IMMUNIZATION COVERAGE AND EQUITY IN SOUTH AFRICA (2016)

VERSE Equity Assessment

Report prepared by Christopher Xiao. For errors or omissions, please contact the VERSE team.

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 produced by the Johns Hopkins Bloomberg School of Public Health.

Highlights

Key highlights from the DHS data

- Vaccine coverage in South Africa varies widely. Some vaccines, such as the BCG vaccine, show high coverage rates across all provinces. Other vaccines show low coverage rates. However, for all vaccines analyzed there are no significant inequities in vaccine distribution.
- For most vaccines, a significant amount of the variation in vaccine distribution can be attributed to urban/rural residence and province of residence. The combination of demand-side and supply-side constraints in certain provinces affect the coverage and equitable distribution of vaccines in South Africa.
- Vaccines provided later in life, such as the third dose of DTP or PCV show significant declines in coverage and slight increases in the inequity of distribution.

National overview

Vaccine coverage in South Africa varies. Coverage for BCG, the first dose of DTP, and first dose of PCV is fairly high with coverage exceeding 85%. Vaccines provided later such as the third dose of DTP and PCV see significant drops in coverage with the exception of Polio vaccines which do not see substantial changes in coverage between doses. Only 39% of children received their full course of vaccines (FULL) scheduled for their age. Furthermore, only 54% 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.

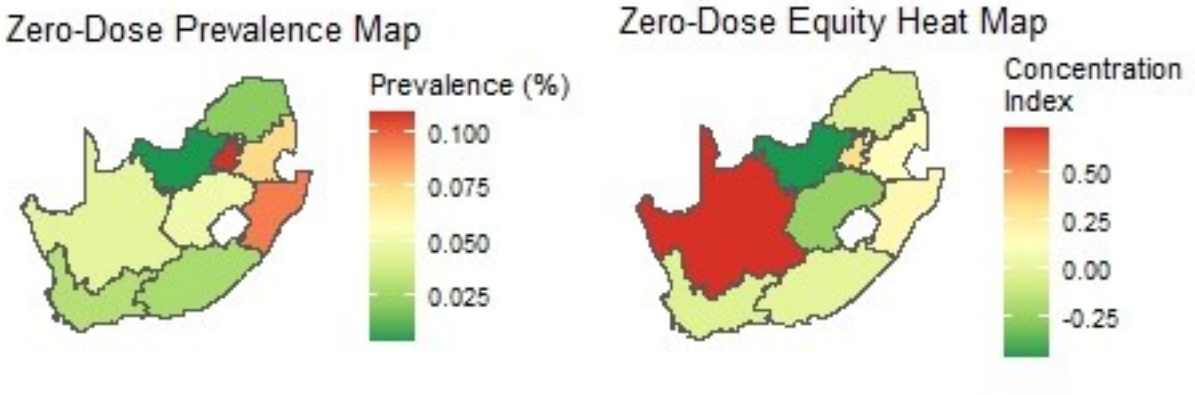
Coverage and equity level estimates for South Africa (2016)

		Concentration indices (95% confidence interval)				Absolute Equity Gap
Vaccine	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)	Composite
ZERO	6.51%	0.411 (0.311; 0.511)	0.071 (-0.029; 0.171)	-0.003 (-0.009; 0.003)	-0.009 (-0.015; -0.003)	0.088 (0.059; 0.117)
FULL	39.41%	0.094 (0.054; 0.134)	0.148 (0.108; 0.188)	-0.005 (-0.016; 0.006)	-0.015 (-0.026; -0.004)	0.154 (0.089; 0.219)
COMPLETE	54.02%	0.129 (0.087; 0.171)	0.279 (0.237; 0.321)	0 (-0.012; 0.012)	0.001 (-0.011; 0.013)	0.251 (0.135; 0.367)
BCG	92.50%	0.02 (0; 0.04)	0.075 (0.055; 0.095)	0.001 (-0.003; 0.005)	0.004 (0; 0.008)	0.079 (0.042; 0.116)
DTP1	87.80%	0.026 (-0.002; 0.054)	0.087 (0.059; 0.115)	-0.007 (-0.013; -0.001)	-0.019 (-0.025; -0.013)	0.105 (0.056; 0.154)
DTP2	73.62%	0.053 (0.025; 0.081)	0.146 (0.118; 0.174)	-0.006 (-0.014; 0.002)	-0.016 (-0.024; -0.008)	0.197 (0.134; 0.26)
DTP3	66.89%	0.055 (0.023; 0.087)	0.133 (0.101; 0.165)	-0.015 (-0.023; -0.007)	-0.042 (-0.05; -0.034)	0.151 (0.084; 0.218)
POLIO1	76.53%	0.058 (0.031; 0.085)	0.173 (0.146; 0.2)	-0.011 (-0.021; -0.001)	-0.032 (-0.042; -0.022)	0.192 (0.135; 0.249)
POLIO2	77.08%	0.062 (0.035; 0.089)	0.184 (0.157; 0.211)	-0.009 (-0.018; 0)	-0.025 (-0.034; -0.016)	0.231 (0.172; 0.29)
POLIO3	76.12%	0.06 (0.032; 0.088)	0.168 (0.14; 0.196)	-0.01 (-0.019; -0.001)	-0.029 (-0.038; -0.02)	0.208 (0.147; 0.269)
PCV1	87.19%	0.029 (0.005; 0.053)	0.096 (0.072; 0.12)	-0.011 (-0.018; -0.004)	-0.03 (-0.037; -0.023)	0.134 (0.085; 0.183)
PCV2	70.85%	0.062 (0.037; 0.087)	0.161 (0.136; 0.186)	-0.014 (-0.021; -0.007)	-0.04 (-0.047; -0.033)	0.155 (0.09; 0.22)
PCV3	52.92%	0.067 (0.033; 0.101)	0.125 (0.091; 0.159)	-0.014 (-0.023; -0.005)	-0.039 (-0.048; -0.03)	0.187 (0.118; 0.256)
MCV1	85.07%	0.023 (-0.002; 0.048)	0.064 (0.039; 0.089)	-0.008 (-0.013; -0.003)	-0.021 (-0.026; -0.016)	0.137 (0.074; 0.2)

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.



Prevalence of zero-dose children is a concern in some regions of South Africa. Gauteng province has the highest prevalence of zero-dose children at 10.9%. Kwazulu-Natal (9.5%) and Mpumalanga (7.5%) provinces have the next highest prevalence of zero-dose children. All other provinces showcased a prevalence of zero-dose children at or below 5%.

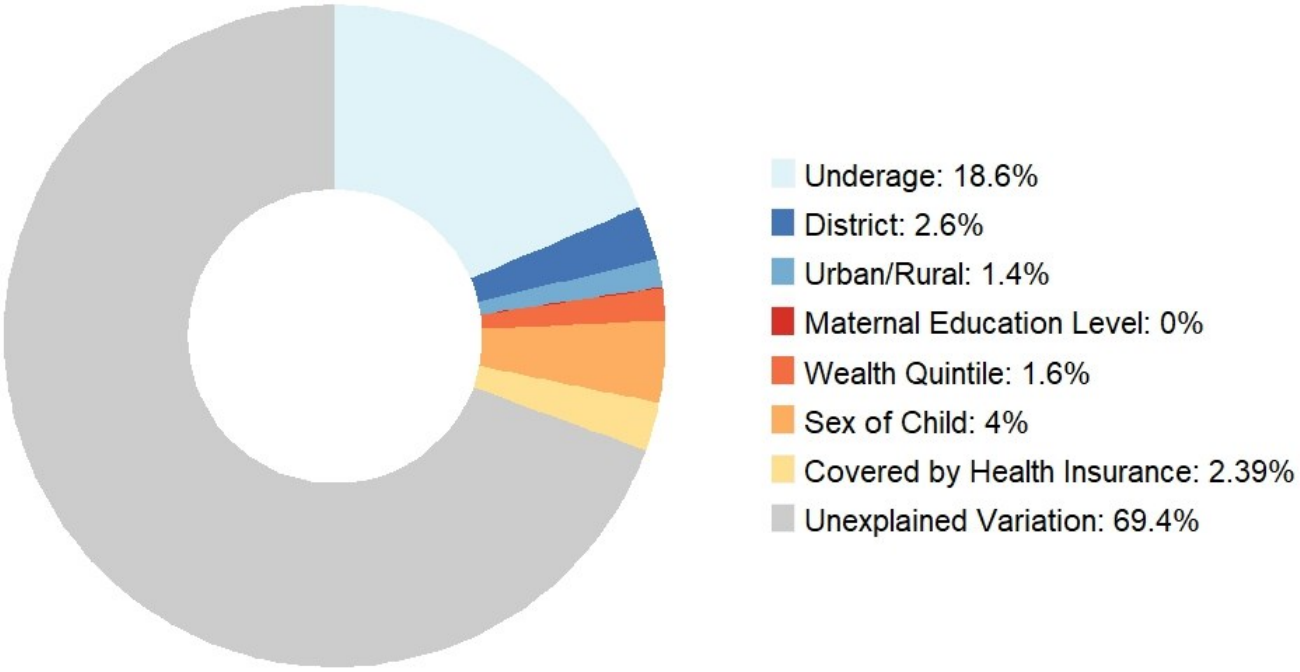
Zero-dose prevalence and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Gauteng	**10.9%**	0.331	0.094	0.015	0.050
Kwazulu-Natal	**9.5%**	0.179	0.044	0.002	0.006
Mpumalanga	**7.5%**	0.144	0.029	-0.053	-0.128
Free State	5.0%	-0.247	-0.031	-0.010	-0.032
Northern Cape	4.5%	0.733	0.083	-0.029	-0.087
Western Cape	3.1%	-0.033	-0.003	0.015	0.053
Eastern Cape	2.8%	0.001	0.000	-0.018	-0.041
Limpopo	2.1%	-0.043	-0.002	0.011	0.024
North West	0.4%	-0.465	-0.005	-0.001	-0.002

Subnational regions as presented in the 2016 DHS for South Africa.

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.

