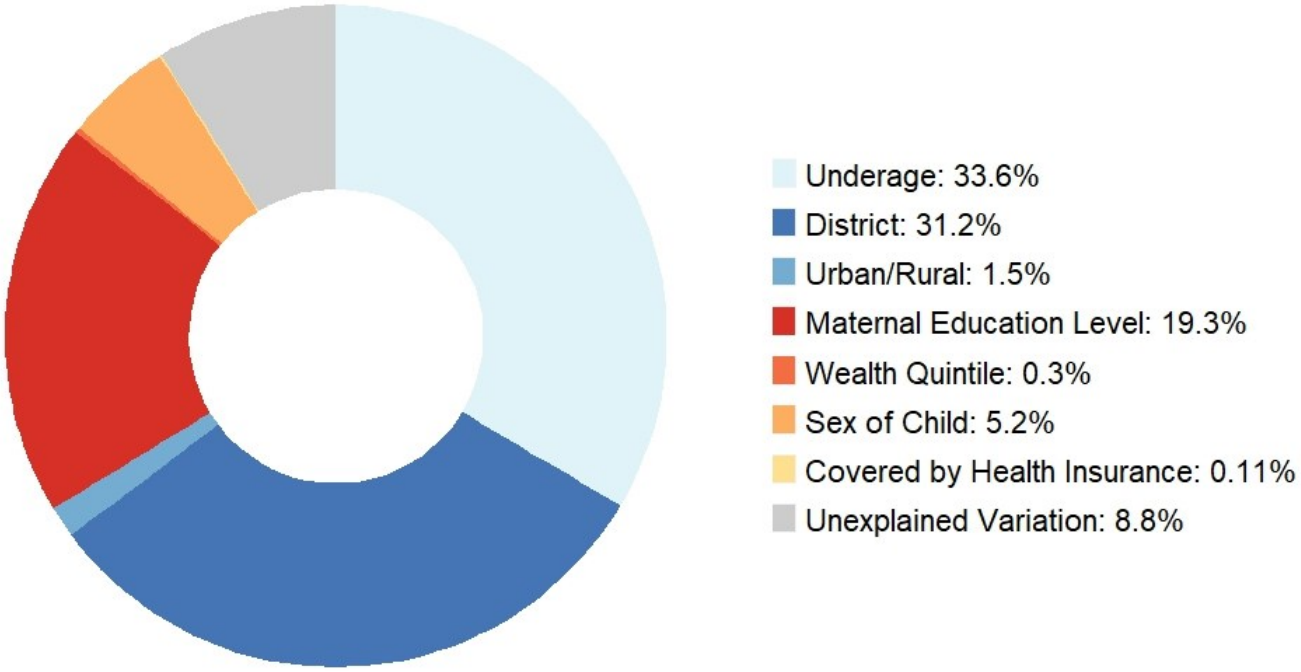
The first dose of the Polio vaccine also has relatively high coverage, with the lowest coverage at 83% in Bugisu district (followed by North and South Buganda at 85-87%). When accounting for factors beyond wealth, the vaccine appears equitably distributed.

POLIO1 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Bugisu	**82.9%**	0.023	0.072	-0.008	-0.022
North Buganda	**85.2%**	0.038	0.122	0.056	0.200
South Buganda	**86.5%**	0.033	0.108	0.062	0.251
Lango	87.9%	0.003	0.009	0.056	0.107
Busoga	88.2%	0.010	0.034	0.001	0.001
Acholi	89.8%	0.023	0.078	0.120	0.208
Tooro	90.2%	0.018	0.064	0.053	0.165
Kampala	90.8%	0.001	0.003	0.001	0.021
Bunyoro	91.2%	-0.004	-0.013	0.087	0.227
West Nile	92.3%	0.007	0.026	0.047	0.094
Karamoja	93.1%	0.008	0.027	-0.008	-0.011
Ankole	93.1%	0.026	0.091	0.050	0.158
Teso	93.9%	-0.004	-0.014	0.051	0.109
Bukedi	94.2%	-0.002	-0.006	0.030	0.074
Kigezi	96.2%	0.009	0.033	0.029	0.094

Subnational regions as presented in the 2016 DHS for Uganda.

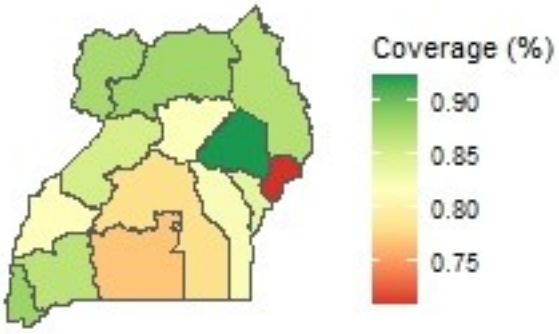
Decomposition of POLIO1 Coverage Equity



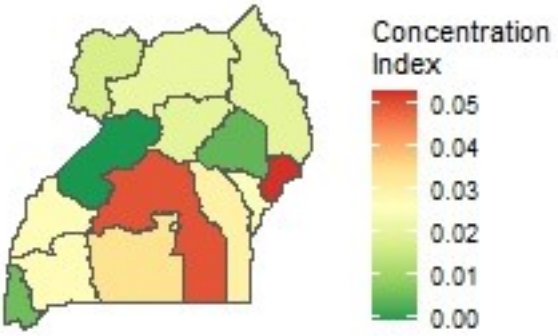
POLIO2 immunization

The second dose of the polio vaccine is given ten weeks after birth in Uganda.

