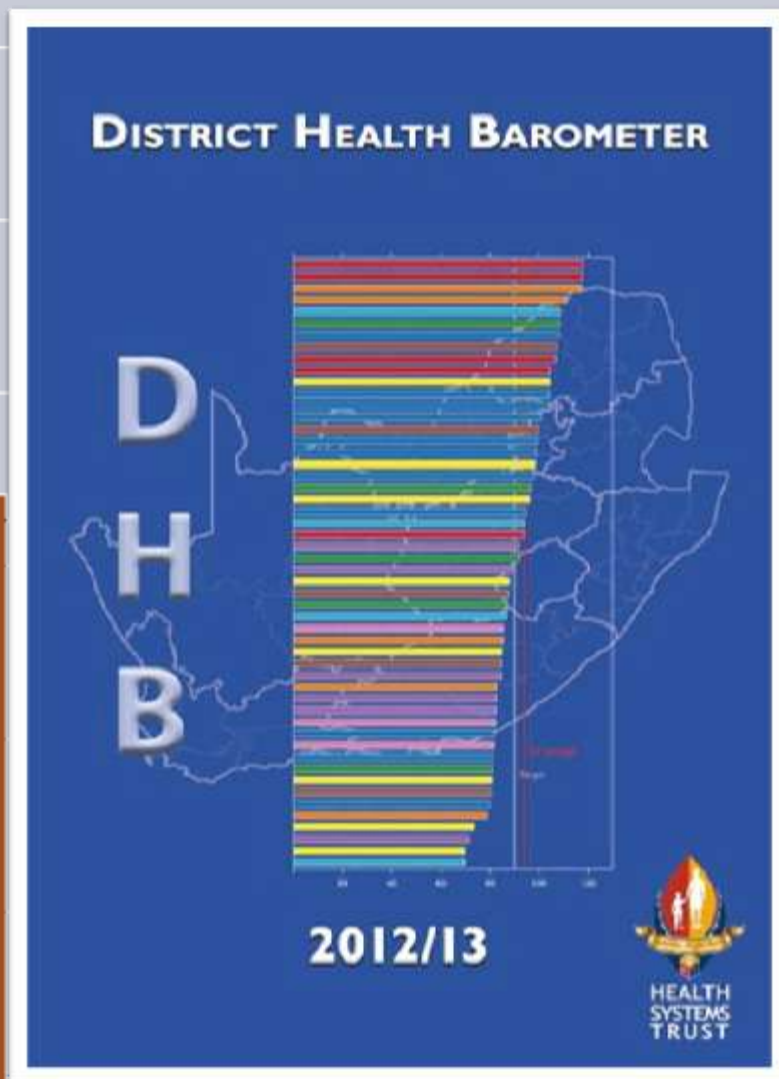




District Health Barometer 2012/13



FOCUS ON IMMUNISATION COVERAGE



DHB 2012/13

Focus on Immunisation Coverage

DHB Supplement Series 2

Published by Health Systems Trust

34 Essex Terrace
Westville
3630
South Africa



Tel: +27 (0)31 266 9090
Fax: +27 (0)31 266 9199
Email: hst@hst.org.za
<http://www.hst.org.za>

October 2013

Funded by the National Department of Health

© Health Systems Trust (2013). All rights reserved.

The copyright in the compilation of this publication, its name and logo is owned by Health Systems Trust. You may not reproduce this publication or its name or the Health Systems Trust's logo or its trademarks, including those of any other third party that appears in this publication, in any form, or for commercial purposes, or for purposes of advertising, publicity, promotion, or in any other manner implying their endorsement, sponsorship of, or affiliation with any product or service, without Health Systems Trust's prior express written permission. All information in this publication is provided in good faith but is relied upon entirely at your own risk. By making use of this publication and its information, you agree to indemnify Health Systems Trust, its Board of Trustees, employees and service providers from all liability arising from its use.

Contents

1.	Introduction.....	1
2.	Immunisation in South Africa	1
3.	Immunisation coverage using different data sources	3
4.	Immunisation coverage (using Census 2011 population denominator) compared to expenditure on vaccines per population under 1 year	10

List of Tables

Table 1: Indicator definitions according to the National Indicator Data Set (NIDS)	3
Table 2: Overview of immunisation coverage in 2011/12 based on two sources for the denominator	4
Table 3: Expenditure on vaccines by district, 2011/12 (Rand, real 2012/13 prices)	11

List of Maps

Map 1: Immunisation coverage under 1 year (DHIS), highlighting overestimation of coverage, 2011/12.....	6
Map 2: Immunisation coverage under 1 year using Census 2011 population denominator, 2011/12	6

List of Figures

Figure 1: Immunisation coverage under 1 year comparing DHIS and Census 2011 population estimates, by district, 2011/12	5
Figure 2: Scatterplot of immunisation coverage under 1 year, DHIS compared to Census 2011 population denominators, 2011/12.....	7
Figure 3: Comparison of vaccine expenditure per population under 1 (Rand, real 2012/13 prices) and immunisation coverage (using Census 2011 denominator), selected provinces, 2011/12	11

1. Introduction

This document is the second in a series of supplements to the *District Health Barometer 2012/13*. The purpose of the supplement series is to provide further in-depth information and some explanation of selected indicators presented in the *Barometer*. Given that many factors may affect the true immunisation coverage, this document compares the immunisation coverage based on the 2011/12 DHIS numerator data for Immunisation coverage under 1 year using the DHIS population estimates compared to the Census 2011 population for the denominator in order to highlight which districts probably are achieving adequate levels of immunisation versus those districts where coverage is definitely or probably inadequate using more recently collected population data. We propose that use of the Census 2011 population data, despite the unresolved contention about its accuracy, may present a more accurate reflection of immunisation coverage. The document concludes by exploring the relationship between expenditure on vaccines and the adjusted immunisation coverage.