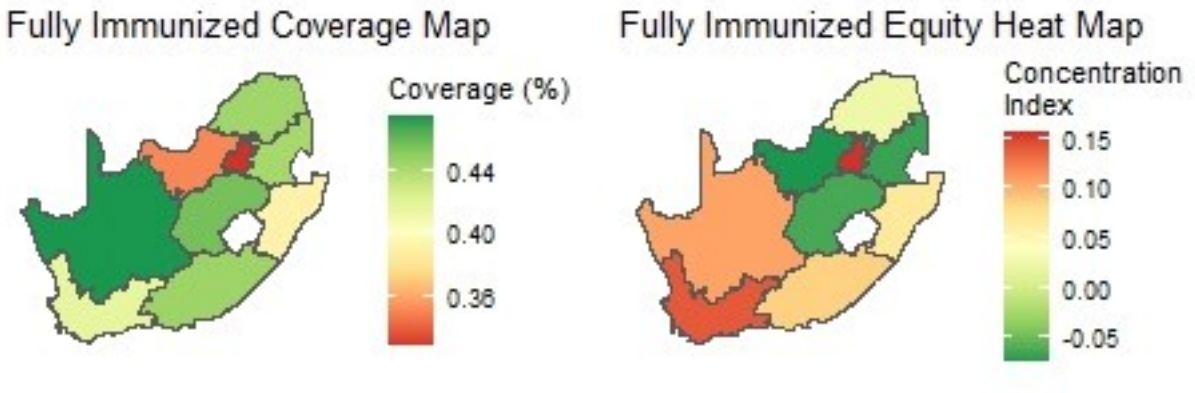
Decomposition of Zero-Dose Inequity



Whether or not a child is underage to receive the vaccine is the dominant contributor towards variation in zero-dose coverage. This is the only fair contributor towards variation in the VERSE model. Sex of child, insurance coverage status, and district of residence are other minor contributors towards variation in zero-dose coverage.

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).



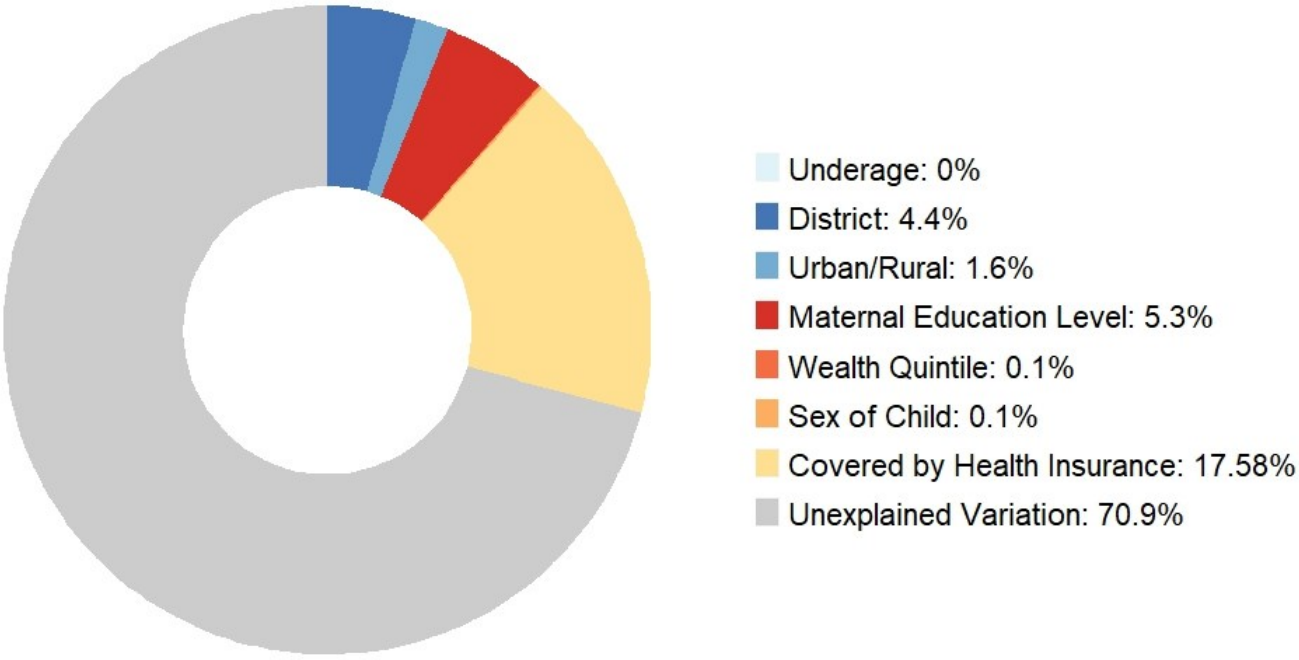
Fully immunized coverage is a concern in South Africa. Three provinces (Gauteng, North West, and Kwazulu-Natal) have fully immunized coverage rates below 40%. There is no province in South Africa with fully immunized coverage rates above 50%. Some provinces show inequitable distributions, Wagstaff concentration indices are above 0.1 for Western Cape, Northern Cape, and Gauteng provinces. However, it is interesting to note that North West province, despite having the second-lowest coverage in the nation, has a "pro-disadvantaged" distribution as shown by having a negative concentration index.

Fully immunized status coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Gauteng	**32.8%**	0.156	0.204	0.026	0.086
North West	**35.1%**	-0.075	-0.106	-0.042	-0.113
Kwazulu-Natal	**39.2%**	0.068	0.107	0.014	0.035
Western Cape	41.6%	0.141	0.234	0.018	0.064
Mpumalanga	44.3%	-0.068	-0.121	-0.042	-0.103
Limpopo	44.5%	0.024	0.043	-0.015	-0.031
Eastern Cape	44.6%	0.086	0.153	-0.018	-0.040
Free State	45.7%	-0.064	-0.118	0.010	0.031
Northern Cape	47.5%	0.107	0.203	0.000	-0.001

Subnational regions as presented in the 2016 DHS for South Africa.

Decomposition of Fully Immunized for Age Equity

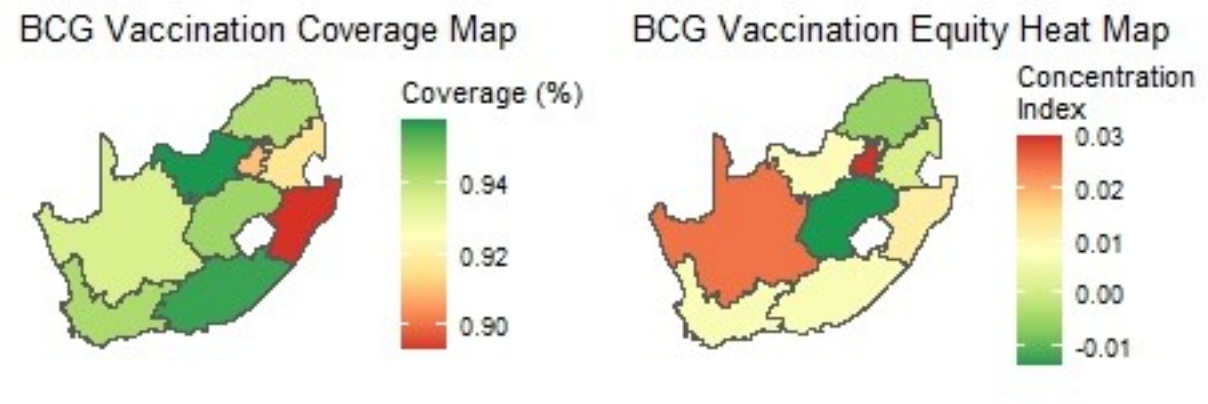


Health insurance coverage status is the primary contributor to variation in full immunization status, explaining 17.58% of the variation. Where the household is located (province, residing in an urban or rural area), and maternal education level also contribute slightly to the variation in fully immunized status.

Individual vaccines

BCG immunization

The BCG vaccine is given at birth inSouth Africa and protects against Tuberculosis.



The only province in South Africa with BCG coverage rates below 90% is Kwazulu-Natal province (89.3%). BCG vaccine delivery also appears equitable in all provinces.

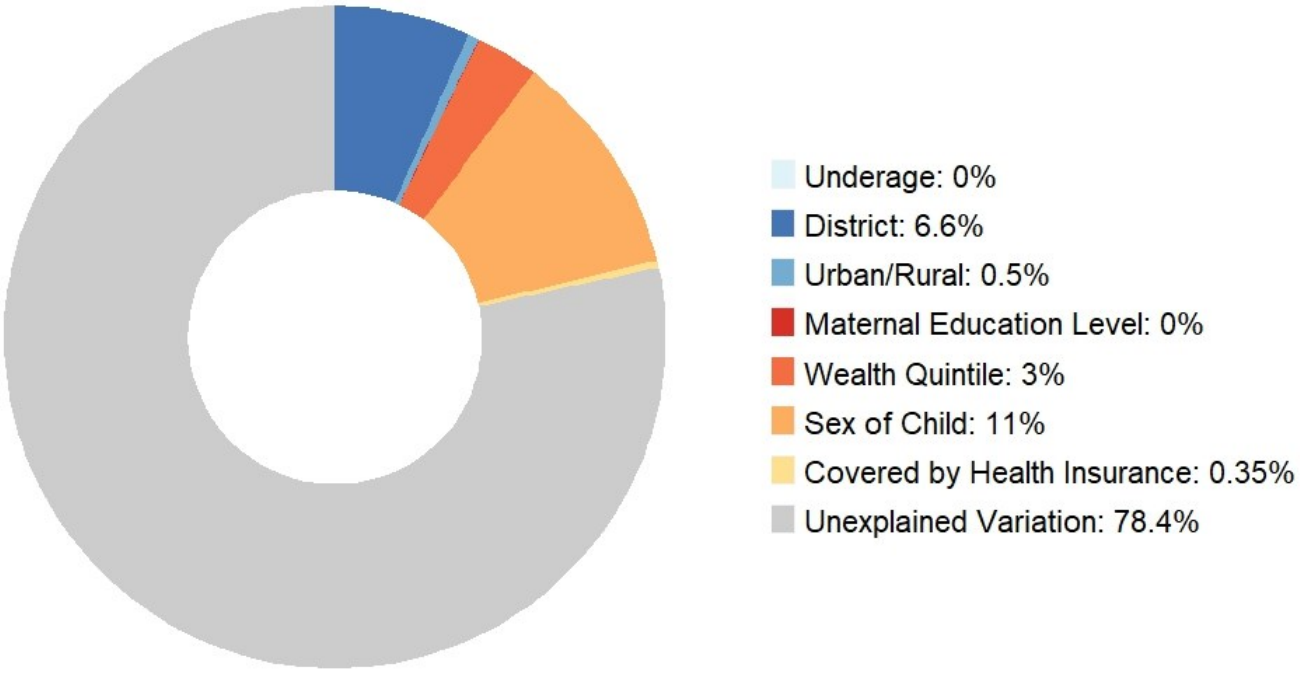
BCG immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Kwazulu-Natal	**89.3%**	0.012	0.043	0.011	0.027
Gauteng	**91.0%**	0.030	0.109	0.021	0.069
Mpumalanga	**91.7%**	0.001	0.003	-0.055	-0.134
Northern Cape	93.6%	0.025	0.094	-0.009	-0.029
Limpopo	94.2%	-0.006	-0.022	0.018	0.039
Western Cape	94.3%	0.007	0.027	0.009	0.033
Free State	94.5%	-0.014	-0.053	-0.001	-0.003
Eastern Cape	95.6%	0.007	0.028	-0.001	-0.002
North West	95.8%	0.009	0.033	0.016	0.043