POLIO2 Vaccination Coverage Map



POLIO2 Vaccination Equity Heat Map

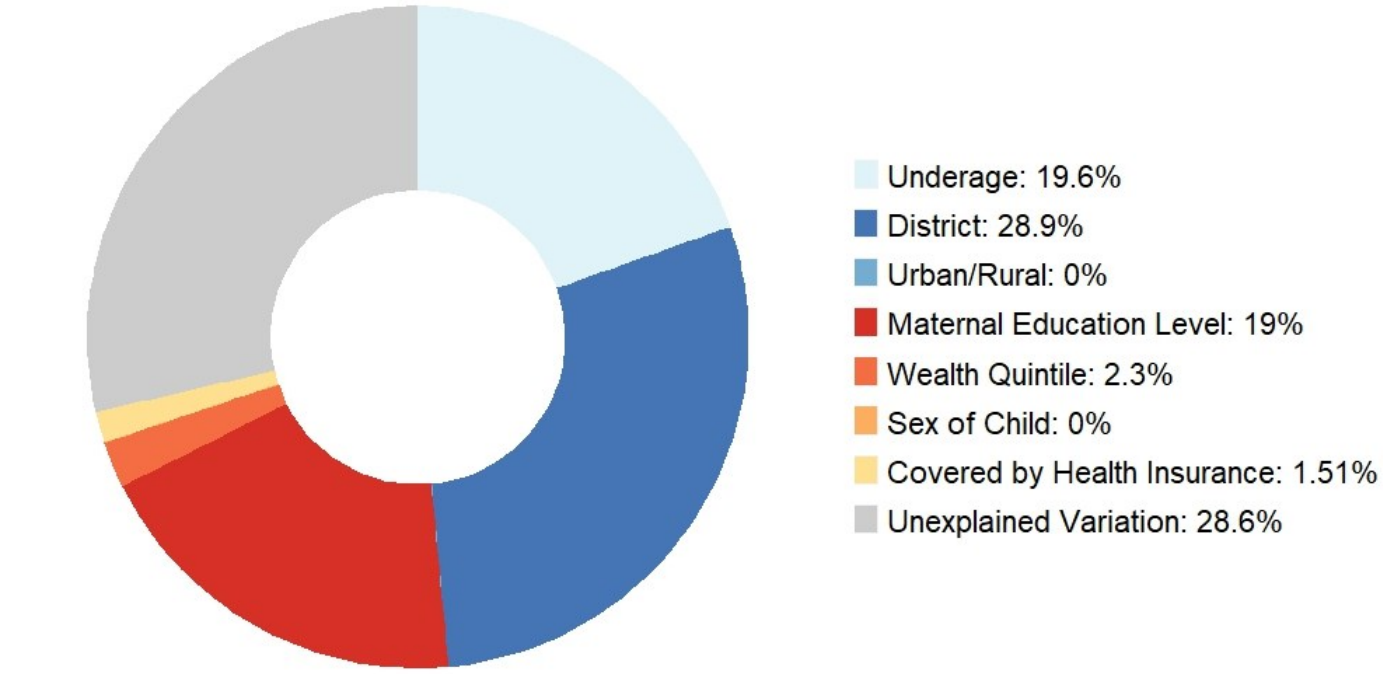


POLIO2 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Bugisu	**70.8%**	0.053	0.138	-0.003	-0.007
South Buganda	**76.8%**	0.034	0.094	0.050	0.203
North Buganda	**78.1%**	0.050	0.144	0.052	0.183
Kampala	79.3%	0.031	0.093	0.001	0.014
Tooro	81.3%	0.027	0.085	0.046	0.143
Lango	81.8%	0.020	0.062	0.051	0.098
Busoga	82.2%	0.030	0.090	0.013	0.037
Bukedi	83.8%	0.025	0.078	0.041	0.099
Bunyoro	85.2%	-0.001	-0.003	0.079	0.208
Ankole	86.6%	0.027	0.084	0.043	0.135
Karamoja	86.9%	0.020	0.066	0.000	0.000
West Nile	87.5%	0.017	0.056	0.049	0.099
Acholi	87.8%	0.021	0.069	0.100	0.172
Kigezi	88.1%	0.005	0.016	0.021	0.067
Teso	92.3%	0.004	0.014	0.052	0.110

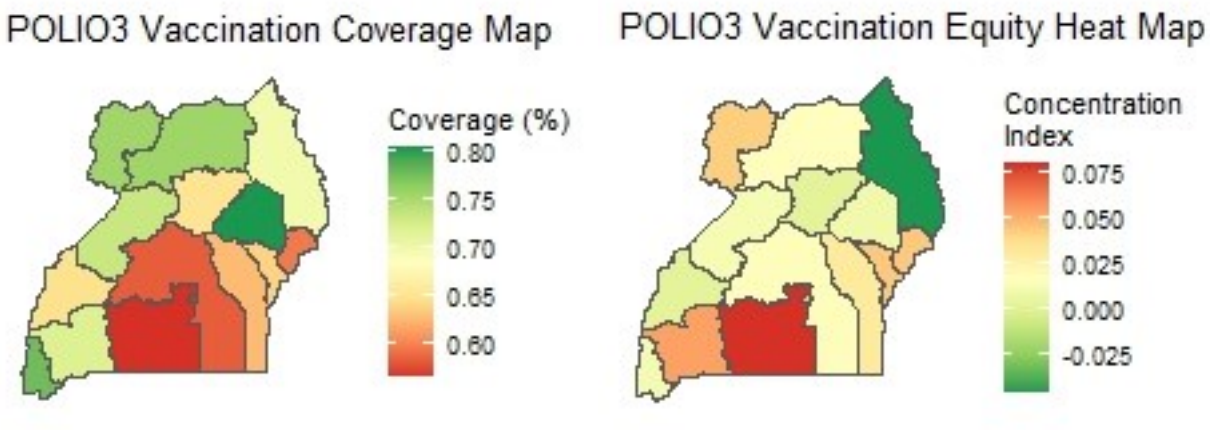
Subnational regions as presented in the 2016 DHS for Uganda.