2. Immunisation in South Africa

Immunisation is a key intervention for child health and reducing child mortality. Immunisation is however only optimally effective if a sufficient herd immunity, or overall level of population coverage is achieved. At present the targets for immunisation coverage are set at 90%. It is therefore not only important that a high overall level of coverage is achieved, but also that high coverage is uniformly achieved throughout the country.

Immunisation coverage is measured by at least two different methodologies:

- **Surveys** involve using recall of immunisations received and/or inspection of children's Road to Health cards. Using this method, the coverage is the percentage of children surveyed who meet the criteria for immunisation by various antigens or overall 'full immunisation coverage'. Coverage will therefore always be under 100% since the numerator is a subset of the denominator and is based on the sample surveyed. Surveys are generally considered to be the gold standard for measuring the overall level of immunisation coverage, although their quality can also be affected by sample size issues and the difficulty in verifying immunisation status from immunisation records.
 - The national surveys that measured immunisation coverage are the 1998 SADHS (prior to full implementation of the DHIS), the 2003 SADHS, the 2008 SABSSM and the 2012 SANHANES (results not yet released).¹ While the 2003 SADHS rates were slightly lower than DHIS, the 2008 SABSSM results were very much lower than DHIS. There were however anomalies in the SABSSM data with different rates reported for antigens included as part of the same vaccine, and a considerable number of missing values in the data. Missing values are usually understood to indicate that the child was not vaccinated, but in this case may instead be an indication of survey data quality problems. It is thus likely that the 2008 SABSSM underestimates true immunisation coverage.²

¹ South Africa Demographic and Health Survey (SADHS), South African National HIV, Behaviour and Health Survey (SABSSM), South African National Health and Nutrition Examination Survey (SANHANES).

² Personal communication, Dr Debbie Bradshaw, August 2013.

³ OPV is Oral Polio Vaccine, PCV is Pneumococcal Conjugate Vaccine, DTaP-IPV-Hib is Diphtheria, Tetanus, acellular Pertussis, Inactivated Polio vaccine and Haemophilus influenzae type b combined, Hep B is Hepatitis B vaccine, PCV is

- **Routine data** – the number of children who have received specific antigens, or all the specified antigens before age 1 (fully immunised) is obtained by aggregated data from facility registers as captured in the District Health Information System (DHIS) and divided by the target population. The value of the target population is based on time series estimates derived from the census by Statistics SA, which is considered to be the official data for use by the National Department of Health, and is described in more detail below.
 - Although there has not been a systematic verification of the immunisation records in DHIS compared to clinic registers, various researchers have demonstrated substantial data capture errors across a range of data elements. Data quality has improved in recent years due to a series of ongoing data validation and clean-up efforts.
 - Validation of the number of immunisations recorded in DHIS compared to vaccine supply data imply very low levels of wastage of vaccines apart from BCG.
 - The denominator (estimated number of children under 1) has to be derived from the population estimates. Time series estimates of the population under 1 have to be modelled from census data every 10 years and other sources of demographic data. These estimates attempt to model changes in migration, mortality and fertility at the national level, as well as sub-national areas based on the best available information. However over time these estimates may become increasingly inaccurate due to errors in the original count of the population (such as the known undercount of children under 5 in the Census 1996 and Census 2001) and unanticipated migration, mortality or fertility changes. In November 2009, Statistics South Africa provided the Department of Health with a series of population estimates down to district level for 2001-2016, and these have been embedded into the DHIS for the calculation of all indicators that require population estimates. Comparison with the ASSA 2008 demographic projection model indicates that since about 2008 the DHIS population estimates are lower than the modelled population. The Census 2011 results indicate a substantially larger number of children under 1 year than either the DHIS time series or the ASSA 2008 model. There has been much controversy around the plausibility of the Census 2011 results, resulting in the unsatisfactory situation where both the DHIS and Census population numbers may be incorrect, but no alternative is currently available.
 - It is therefore possible for immunisation coverage calculated from routine data to be incorrect either due to data quality errors in the numerator data collection, or problems with the denominator population estimates. Coverage over 100% may occur if either the numerator is over-counted (data quality problems) or the population estimate is lower than the actual number of children receiving health services in an area (population undercount or cross-border flow of patients from another area).

Coverage may be measured for individual antigens,³ or for composite outcomes such as 'full immunisation coverage'. In general these rates tend to be highly correlated and so for the purpose of this analysis to illustrate the impact of denominators and data quality issues, full immunisation coverage under 1 year is used as the main indicator.