Subnational regions as presented in the 2016 DHS for South Africa.

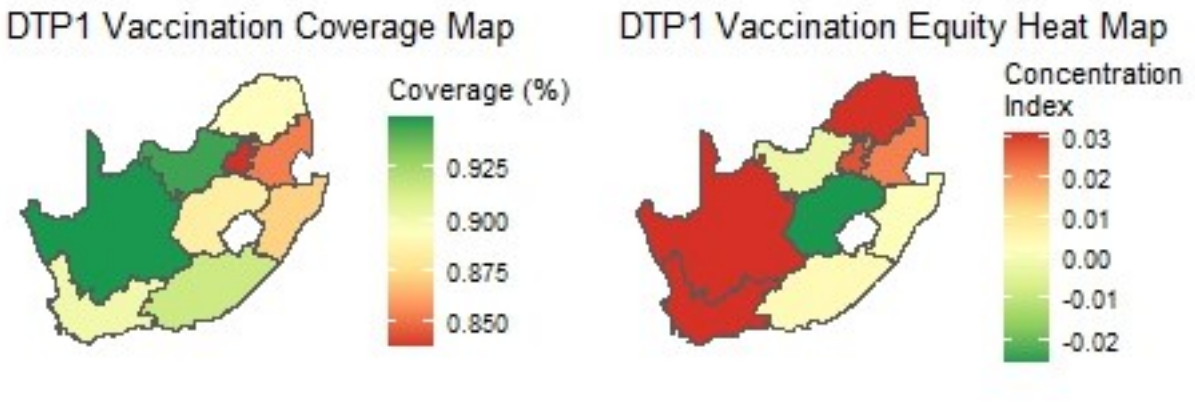
Sex of child is the primary source of variation in BCG coverage, explaining 11% of the variation. Province of residence is another contributor of variation.

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 South Africa which provides protection against Diphtheria, Whooping Cough (Pertussis), Tetanus, Hepatitis B, and Haemophilus influenza type B.



(SAMPLE TEXT 1)

Most provinces show relatively high coverage with rates above 88%. Gauteng and Mpumalanga provinces have the lowest coverages at 83.8% and 85.3%.

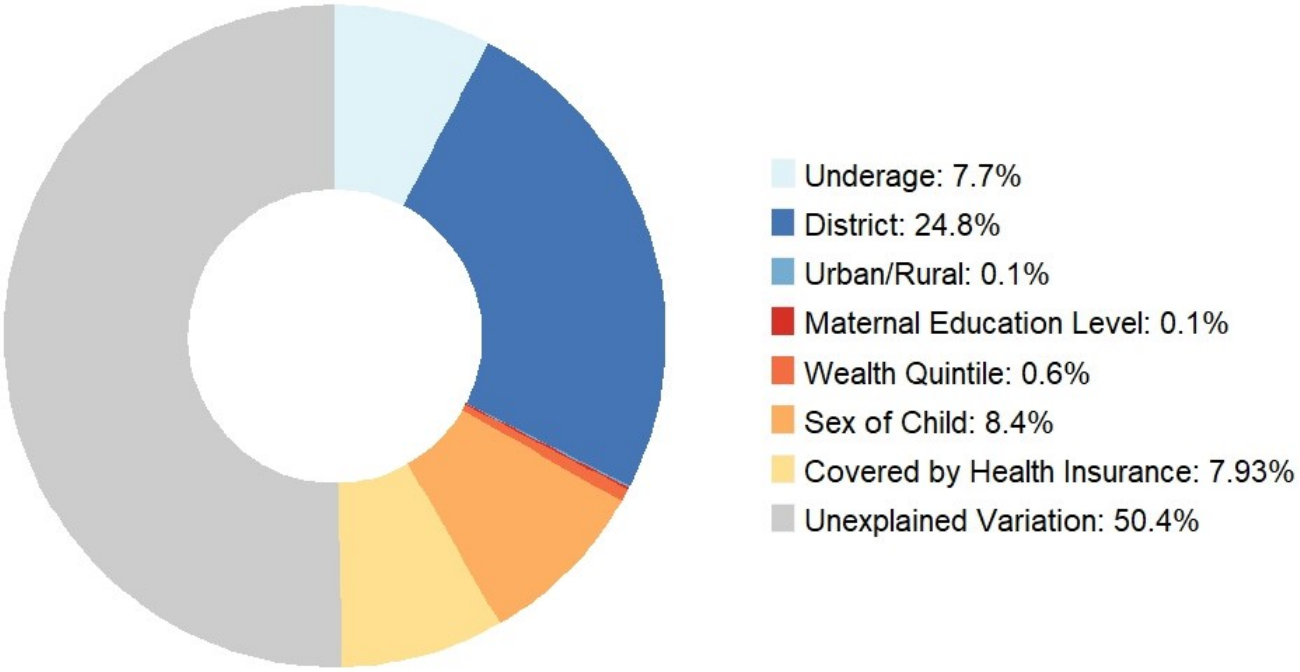
DTP1 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Gauteng	**83.8%**	0.028	0.092	0.010	0.035
Mpumalanga	**85.3%**	0.023	0.077	-0.063	-0.152
Kwazulu-Natal	**87.2%**	0.002	0.008	0.002	0.004
Free State	88.4%	-0.026	-0.088	-0.003	-0.010
Limpopo	89.3%	0.031	0.104	-0.005	-0.011
Western Cape	90.0%	0.031	0.106	0.013	0.047
Eastern Cape	91.5%	0.004	0.014	-0.020	-0.044
North West	94.5%	-0.002	-0.009	0.020	0.053
Northern Cape	94.9%	0.031	0.111	-0.002	-0.007

Subnational regions as presented in the 2016 DHS for South Africa.

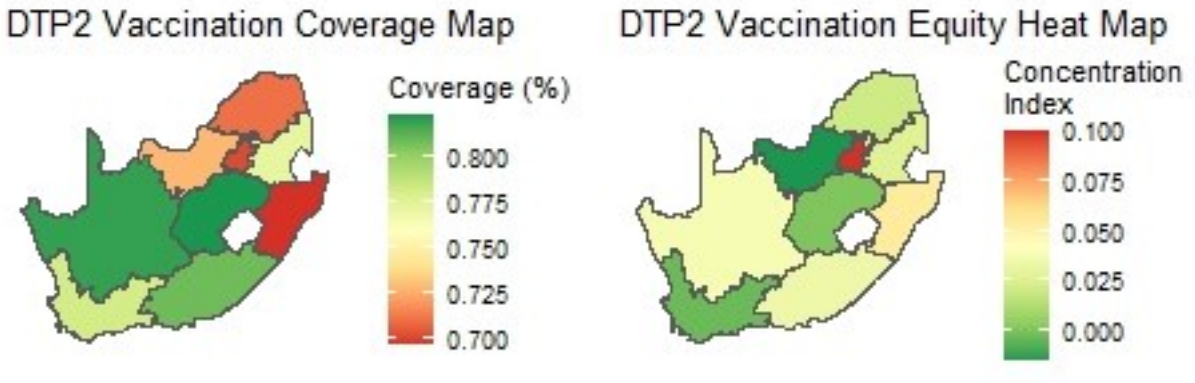
District of residence is the major contributor towards variation in DTP1 coverage, explaining 24.8% of the variation. Sex of child and health insurance coverage status are other contributors towards variation.

Decomposition of DTP1 Coverage Equity



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 South Africa.