Decomposition of POLIO2 Coverage Equity



POLIO3 immunization

The third dose of the polio vaccine is given 14 weeks after birth in Uganda.



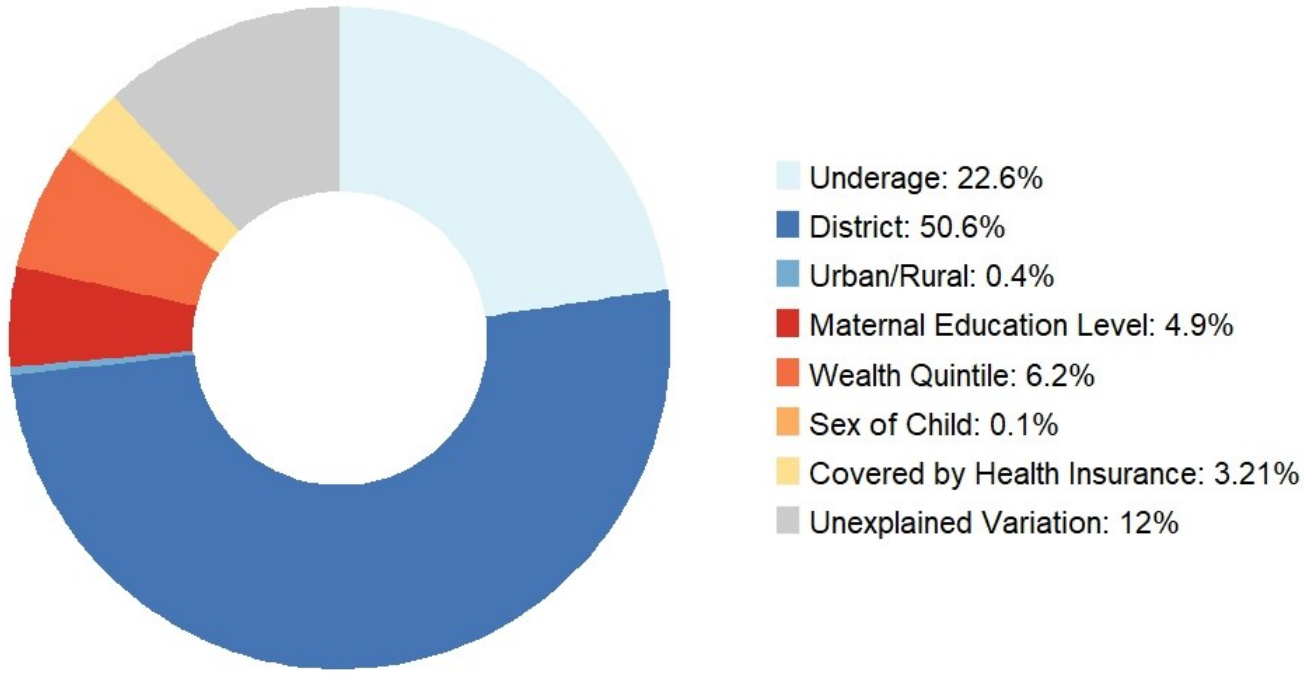
Coverage for the third dose of the polio vaccine is heterogenous, with wide variations between districts. Teso, Kigezi, Acholi, and West Nile districts all perform well with 75-80% coverage, while South and North Buganda, Kampala, and Bugisu see much lower coverage rates of 56-59%. Despite these differences, there does not seem to be significant inequity (composite or wealth-based only) within districts.

POLIO3 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
South Buganda	**56.40%**	0.080	0.164	0.041	0.166
Kampala	**56.90%**	0.044	0.092	0.002	0.042
North Buganda	**58.10%**	0.018	0.038	0.039	0.140
Bugisu	59.40%	0.044	0.092	-0.005	-0.013
Busoga	62.50%	0.030	0.068	0.002	0.006
Bukedi	63.70%	0.044	0.098	0.035	0.086
Tooro	64.70%	0.002	0.004	0.038	0.117
Lango	65.00%	0.002	0.004	0.034	0.066
Karamoja	69.70%	-0.047	-0.113	-0.030	-0.041
Ankole	71.70%	0.054	0.138	0.035	0.112
Bunyoro	73.20%	0.012	0.030	0.070	0.183
West Nile	75.40%	0.042	0.114	0.046	0.093
Acholi	75.50%	0.017	0.045	0.067	0.116
Kigezi	77.60%	0.011	0.031	0.023	0.072
Teso	80.30%	0.009	0.026	0.049	0.103

Subnational regions as presented in the 2016 DHS for Uganda.

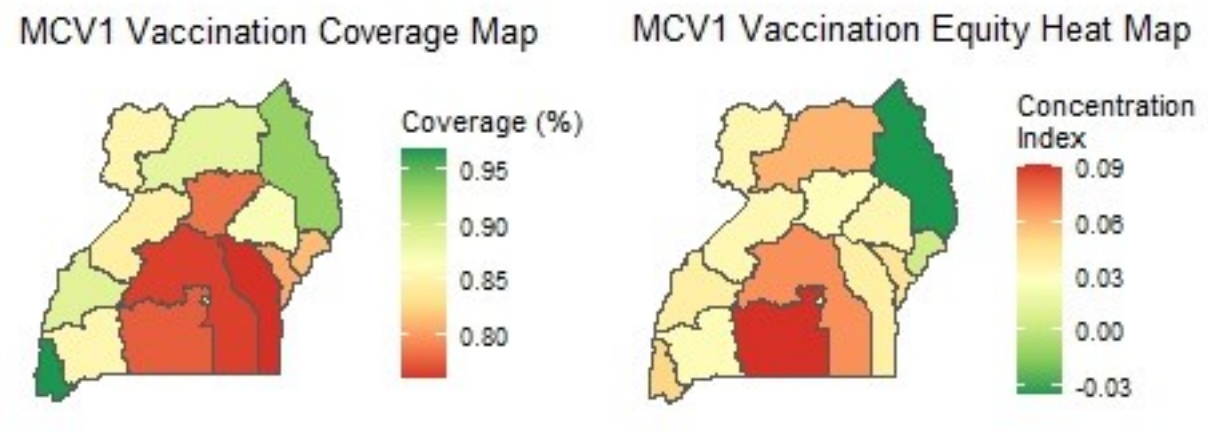
Decomposition of POLIO3 Coverage Equity



Differences in coverage in Uganda for the third dose of the polio vaccine are essentially explained by differences between districts. Demand-side constraints play a minor role in POLIO3 uptake.