3. Immunisation coverage using different data sources

This section compares the immunisation coverage based on the 2011/12 DHIS numerator data for Immunisation coverage under 1 year using the DHIS population estimates compared to the Census 2011 population for the denominator.

Table 1: Indicator definitions according to the National Indicator Data Set (NIDS)

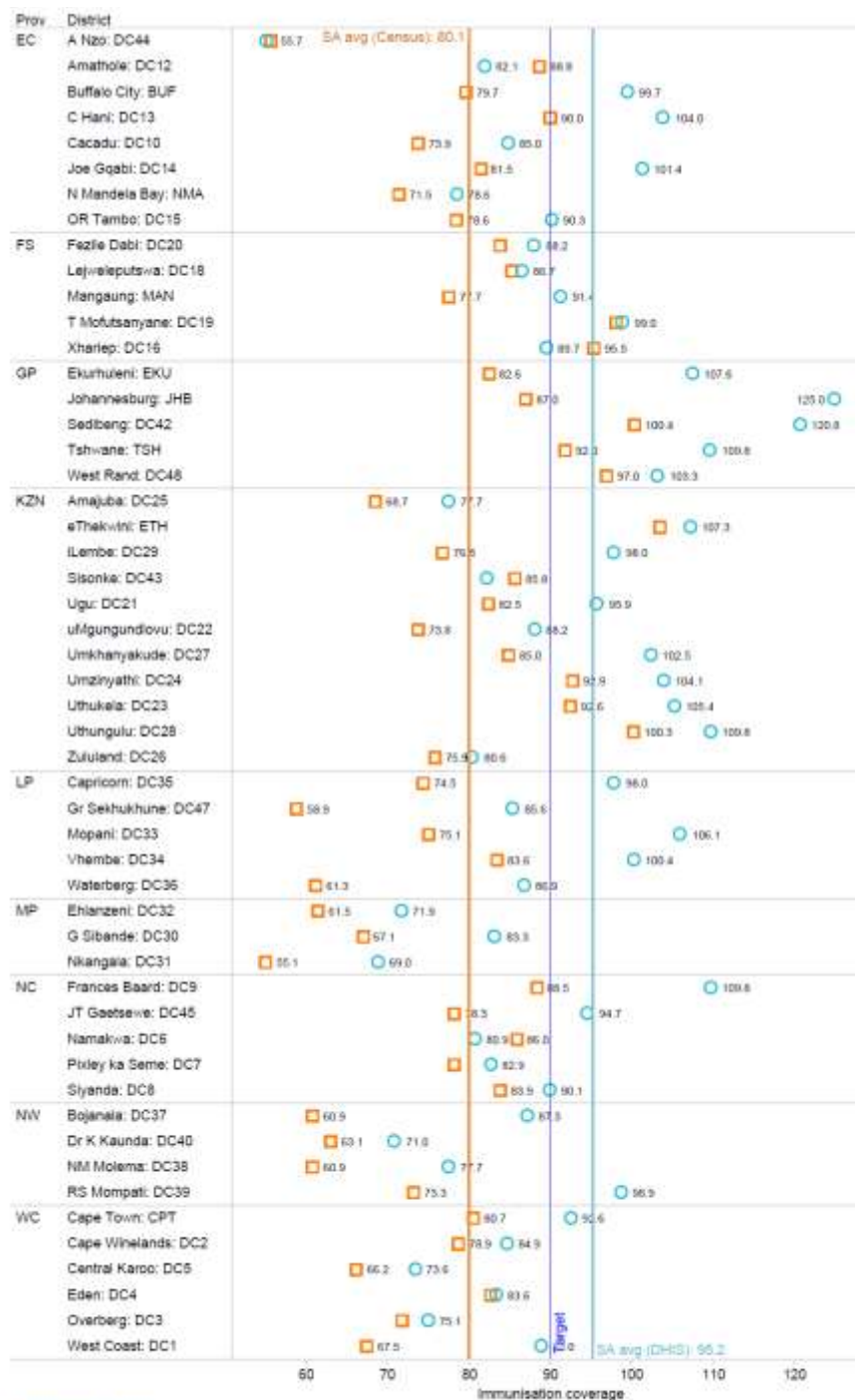
NIDS version	Indicator name	Numerator	Denominator	Indicator definition	Comments on indicator formula/ definition
2010 (this definition applies to the data presented in this document)	Immunisation coverage under 1 year (annualised)	Immunised fully under 1 year - new	Target population under 1 year	The proportion of all children in the target area under one year who complete their primary course of immunisation. A Primary Course includes BCG, OPV 1,2 & 3, DTP-Hib 1,2 & 3, HepB 1,2 & 3, and 1st measles (usually at 9 months).	The child should only be counted ONCE as fully immunised when receiving the last vaccine in the course - usually the 1st measles immunisation - AND there is documentary proof of all required vaccines (e.g. on the Road to Health Card/Booklet).
2013 (this definition will apply to data collected from April 2013)	Immunisation coverage under 1 year (annualised)	SUM([Immunised fully under 1 year new])	Population under 1 year	Proportion children under 1 year who completed their primary course of immunisation	The child should only be counted ONCE as fully immunised when receiving the last vaccine in the course (usually the 1st measles and PCV3 vaccines) AND if there is documented proof of all required vaccines (BCG, OPV1, DTaP-IPV/Hib 1, 2, 3, HepB 1, 2, 3, PCV 1,2,3, RV 1,2 and measles 1) on the Road to Health Card/Booklet AND the child is under 1 year old