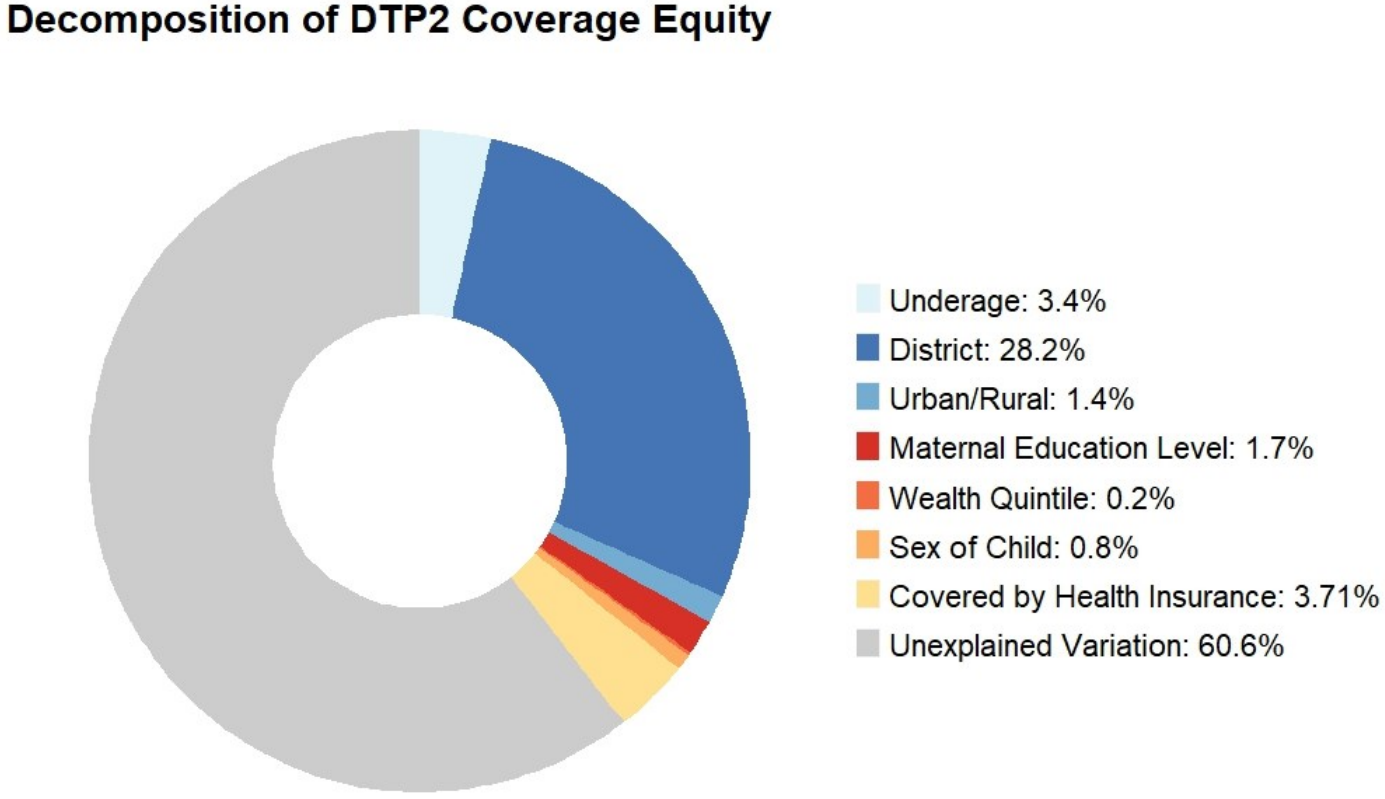
Vaccination coverage for the second dose of DTP drops significantly compared to first dose coverage. Kwazulu-Natal, Gauteng, Limpopo, and North West provinces show the lowest coverage of approximately 70-

71%. All other provinces have coverage above 75%. Despite drops in coverage, the distribution does not appear to be significantly inequitable.

DTP2 immunization coverage and equity by district

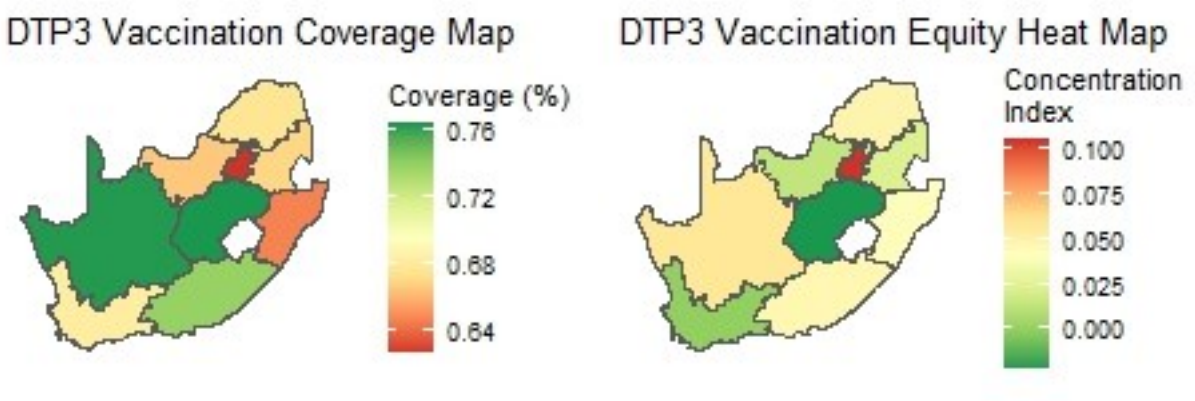
		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Kwazulu-Natal	**69.6%**	0.054	0.137	0.006	0.015
Gauteng	**70.1%**	0.100	0.264	0.021	0.071
Limpopo	**71.0%**	0.020	0.051	-0.016	-0.034
North West	72.8%	-0.016	-0.045	-0.036	-0.097
Mpumalanga	77.2%	0.026	0.074	-0.057	-0.139
Western Cape	78.2%	-0.004	-0.011	0.006	0.022
Eastern Cape	80.9%	0.034	0.104	-0.027	-0.060
Northern Cape	82.0%	0.038	0.113	-0.012	-0.038
Free State	82.3%	0.000	-0.001	-0.003	-0.010

Subnational regions as presented in the 2016 DHS for South Africa.



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 South Africa.



DTP3 immunization coverage and equity by district

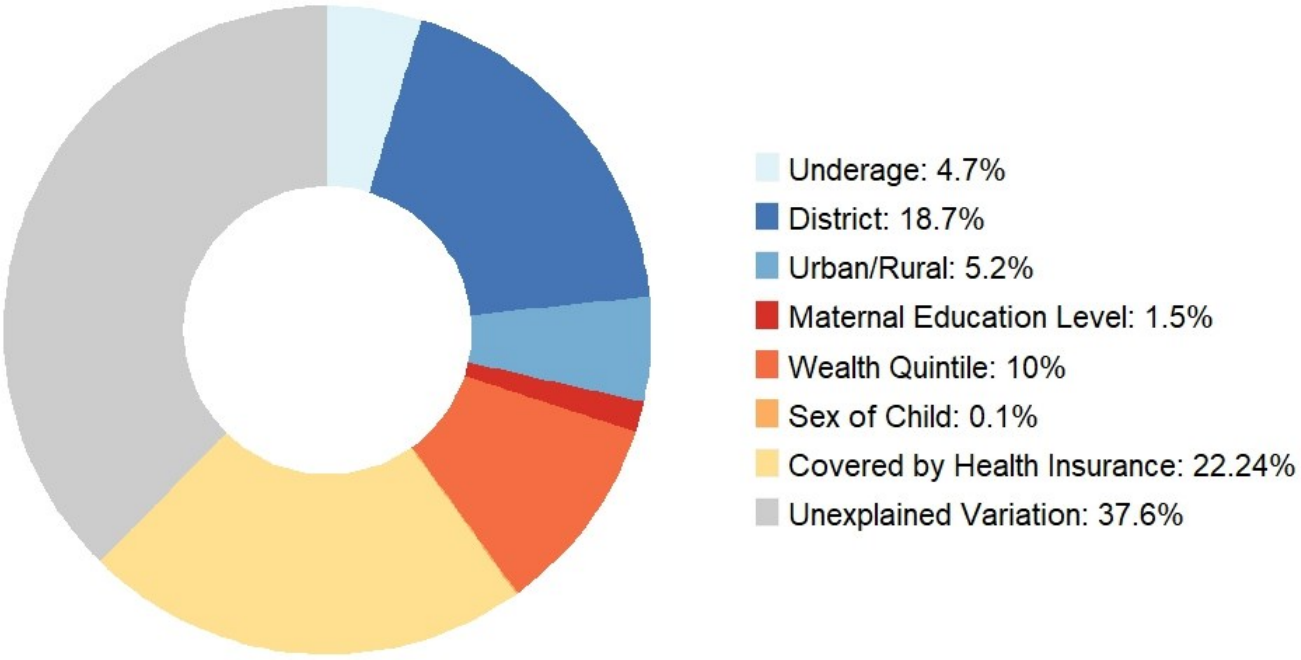
		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Gauteng	**62.7%**	0.106	0.244	0.020	0.066
Kwazulu-Natal	**64.7%**	0.043	0.100	-0.004	-0.011
North West	**66.6%**	0.013	0.032	-0.027	-0.073
Mpumalanga	67.0%	0.022	0.055	-0.053	-0.129
Limpopo	67.7%	0.049	0.114	-0.050	-0.106
Western Cape	68.3%	-0.001	-0.001	-0.007	-0.026
Eastern Cape	73.9%	0.047	0.125	-0.043	-0.096
Northern Cape	76.3%	0.057	0.152	-0.010	-0.031
Free State	76.4%	-0.023	-0.061	-0.011	-0.037

Subnational regions as presented in the 2016 DHS for South Africa.

Vaccination coverage for the third dose is lower compared to second dose coverage rates. Only three provinces have coverage rates above 70%. Gauteng and Kwazulu-Natal provinces have the lowest coverage rates.

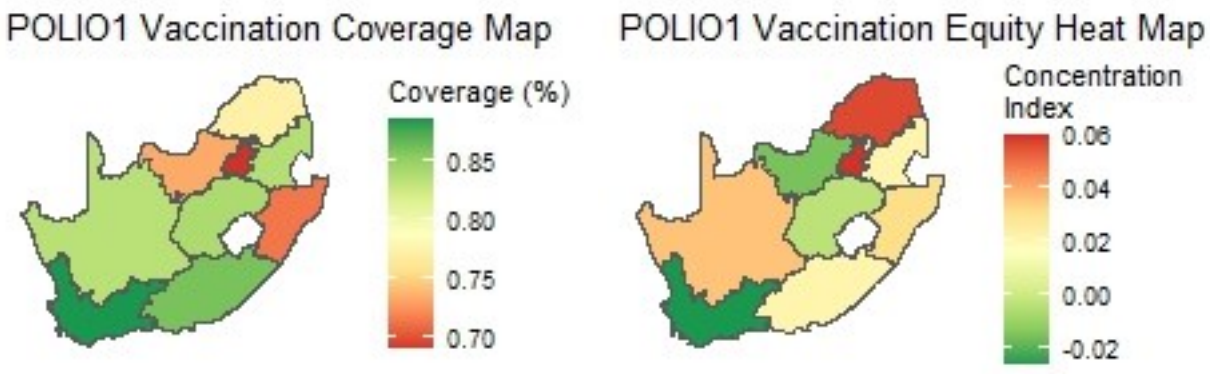
A significant amount of the variation in DTP3 coverage can be explained by district of residence or health insurance coverage status.