MCV1 immunization

The first dose of the MCV is given nine months after birth in Uganda and provides protection against measles.



Aside from two districts (Kigezi and Karamoja), Ugandan districts fall short of the 90% coverage target to prevent measles outbreaks. Busoga, North and South Buganda, and Lango districts have the lowest coverage, ranging from 76-78%, making them more prone to outbreaks. While modest, the distribution of MCV1 is less equitable than for other vaccines in these low-coverage districts.

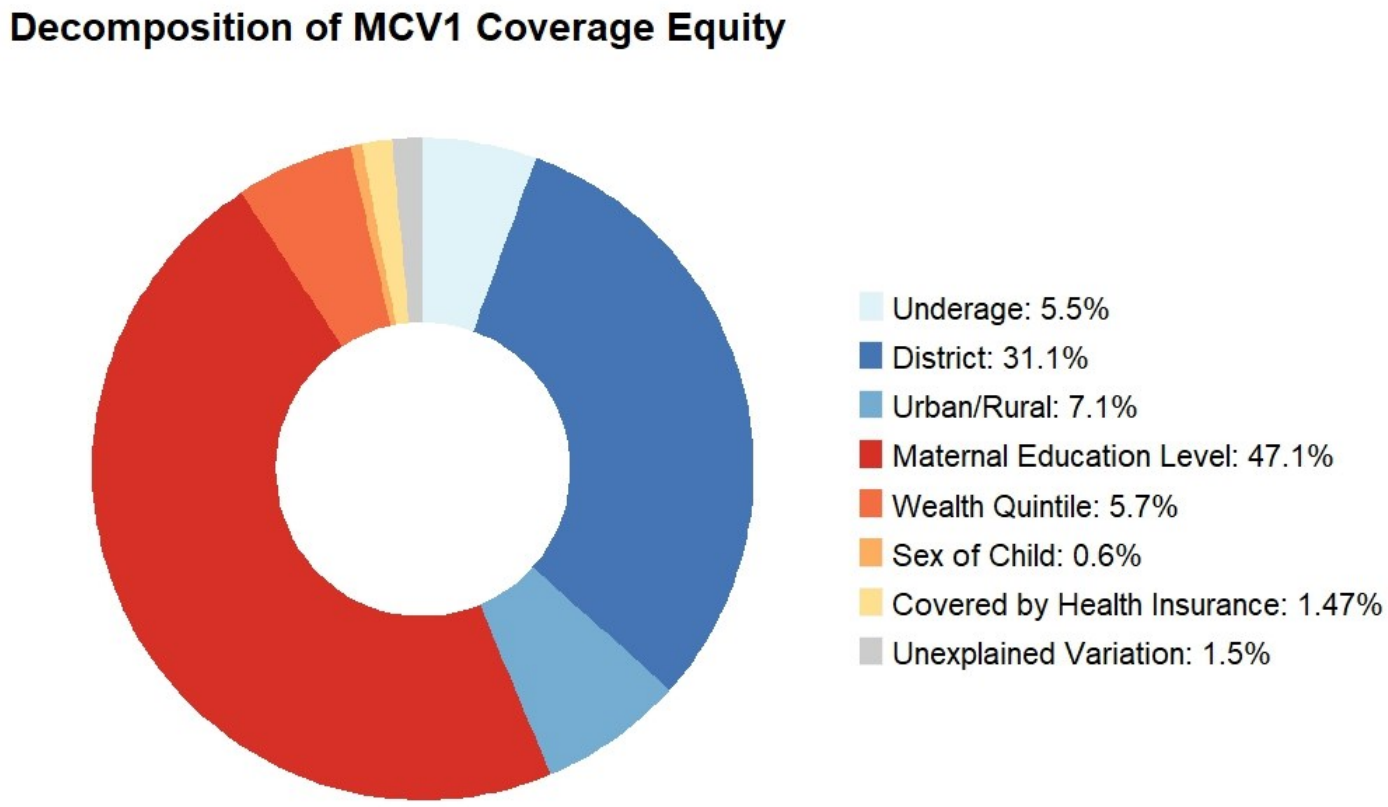
MCV1 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Busoga	**76.0%**	0.038	0.081	0.004	0.012
North Buganda	**76.5%**	0.069	0.156	0.048	0.170
South Buganda	**77.5%**	0.091	0.210	0.062	0.249
Lango	78.4%	0.029	0.068	0.066	0.128
Bukedi	80.6%	0.045	0.109	0.043	0.104
Bugisu	81.4%	0.004	0.010	-0.005	-0.012
Bunyoro	84.7%	0.032	0.074	0.075	0.197
Kampala	85.3%	0.030	0.079	0.002	0.045
West Nile	85.3%	0.033	0.083	0.039	0.078
Ankole	85.5%	0.030	0.068	0.043	0.136
Teso	86.9%	0.033	0.078	0.053	0.112
Acholi	88.6%	0.060	0.153	0.125	0.216
Tooro	88.9%	0.038	0.099	0.042	0.131
Karamoja	93.0%	-0.036	-0.097	-0.044	-0.059
Kigezi	96.8%	0.051	0.140	0.031	0.101

Subnational regions as presented in the 2016 DHS for Uganda.