³ OPV is Oral Polio Vaccine, BCG is Bacille Calmette-Guérin, DTaP-IPV-Hib is Diphtheria, Tetanus, acellular Pertussis, Inactivated Polio vaccine and Haemophilus influenzae type b combined, Hep B is Hepatitis B vaccine, PCV is pneumococcal vaccine and RV is rotavirus vaccine. Over the past years OPV2 and OPV3 have been phased out with the introduction of the pentavalent DTaP-IPV-Hib vaccine.

Table 2: Overview of immunisation coverage in 2011/12 based on two sources for the denominator

DHIS population denominator	Census 2011 population denominator
The immunisation coverage in the country for 2012/13 was 94.0% which is fairly similar to the 2011/12 level of 95.2%	The national coverage at 80.1% was much lower than the DHIS data value of 95.2%.
The national coverage exceeded the target of 90% in 2011/12 and 2012/13.	The average coverage in the country is below the target and only a minority of districts (17.3%) had coverage above the target in 2011/12, leaving large areas of the country with grossly inadequate coverage (Map 2).
Estimates of provincial coverage: Gauteng – 114.6% Limpopo – 96.7%	Estimates of provincial coverage: Gauteng – 88.6% Limpopo – 72.1%
The district coverage ranges from 125.0% in Johannesburg (GP) to 55.2% in Alfred Nzo (EC) in 2011/12.	The district coverage ranges from 103.6% in eThekweni (KZN) to 55.1% in Nkangala (MP) in 2011/12.

Figure 1: Immunisation coverage under 1 year comparing DHIS and Census 2011 population estimates, by district, 2011/12

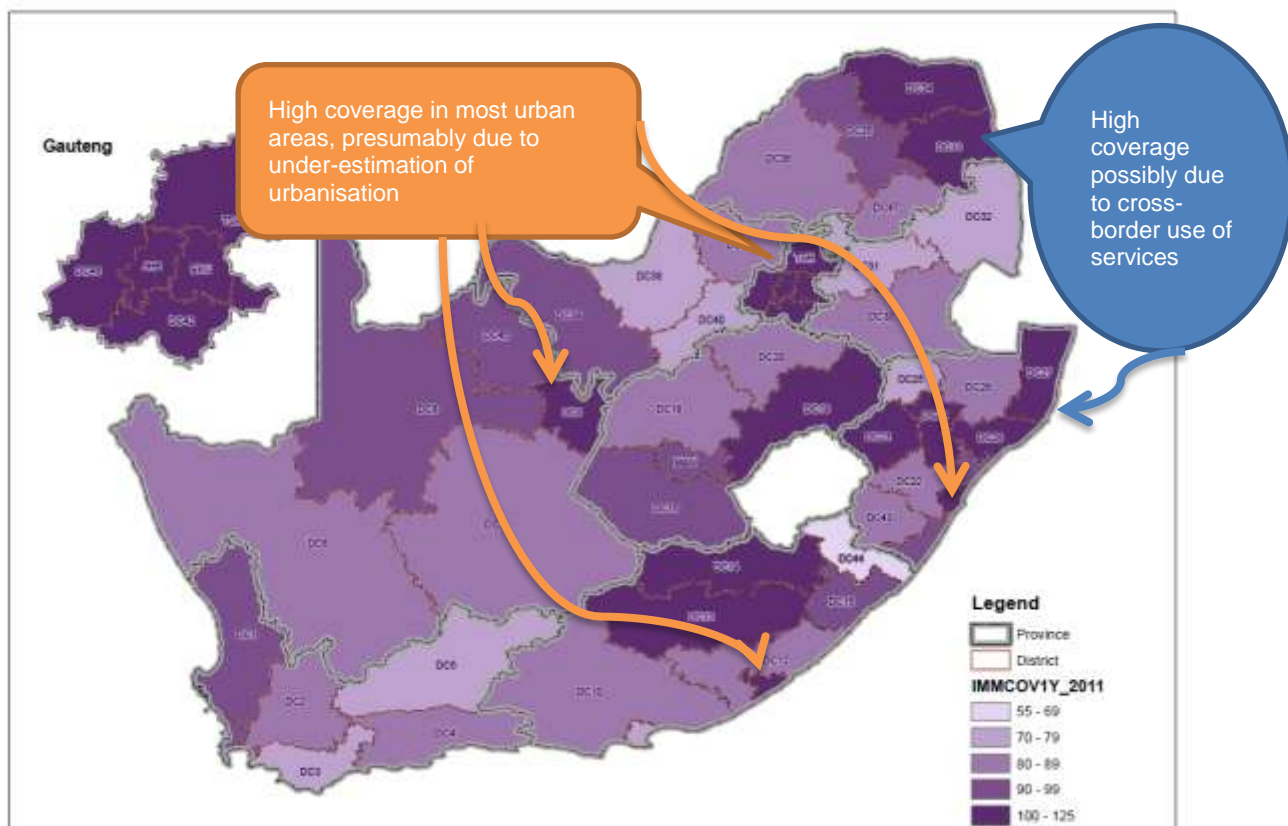


Imm cov yy (blue) is the DHIS indicator.