Decomposition of DTP3 Coverage Equity



POLIO1 immunization

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



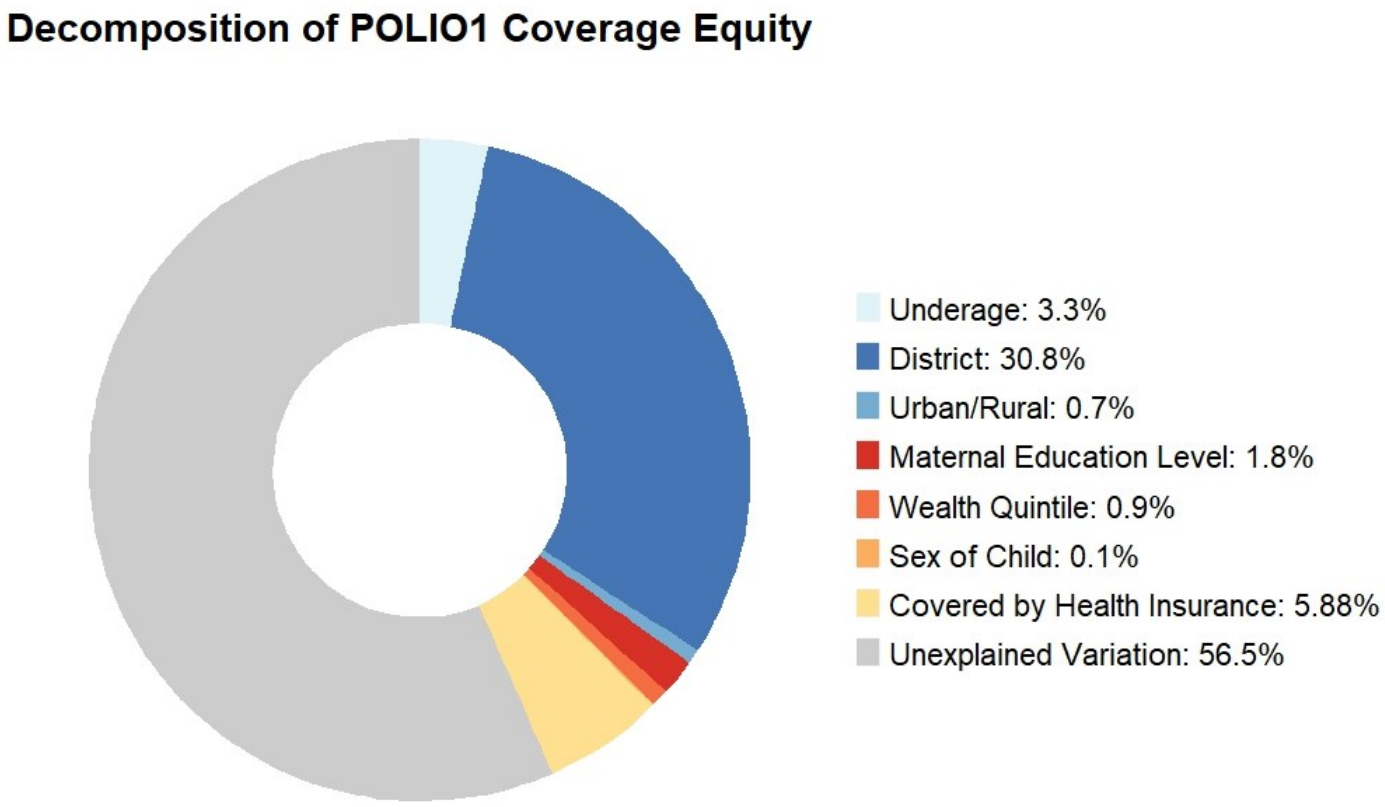
Polio immunization coverage varies widely by province. Some districts such as Western Cape and Eastern Cape have coverage rates above 85%, while Gauteng province has the lowest coverage at 69%. The vaccine appears equitably distributed based.

POLIO1 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Gauteng	**69.0%**	0.060	0.162	0.011	0.038
Kwazulu-Natal	**71.4%**	0.031	0.085	0.002	0.005
North West	**73.4%**	-0.016	-0.045	-0.042	-0.112
Limpopo	77.3%	0.057	0.167	-0.016	-0.034
Northern Cape	83.5%	0.036	0.113	0.005	0.015
Mpumalanga	83.7%	0.021	0.067	-0.062	-0.150
Free State	84.1%	-0.004	-0.012	0.001	0.003
Eastern Cape	86.1%	0.021	0.070	-0.027	-0.061
Western Cape	88.6%	-0.027	-0.091	0.013	0.049

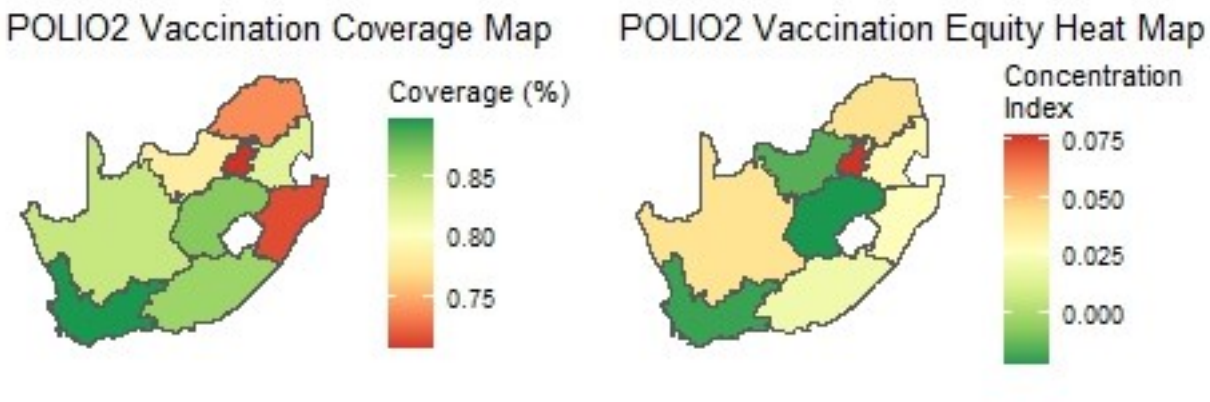
Subnational regions as presented in the 2016 DHS for South Africa.

30.8% of the variation in polio immunization coverage can be explained by district of residence.



POLIO2 immunization

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

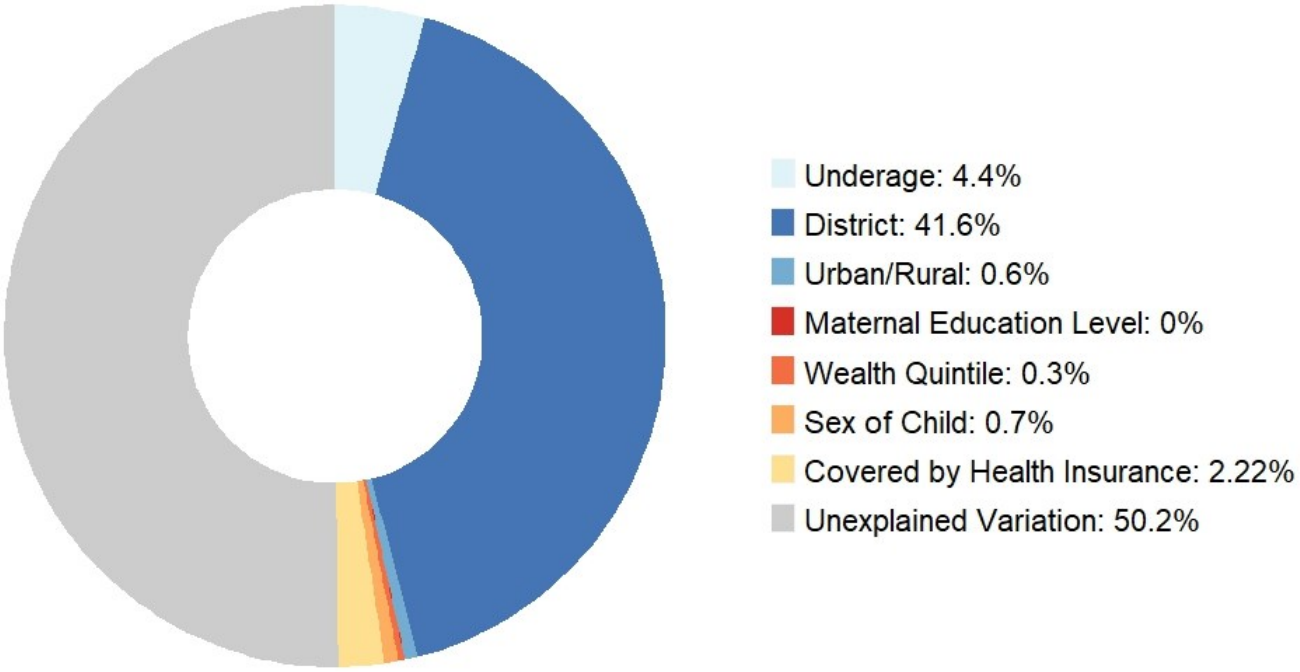


POLIO2 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Gauteng	**70.5%**	0.077	0.212	0.014	0.047
Kwazulu-Natal	**71.3%**	0.028	0.078	0.001	0.001
Limpopo	**73.7%**	0.042	0.114	-0.027	-0.058
North West	78.3%	-0.016	-0.048	-0.037	-0.099
Mpumalanga	82.5%	0.031	0.100	-0.066	-0.161
Northern Cape	84.2%	0.041	0.130	0.008	0.024
Eastern Cape	86.0%	0.021	0.071	-0.027	-0.059
Free State	86.9%	-0.023	-0.077	0.002	0.007
Western Cape	89.8%	-0.020	-0.070	0.011	0.039