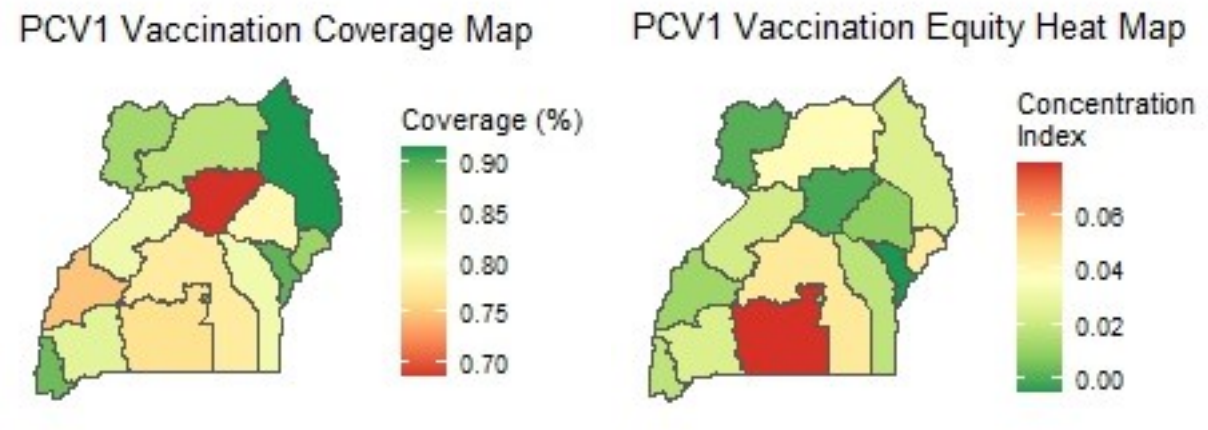
While there are significant differences in coverage by district (explaining 31.1% of the variation in coverage), maternal education level was the dominant factor for MCV1 coverage, explaining 47.1%. Since very little of the variation is left unexplained (1.5%) by the selected factors, we understand how important it will be for the

government to consider a comprehensive approach sensitive to health literacy and education level to improve MCV1 uptake.



PCV1 immunization

The first dose of the pcv vaccine is given six weeks after birth in Uganda.

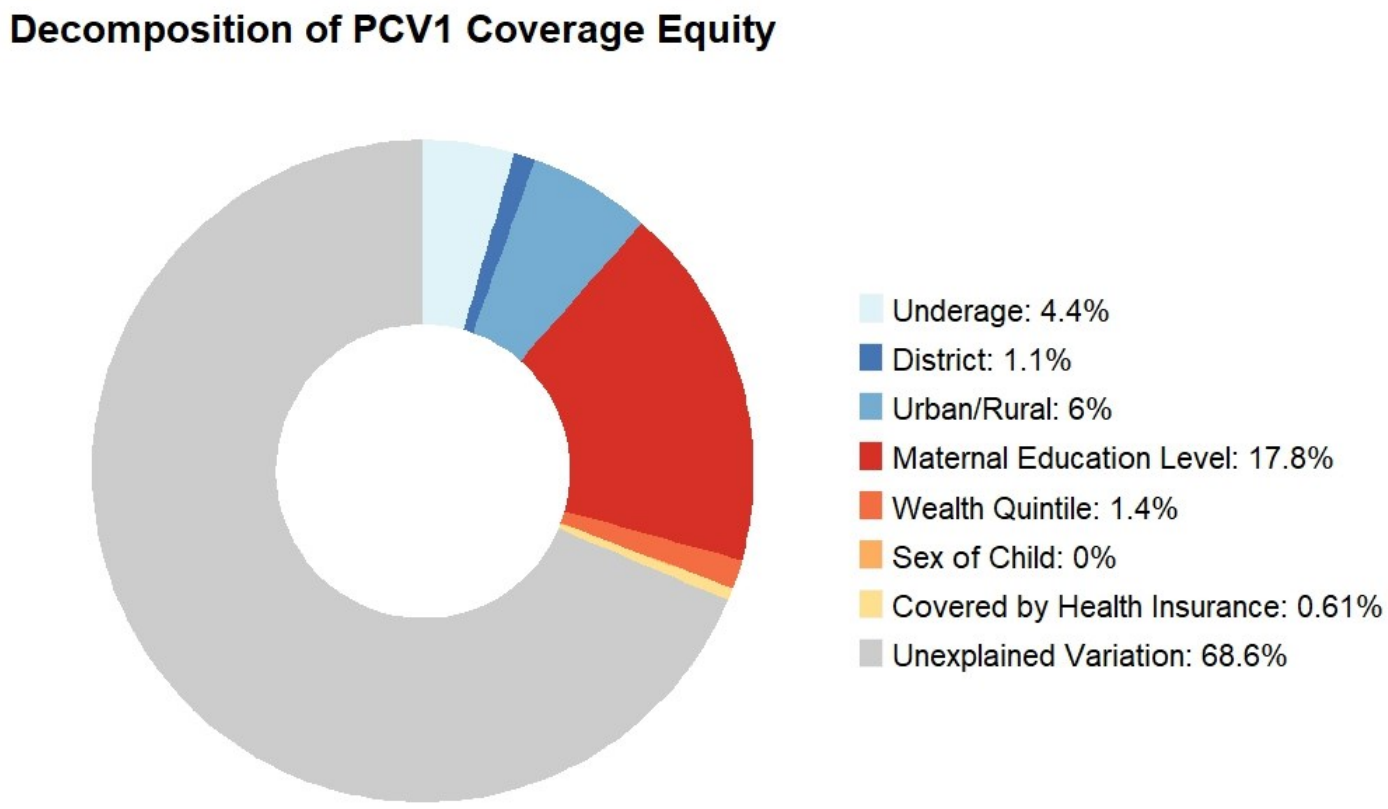


The PCV was introduced in 2013 in Uganda's EPI, making the 2016 Uganda DHS the first to feature PCV coverage. Yet, coverage in many districts has reached excellent levels within 2-3 years: 10 of the 15 districts have reached 80% coverage (ranging from 81-92%). Lango, Tooro, South and North Buganda, and Teso districts have the lowest coverage, ranging from 69-79%.