Imm cov yy Census (orange) uses the number of children fully immunised under 1 year from DHIS in the numerator, but the Census 2011 estimates for the number of children under 1 year of age as the denominator.

IndicatorShort IndicatorShort
 ○ Imm cov yy ■ Imm cov yy
 ■ Imm cov yy Census ■ Imm cov yy Census

Map 1: Immunisation coverage under 1 year (DHIS), highlighting overestimation of coverage, 2011/12



Map 2: Immunisation coverage under 1 year using Census 2011 population denominator, 2011/12

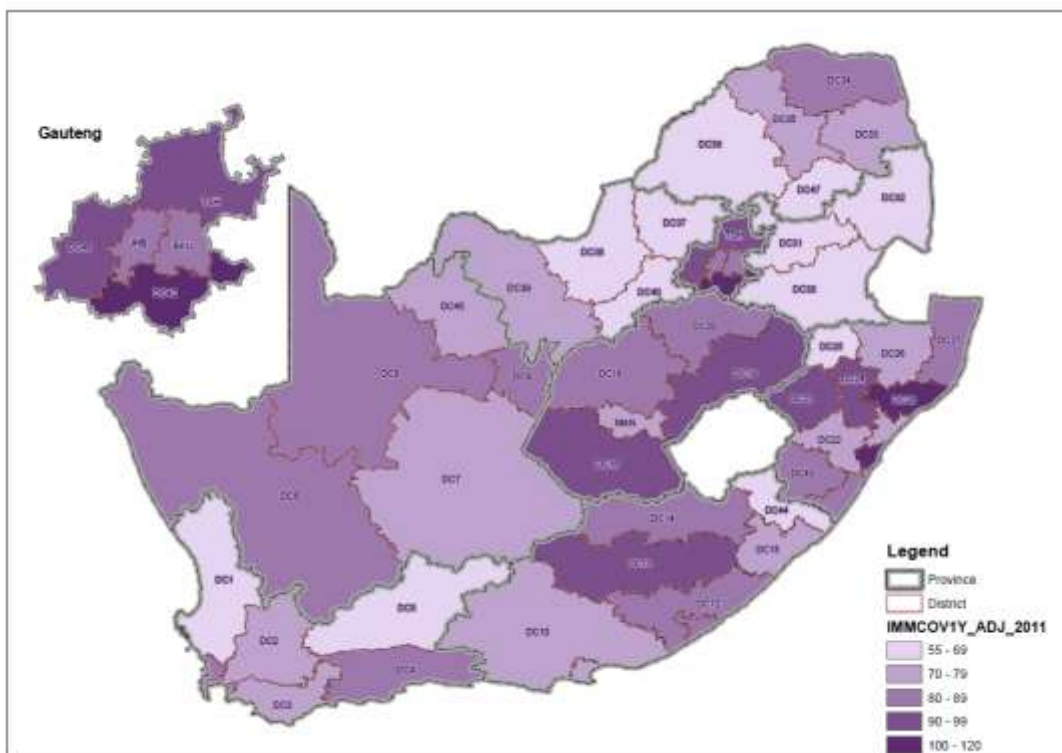
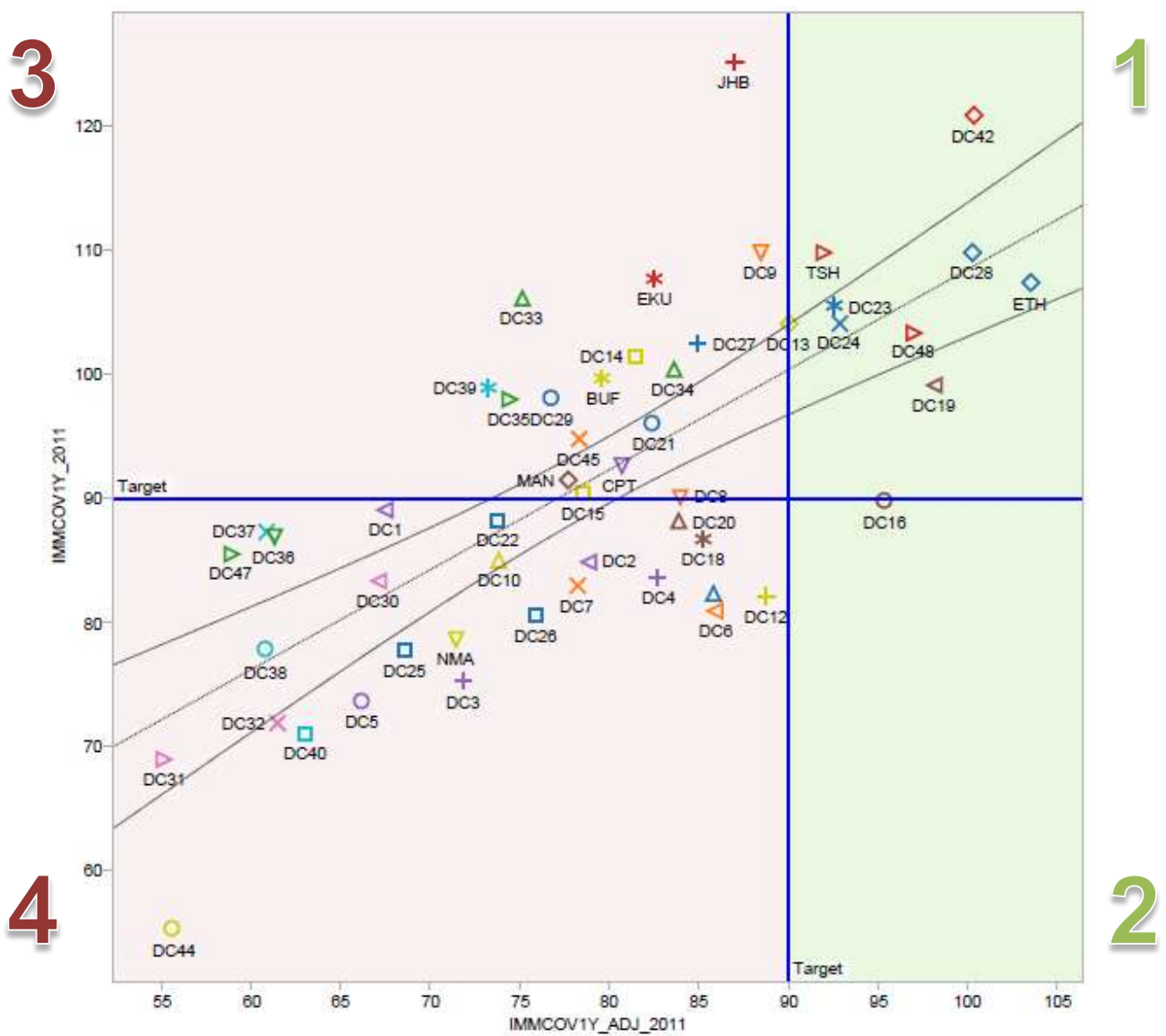