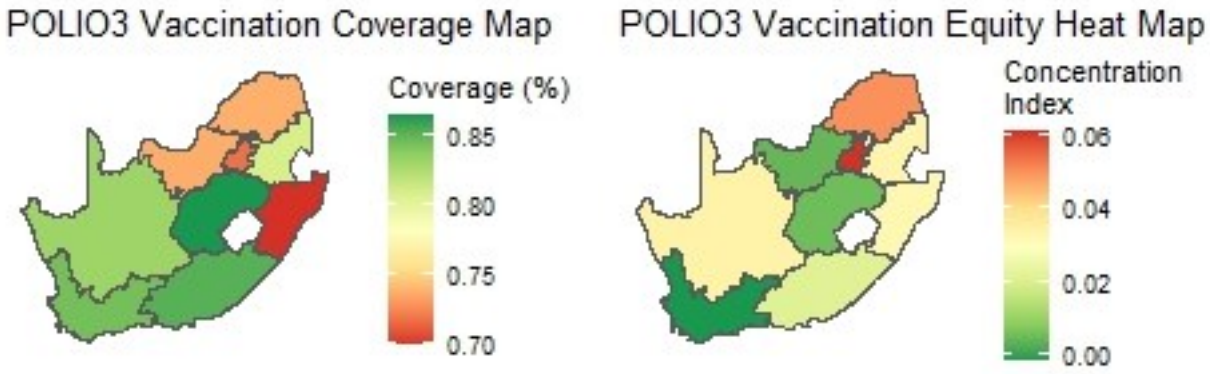
Subnational regions as presented in the 2016 DHS for South Africa.

Decomposition of POLIO2 Coverage Equity



POLIO3 immunization

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



Coverage for the third dose of the polio vaccine also has significant variation by province. Mpumalanga, Northern Cape, Western Cape, Eastern Cape, and Free State provinces all perform well with coverage rates above 80%. Limpopo, North West, Gauteng, and Kwazulu-Natal provinces see lower coverage rates of

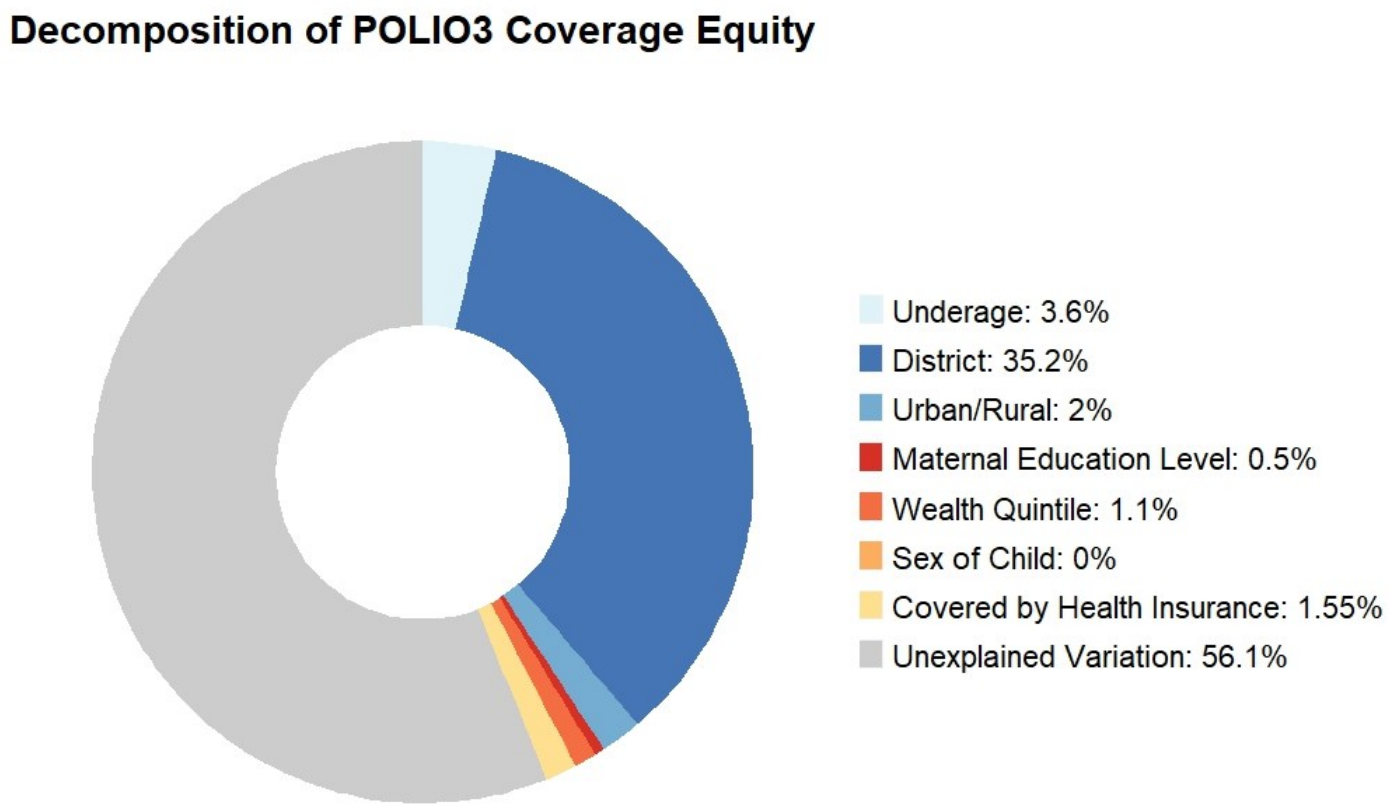
approximately 69-74%. However, based on concentration indices, there distribution of vaccines within provinces appears equitable.

POLIO3 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Kwazulu-Natal	**69.90%**	0.032	0.082	0.000	0.001
Gauteng	**71.70%**	0.061	0.162	0.014	0.045
North West	**73.70%**	0.004	0.012	-0.040	-0.108
Limpopo	73.80%	0.050	0.130	-0.022	-0.047
Mpumalanga	81.00%	0.033	0.099	-0.065	-0.159
Northern Cape	83.20%	0.034	0.102	0.006	0.018
Western Cape	84.50%	-0.002	-0.006	0.000	0.001
Eastern Cape	85.30%	0.021	0.066	-0.024	-0.052
Free State	86.50%	0.005	0.015	0.001	0.003

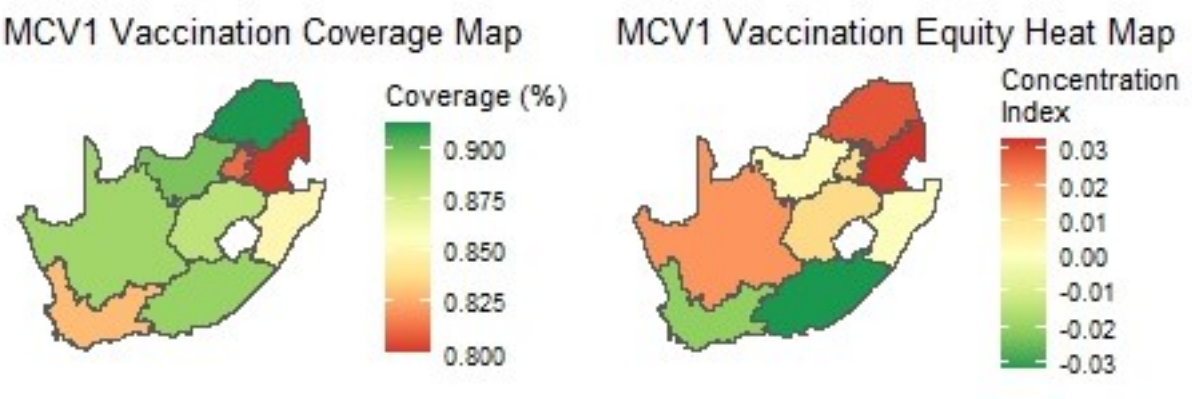
Subnational regions as presented in the 2016 DHS for South Africa.

Similarly to the first and second doses of the polio vaccine, district of residence is the main contributor towards variation in third dose polio vaccination status,



MCV1 immunization

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



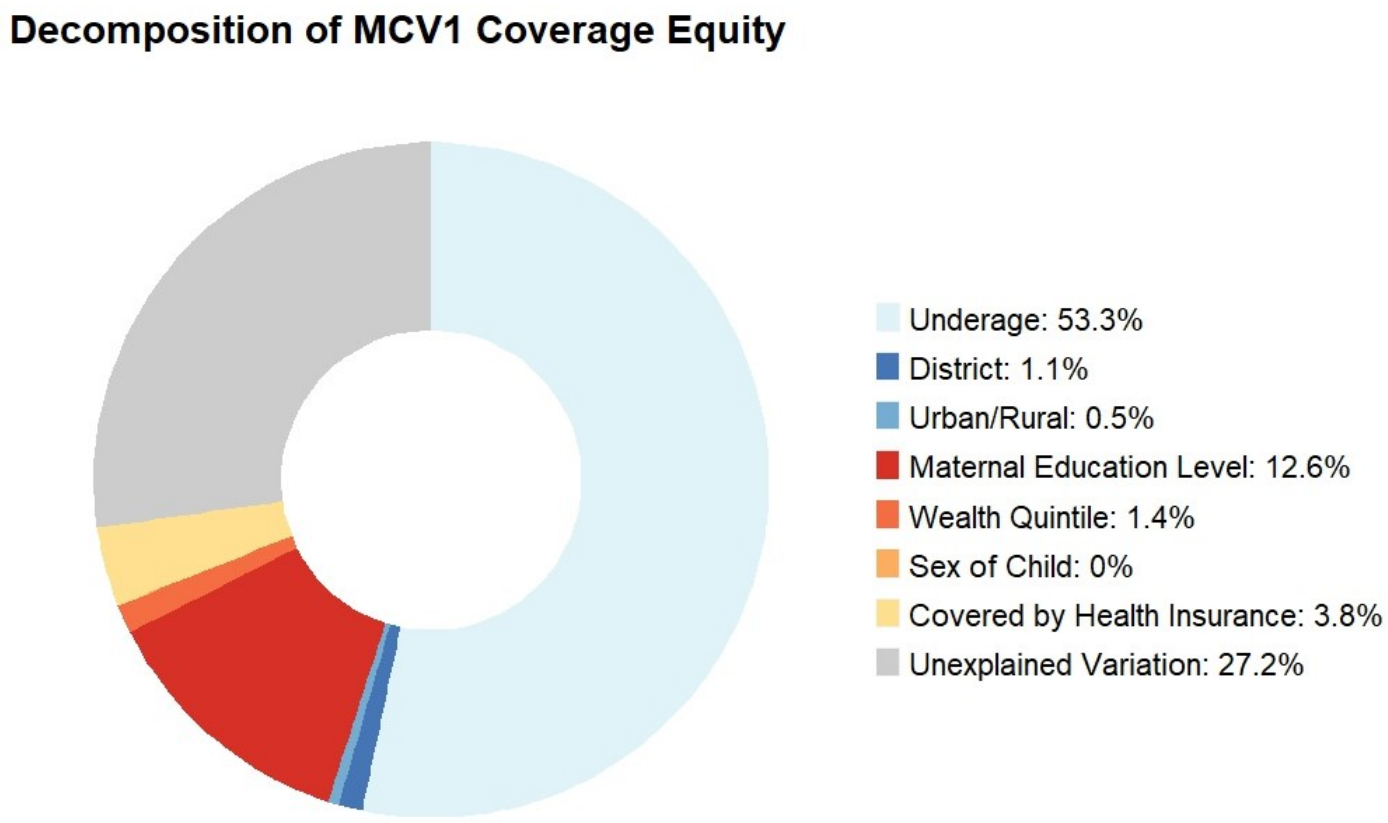
All South African provinces, apart from Limpopo province, have coverage rates below the 90% coverage target to prevent measles outbreaks. Mpumalanga and Gauteng province have the lowest coverage rates ranging from approximately 80-81%. The distribution of MCV1 appears equitable.