PCV1 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Lango	**68.5%**	-0.001	-0.003	0.044	0.085
Tooro	**74.9%**	0.012	0.033	0.035	0.108
South Buganda	**76.6%**	0.079	0.229	0.070	0.282
North Buganda	77.7%	0.047	0.140	0.045	0.158
Teso	79.2%	0.009	0.027	0.067	0.142
Busoga	81.3%	0.018	0.057	0.004	0.012
Bunyoro	81.5%	0.022	0.069	0.076	0.198
Ankole	82.7%	0.024	0.074	0.036	0.112
Acholi	85.3%	0.039	0.126	0.124	0.214
West Nile	86.6%	0.001	0.005	0.041	0.082
Bugisu	87.1%	0.046	0.150	0.014	0.035
Kampala	88.4%	0.014	0.049	0.002	0.035
Kigezi	89.0%	0.018	0.061	0.030	0.095
Bukedi	89.6%	-0.005	-0.017	0.029	0.070
Karamoja	91.5%	0.024	0.083	-0.005	-0.006

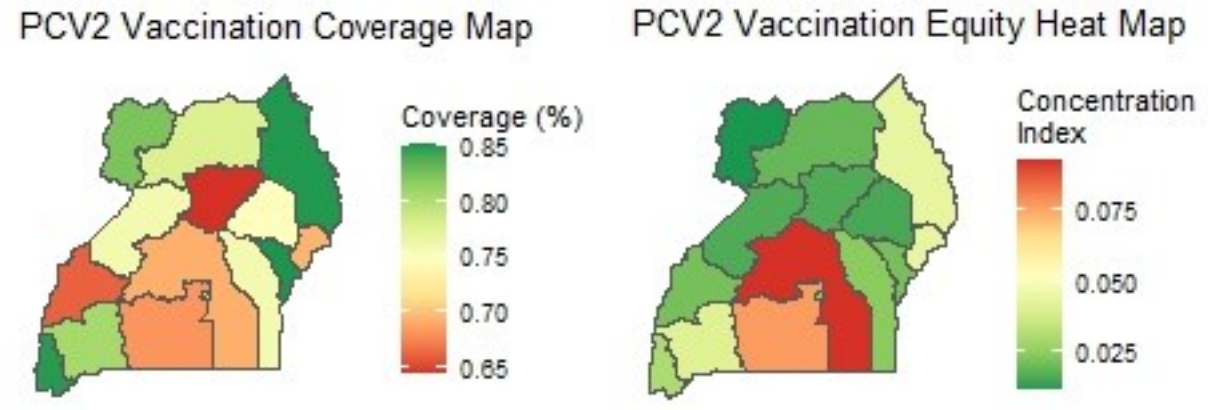
Subnational regions as presented in the 2016 DHS for Uganda.



PCV benefited from significant improvements in vaccine delivery in Uganda, allowing for a little contribution to the inequity from supply-side constraints, despite significant coverage differences between districts.

PCV2 immunization

The second dose of the pcv vaccine is given ten weeks after birth in Uganda.