Figure 2: Scatterplot of immunisation coverage under 1 year, DHIS compared to Census 2011 population denominators, 2011/12



Probably below target

3

District	Census 2011	DHIS	Comment
Johannesburg: JHB	87.0	125.0	Coverage was 118% in 2012/13, and 125.0% in 2011/12, ranking JHB highest in the country. When recalculated, coverage drops by a massive 38 percentage points, reflecting the extent to which the current population estimates have underestimated population growth in this metro.
Frances Baard: DC9	88.5	109.8	
Ekurhuleni: EKU	82.6	107.6	
Mopani: DC33	75.1	106.1	When recalculated, coverage drops by 31 percentage points, from over 100% to well below target.
Umkhanyakude: DC27	85.0	102.5	
Joe Gqabi: DC14	81.5	101.4	This high coverage is due to substantial underestimation of the population under one year.
Vhembe: DC34	83.6	100.4	
Buffalo City: BUF	79.7	99.7	The coverage of 79.7% was 20 percentage points below the DHIS value of 99.7%.
RS Mompoti: DC39	73.3	98.9	When recalculated coverage was 73.3%, still the highest in the province but now substantially below target.
Capricorn: DC35	74.5	98.0	
iLembe: DC29	76.8	98.0	
Ugu: DC21	82.5	95.9	
JT Gaetsewe: DC45	78.3	94.7	
Cape Town: CPT	80.7	92.6	
Mangaung: MAN	77.7	91.4	
OR Tambo: DC15	78.6	90.3	
Siyanda: DC8	83.9	90.1	

Target most likely achieved

1

District	Census 2011	DHIS	Comment
eThekweni: ETH	103.6	107.3	The population estimates are similar and recalculation does not affect the level of coverage dramatically.
Sedibeng: DC42	100.4	120.8	When recalculated the coverage is still over 100% but much more realistic than DHIS.
Uthungulu: DC28	100.3	109.8	
T Mofutsanyane: DC19	98.2	99.0	The Census and DHIS populations are relatively similar suggesting that the numerator may have quality problems, or that there is substantial cross-boundary use of services in T Mofutsanyane.
West Rand: DC48	97.0	103.3	
Umzinyathi: DC24	92.9	104.1	DHIS values over 100% are primarily due to an underestimation of the under-one population.
Uthukela: DC23	92.6	105.4	
Tshwane: TSH	92.0	109.8	
C Hani: DC13	90.0	104.0	