MCV1 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Mpumalanga	**80.0%**	0.033	0.085	-0.036	-0.088
Gauteng	**81.1%**	0.012	0.032	0.000	-0.001
Western Cape	**82.9%**	-0.021	-0.058	0.004	0.014
Kwazulu-Natal	85.1%	0.000	0.000	0.028	0.071
Free State	88.2%	0.012	0.031	0.010	0.033
Northern Cape	88.9%	0.021	0.056	0.003	0.010
Eastern Cape	89.1%	-0.032	-0.089	-0.043	-0.095
North West	89.7%	0.002	0.007	0.016	0.042
Limpopo	91.2%	0.029	0.084	-0.022	-0.046

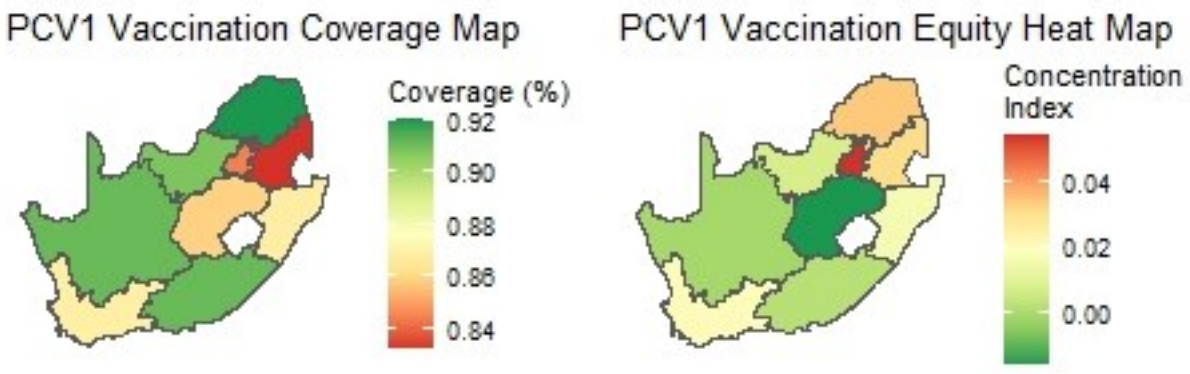
Subnational regions as presented in the 2016 DHS for South Africa.

Being underage to receive the MCV1 (53.3%) vaccine accounts for the majority of differences in MCV1 receipt. Maternal education level (12.6%) is the dominant unfair contributor towards variation in MCV1 coverage status.



PCV1 immunization

The first dose of the PCV is given six weeks after birth in South Africa.



PCV1 coverage is high in all South African provinces. Every province has coverage rates above 80%, and four provinces have coverage rates above 90%.

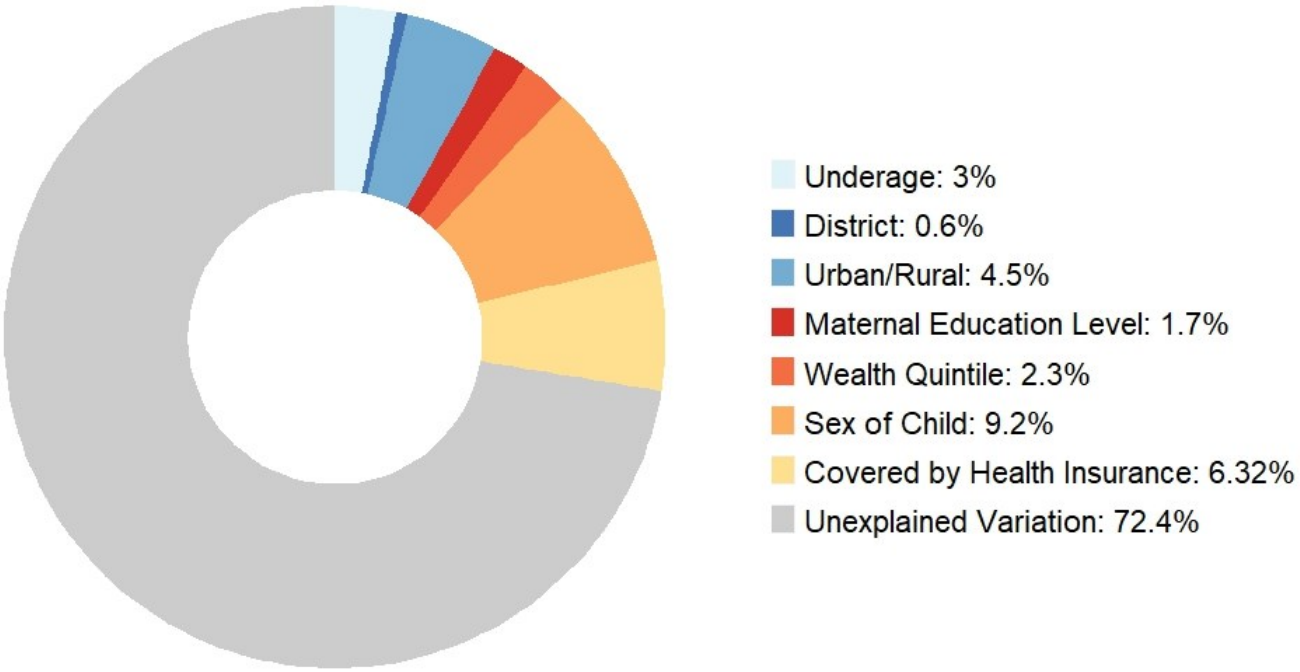
PCV1 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Mpumalanga	**83.2%**	0.031	0.099	-0.062	-0.151
Gauteng	**84.4%**	0.054	0.176	0.003	0.010
Free State	**85.9%**	-0.016	-0.054	0.002	0.007
Kwazulu-Natal	86.8%	0.016	0.052	0.006	0.016
Western Cape	86.9%	0.020	0.065	0.002	0.008
North West	90.8%	0.007	0.025	0.022	0.059
Eastern Cape	91.1%	0.002	0.007	-0.036	-0.080
Northern Cape	91.1%	-0.001	-0.002	-0.002	-0.007
Limpopo	92.0%	0.034	0.120	0.017	0.035

Subnational regions as presented in the 2016 DHS for South Africa.

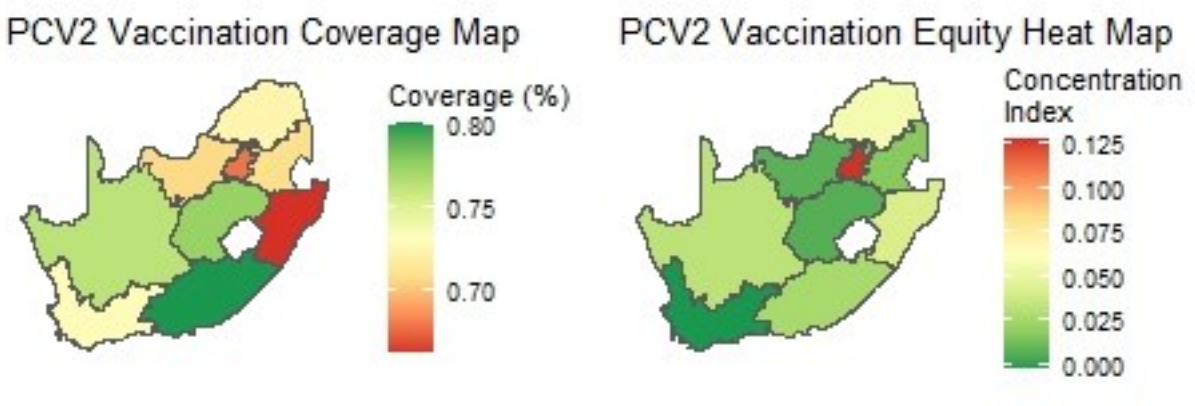
Sex of child (9.32%), health insurance coverage status (6.32%), and living in an urban or rural area (4.5%) contribute towards variation in PCV1 coverage.

Decomposition of PCV1 Coverage Equity



PCV2 immunization

The second dose of the PCV is given ten weeks after birth in South Africa.