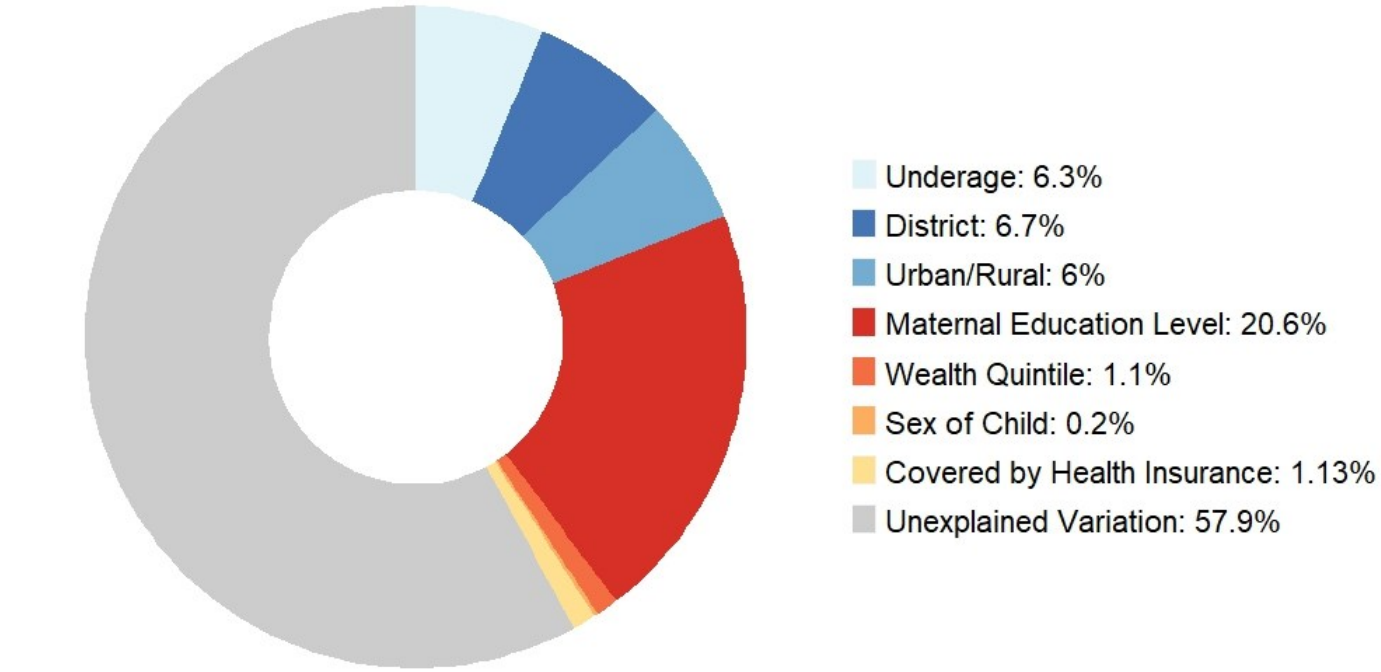


PCV2 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Lango	**64.30%**	0.016	0.038	0.036	0.070
Tooro	**66.00%**	0.021	0.053	0.042	0.130
South Buganda	**68.10%**	0.077	0.191	0.057	0.228
North Buganda	69.20%	0.093	0.240	0.054	0.192
Bugisu	69.40%	0.044	0.113	-0.001	-0.002
Teso	74.60%	0.015	0.041	0.080	0.171
Busoga	75.70%	0.024	0.068	0.007	0.021
Bunyoro	75.70%	0.016	0.043	0.068	0.178
Acholi	77.80%	0.019	0.055	0.082	0.142
Kampala	79.00%	0.026	0.078	0.002	0.048
Ankole	80.60%	0.041	0.122	0.039	0.123
West Nile	82.30%	0.011	0.032	0.035	0.071
Kigezi	84.90%	0.030	0.092	0.018	0.058
Karamoja	85.00%	0.044	0.139	-0.009	-0.013
Bukedi	85.10%	0.021	0.066	0.033	0.080

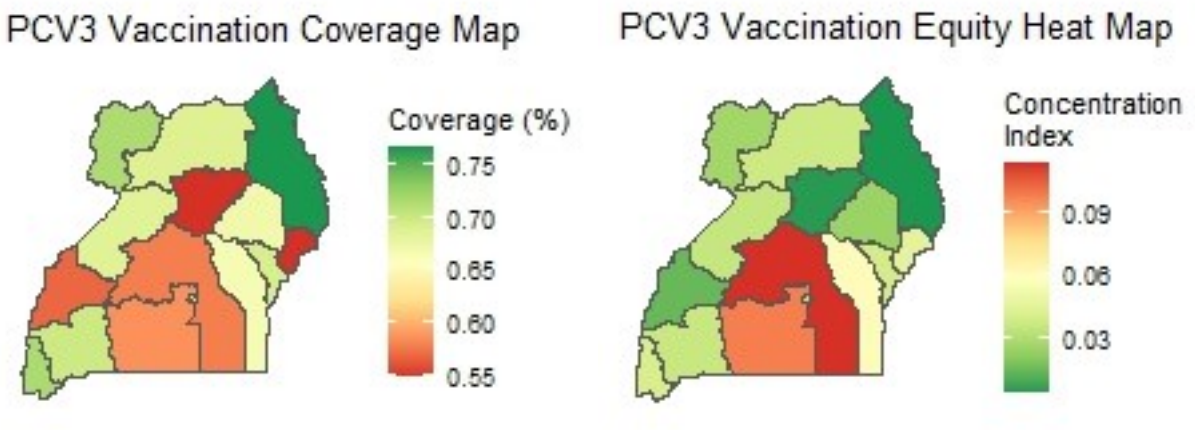
Subnational regions as presented in the 2016 DHS for Uganda.

Decomposition of PCV2 Coverage Equity



PCV3 immunization

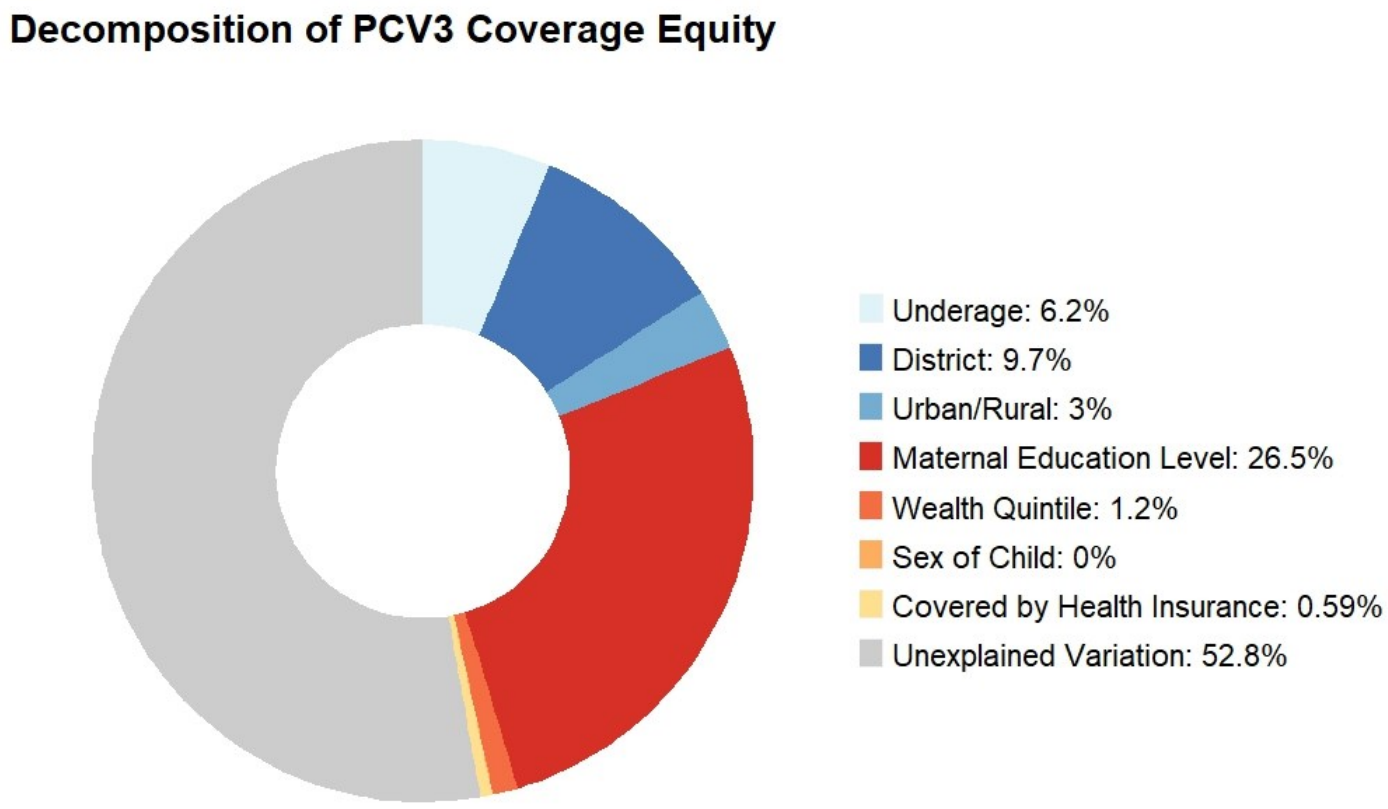
The third dose of the pcv vaccine is given 14 weeks after birth in Uganda.