4

Below target

District	Census 2011	DHIS	Comment
West Coast: DC1	67.5	89.0	
uMgungundlovu: DC22	73.8	88.2	
Fezile Dabi: DC20	83.9	88.2	
Bojanala: DC37	60.9	87.3	DHIS overestimates coverage by 26 percentage points.
Waterberg: DC36	61.3	86.9	When recalculated, the coverage of 61.3% in 2011/12 was much lower than the DHIS data of 86.9%.
Lejweleputswa: DC18	85.3	86.7	
Gr Sekhukhune: DC47	58.9	85.6	When recalculated coverage was 27 percentage points lower, and was the third lowest immunisation coverage in the country.
Cacadu: DC10	73.9	85.0	
Cape Winelands: DC2	78.9	84.9	
Eden: DC4	82.8	83.6	When recalculated Eden's coverage was better than the national average, suggesting that its relative performance is better than that indicated by current routine data, although still below target.
G Sibande: DC30	67.1	83.3	
Pixley ka Seme: DC7	78.3	82.9	There are actually slightly fewer children under one in this district than the current population estimates in DHIS, and after recalculation Sisonke is performing better than average, although still below target.
Sisonke: DC43	85.8	82.3	
Amathole: DC12	88.8	82.1	Coverage is higher after recalculation, suggesting that the actual population is lower than the DHIS estimates.
Namakwa: DC6	86.0	80.9	
Zululand: DC26	75.9	80.6	
N Mandela Bay: NMA	71.5	78.6	
NM Molema: DC38	60.9	77.7	
Amajuba: DC25	68.7	77.7	
Overberg: DC3	71.9	75.1	
Central Karoo: DC5	66.2	73.6	
Ehlanzeni: DC32	61.5	71.9	
Dr K Kaunda: DC40	63.1	71.0	
Nkangala: DC31	55.1	69.0	When recalculated the coverage of 55.1% in 2011/12 was the lowest in the country, much lower than the national average (80.1%).
A Nzo: DC44	55.7	55.2	The lowest coverage in the country using DHIS, and also very low with the Census population.

2

Target probably achieved

District	Census 2011	DHIS	Comment
Xhariep: DC16	95.5	89.7	DHIS over-estimates the number of children under 1 year, since the indicator calculated using the Census gives higher immunisation coverage of 95.5% for 2011/12.

4. Immunisation coverage (using Census 2011 population denominator) compared to expenditure on vaccines per population under 1 year

Expenditure on the non-negotiable item 'Vaccines' was extracted from the Basic Accounting System (BAS) per district and compared to the adjusted immunisation coverage. An overall assessment of expenditure on non-negotiable items highlights significant challenges in the allocation and coding of expenditure which limit the analysis. Some of the identified issues include:

- Not all provincial expenditure can be allocated to districts but is recorded at the provincial level (for example Free State and Mpumalanga);
- Some provinces record virtually no expenditure for vaccines; presumably the expenditure is combined with the general item for medicines (for example Limpopo and North West);
- No adjustment has been made for medical scheme coverage since there are no reliable data at district level, particularly by age categories (this comparison thus includes only public sector expenditure on vaccines and DHIS immunisation coverage which is primarily from public sector facilities but does include some private sector data).

Although there may be confounding issues and data quality problems, it does appear that immunisation coverage is correlated with expenditure per population under 1 year at the district level. Presumably the low immunisation coverage in Alfred Nzo may be partially attributed to inadequate allocation of resources to vaccines. On the other hand, districts such as uMgungundlovu have relatively high expenditure but are only achieving coverage of 74%.

Figure 3: Comparison of vaccine expenditure per population under 1 (Rand, real 2012/13 prices) and immunisation coverage (using Census 2011 denominator), selected provinces, 2011/12