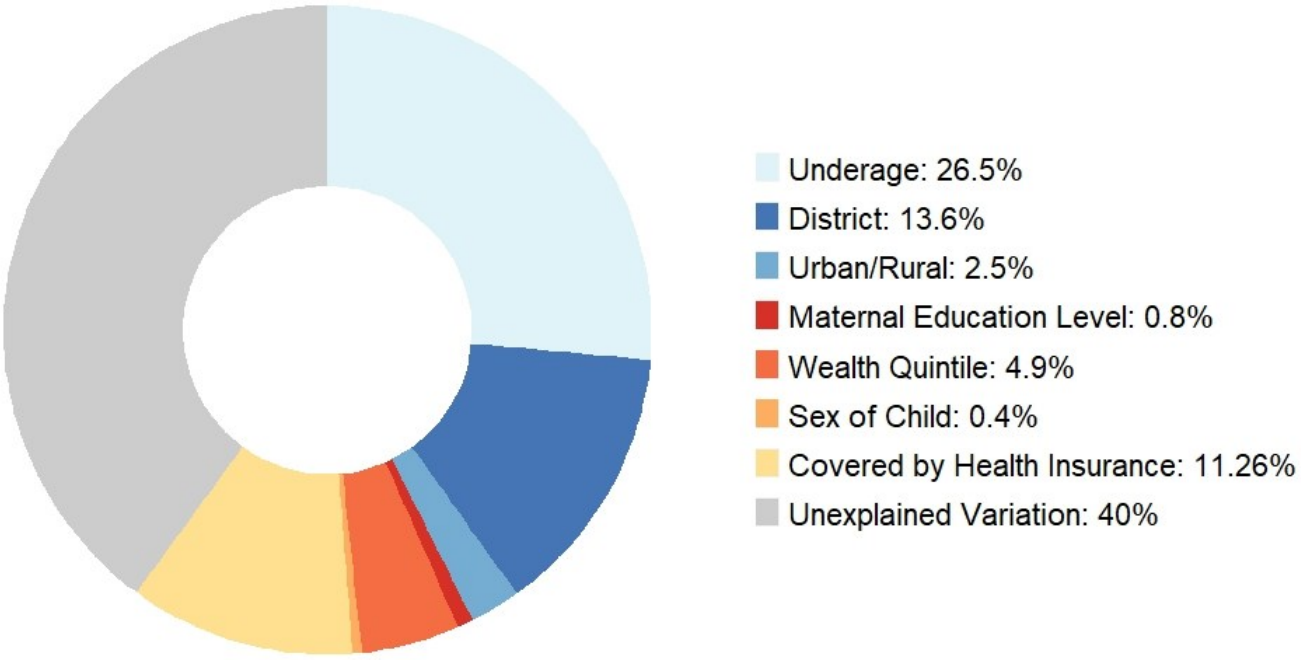


PCV2 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Kwazulu-Natal	**66.1%**	0.041	0.097	0.001	0.003
Gauteng	**67.7%**	0.128	0.329	0.011	0.038
North West	**70.6%**	0.007	0.018	-0.035	-0.095
Mpumalanga	70.8%	0.017	0.044	-0.052	-0.126
Limpopo	72.3%	0.057	0.146	-0.025	-0.052
Western Cape	72.8%	-0.003	-0.009	-0.005	-0.017
Northern Cape	76.3%	0.032	0.087	-0.007	-0.023
Free State	77.4%	0.006	0.016	-0.005	-0.017
Eastern Cape	80.0%	0.026	0.076	-0.047	-0.104

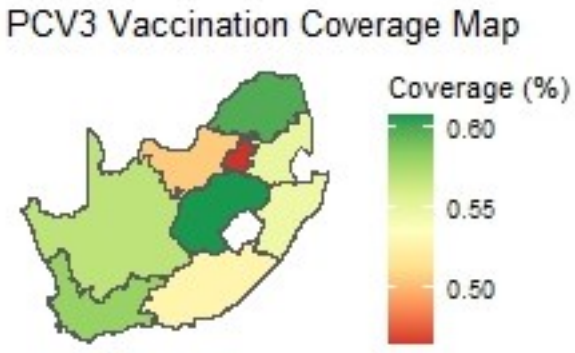
Subnational regions as presented in the 2016 DHS for South Africa.

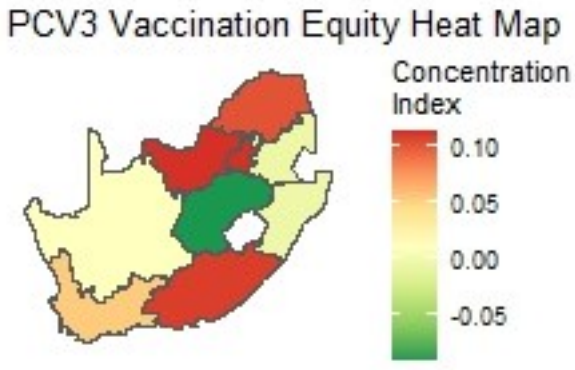
Decomposition of PCV2 Coverage Equity



PCV3 immunization

The third dose of the PCV is given 14 weeks after birth in South Africa.





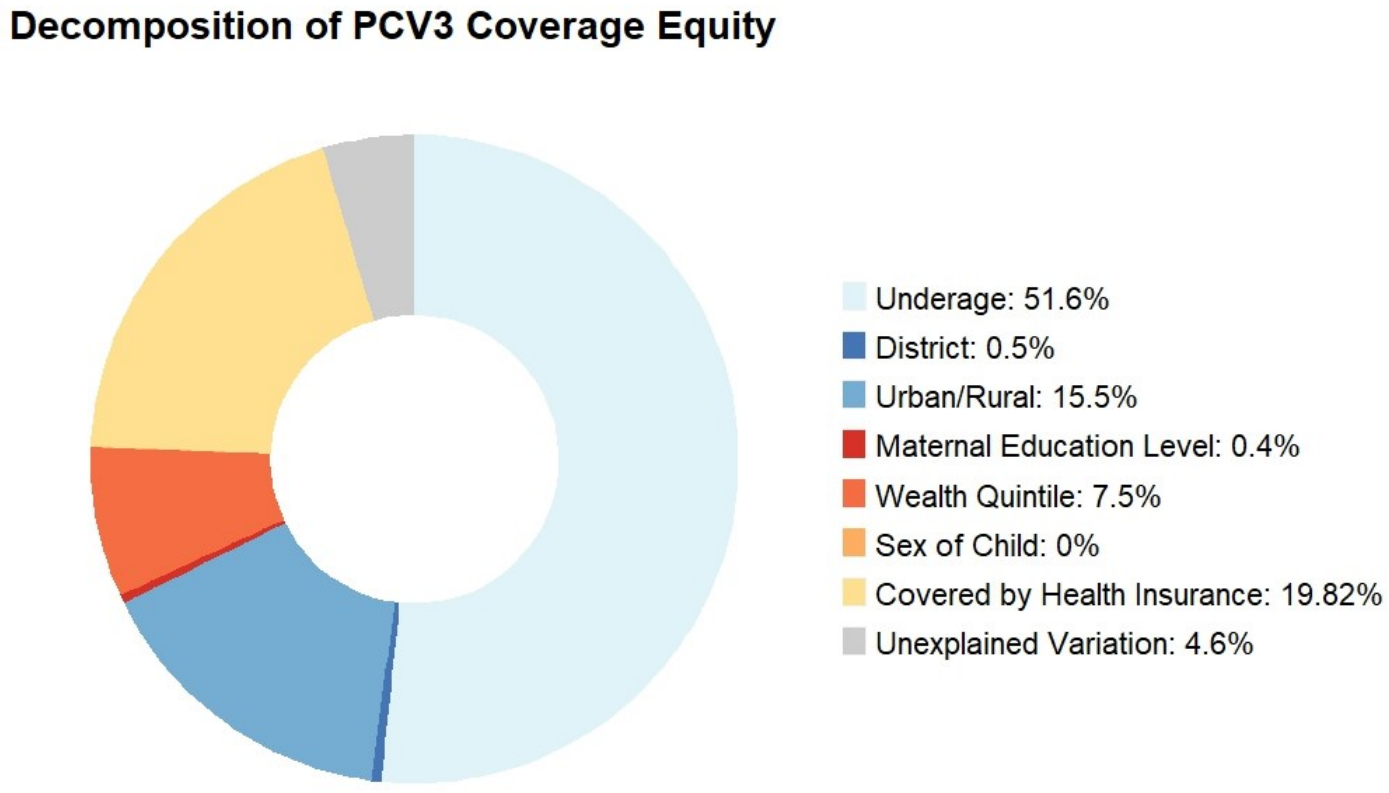
Coverage drops significantly from the first dose of PCV to the third dose. No province has PCV3 coverage rates above 65%. Gauteng province has the lowest coverage nationally at 46.4%. The distribution of PCV3 does not appear significantly inequitable, however inequity in PCV3 distribution was higher than inequity in PCV1 or PCV2 distribution.

PCV3 immunization coverage and equity by district

		Concentration indices			
District	Coverage	Composite (Wagstaff)	Composite (Erreyger)	Wealth (Wagstaff)	Wealth (Erreyger)
Gauteng	**46.4%**	0.113	0.190	0.012	0.040
North West	**50.6%**	0.113	0.211	-0.042	-0.113
Eastern Cape	**52.8%**	0.109	0.206	-0.041	-0.091
Kwazulu-Natal	54.7%	-0.004	-0.008	0.015	0.037
Mpumalanga	54.9%	-0.005	-0.010	-0.037	-0.091
Northern Cape	56.9%	0.011	0.021	-0.010	-0.029
Western Cape	58.1%	0.053	0.108	-0.003	-0.010
Limpopo	59.9%	0.102	0.210	-0.045	-0.095
Free State	60.8%	-0.092	-0.188	0.003	0.009

Subnational regions as presented in the 2016 DHS for South Africa.

Being underage to receive the vaccine explains the majority of the variation in PCV3 coverage distribution (51.6%). Health insurance coverage status (19.82%) and urban/rural residence (15.5%) are other important factors which explain variation in coverage. Only 4.6% of the variation is left unexplained by selected factors.



Publications & Resources

- 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 South Africa 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
- 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.