PCV3 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Bugisu	**54.80%**	0.046	0.089	0.012	0.030
Lango	**54.80%**	0.004	0.009	0.032	0.062
Tooro	**56.80%**	0.014	0.029	0.026	0.082
North Buganda	57.80%	0.114	0.240	0.051	0.182
South Buganda	58.60%	0.099	0.209	0.059	0.239
Busoga	66.50%	0.060	0.143	0.006	0.018
Teso	67.00%	0.024	0.056	0.075	0.159
Kampala	67.90%	0.035	0.087	0.002	0.038
Bunyoro	68.50%	0.035	0.082	0.064	0.167
Acholi	68.80%	0.037	0.090	0.087	0.150
Bukedi	69.30%	0.039	0.094	0.037	0.089
Ankole	69.90%	0.036	0.089	0.034	0.108
West Nile	71.50%	0.026	0.068	0.038	0.076
Kigezi	71.60%	0.040	0.100	0.017	0.055
Karamoja	76.60%	0.003	0.008	-0.029	-0.039

Subnational regions as presented in the 2016 DHS for Uganda.



Publications & Resources

- Detailed equity analysis for vaccine equity in Uganda - *Preprint under consideration*
  - Ssebagereka et al. (preprint). Equity in vaccine coverage in Uganda from 2000 to 2016: Revealing the multifaceted nature of inequity.
- Full Methodological Paper for the VERSE Equity Toolkit
  - Patenaude et al. (2022). A standardized approach for measuring multivariate equity in vaccination coverage, cost-of-illness, and health outcomes: Evidence from the Vaccine Economics Research for Sustainability & Equity (VERSE) project. *Social Science & Medicine, 302*, 114979.
- Global comparison of VERSE composite against wealth-based equity measures
  - Patenaude et al. (2023). Comparing Multivariate with Wealth-Based Inequity in Vaccination Coverage in 56 Countries: Toward a Better Measure of Equity in Vaccination Coverage. *Vaccines, 11*(3), 536.

Methods

VERSE Equity Toolkit

The Vaccine Economics Research for Sustainability and Equity (VERSE) Equity Toolkit provides a quantitative measure of immunization coverage and equity by (1) ranking the sample population with a composite direct unfairness index and (2) generating efficiency (coverage) and equity metrics.

Our fair source of variation is defined as the child's age – children too young to receive routine immunization are not expected to be vaccinated. Unfair sources of variation are the child's region of residence, whether they live in an urban or rural area, the mother's education level, the household's socioeconomic status, the child's sex, and their insurance coverage status. We identify a "more privileged" situation for each unfair variation source. Equity measures using socioeconomic status only ("wealth", traditionally used to discuss inequalities) are also presented for comparison.

The model enables analysts to assess the equity and efficiency tradeoffs in achieving the immunization program's targets, including reaching vulnerable populations. Read the full methodology on Social Science & Medicine (2022).

Data source

The toolkit was applied to the Demographic and Health Survey for Uganda in 2016. The data are available to the public on dhsprogram.com.

How to read the metrics

- Efficiency metric
  - **Vaccine coverage**: An estimate (based on DHS data) of the vaccine coverage (or zero-dose status prevalence) in the national and district-level populations
- Equity metric
  - **Concentration index**: The difference between the current distribution of vaccine coverage and perfect equity.
  - **Absolute equity gap**: The difference between health outcome attainment between the most advantaged 20% of the population and the least advantaged 20% of the population.
  - **Relative equity gap**: The relative difference in vaccine coverage between two groups. Those two groups are defined based on one of the following binary unfair factors of inequity: health insurance, sex of the child, whether in a rural area.
  - **Slope index of inequity**: The difference in estimated values of a health indicator between the 20% most advantaged and 20% most disadvantaged households, while accounting for other subgroups.
  - **Relative index of inequity**: The relative difference in estimated values of a health indicator between the 20% most advantaged and 20% most disadvantaged households, while accounting for other subgroups.

Acronyms

- AEG: Absolute Equity Gap
- BCG: Bacille Calmette Guerin vaccine
- CI: Concentration index (Wagstaff)
- CIE: Concentration index (Erreyger)
- DHS: Demographic & Health Surveys
- DTP/DPT: Diphtheria Tetanus Pertussis vaccine
- EPI: Expanded Program for Immunization
- FULL: Fully immunized for age
- MCV: Measles-Containing Vaccine
- PCV: Pneumococcal Conjugate Vaccine
- SIA: Supplementary Immunization Activities
- VERSE: Vaccine Economics Research for Sustainability and Equity
- ZERO: Zero-dose status

For errors or omissions, please contact the VERSE team.