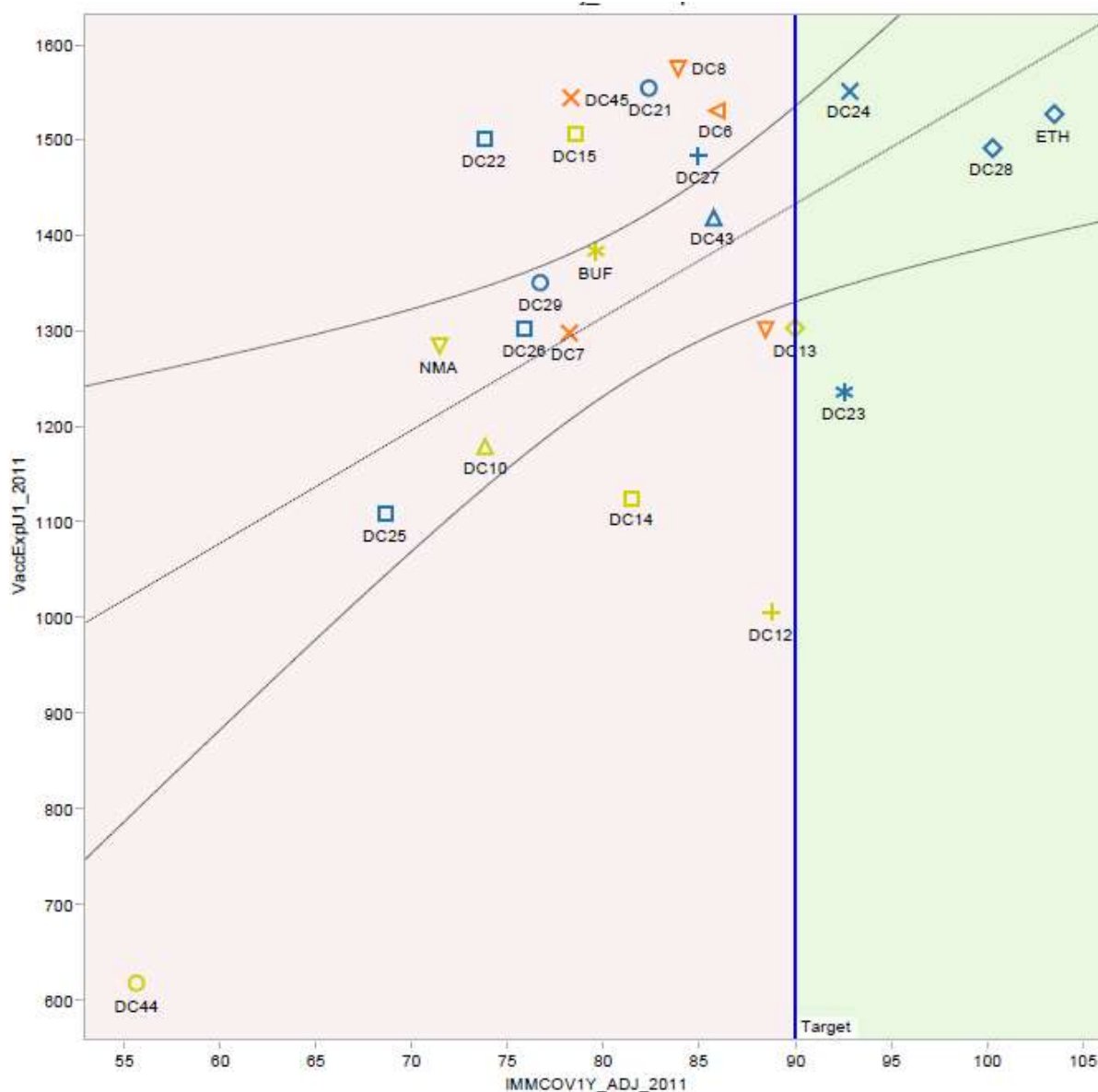


Table 3: Expenditure on vaccines by district, 2011/12 (Rand, real 2012/13 prices)

Province	District	Percentage of expenditure within province, 2011/12	Expenditure, 2011/12	Census Pop <1	Vaccine exp per pop <1, FY 2012
EC	BUF	12.0%	20 893 474	15 104	1 383
	DC10	6.1%	10 642 347	9 020	1 180
	DC12	10.5%	18 293 410	18 211	1 005
	DC13	12.4%	21 627 347	16 596	1 303
	DC14	5.0%	8 679 038	7 722	1 124
	DC15	31.0%	54 114 616	35 942	1 506
	DC44	7.7%	13 354 999	21 699	615
	NMA	15.3%	26 684 134	20 773	1 285

Province	District	Percentage of expenditure within province, 2011/12	Expenditure, 2011/12	Census Pop <1	Vaccine exp per pop <1, FY 2012
	provEC	0.0%	5 516		
FS	DC16	30.3%	3 631 533	3 145	1 155
	DC18	0.6%	74 945	13 736	5
	DC19	1.6%	188 311	16 693	11
	DC20	0.1%	6 164	10 136	1
	MAN	2.2%	269 153	15 266	18
	provFS	65.2%	7 803 614		
GP	DC42	0.0%	2	18 103	0
	DC48	0.3%	24 966	16 876	1
	EKU	0.0%	1	68 022	0
	JHB	0.0%	1	94 072	0
	TSH	99.7%	8 509 643	58 790	145
	provGP				
KZN	DC21	7.6%	26 139 166	16 840	1 552
	DC22	9.1%	31 305 944	20 866	1 500
	DC23	6.2%	21 099 388	17 075	1 236
	DC24	6.4%	21 767 172	14 042	1 550
	DC25	3.6%	12 428 747	11 212	1 109
	DC26	8.4%	28 679 967	22 040	1 301
	DC27	7.7%	26 340 509	17 763	1 483
	DC28	9.4%	32 236 584	21 610	1 492
	DC29	6.0%	20 605 338	15 280	1 349
	DC43	5.2%	17 737 886	12 505	1 418
	ETH	30.4%	104 146 690	68 211	1 527
	provKZN	0.0%	0		
LP	provLP				
MP	DC30	0.0%	0	24 261	0
	provMP	100.0%	15 897 766		
NC	DC6	8.1%	2 845 978	1 859	1 531
	DC7	14.4%	5 070 393	3 906	1 298
	DC8	21.3%	7 530 135	4 781	1 575
	DC9	30.2%	10 652 101	8 180	1 302
	DC45	26.0%	9 189 243	5 952	1 544
	provNC	0.0%	0		
NW	DC38		0	21 258	0
WC	CPT	20.8%	12 406 658	77 937	159
	DC1	15.3%	9 116 410	7 710	1 182
	DC2	32.0%	19 055 960	15 365	1 240
	DC3	8.9%	5 318 869	4 614	1 153
	DC4	20.0%	11 902 349	10 541	1 129
	DC5	3.0%	1 791 253	1 484	1 207
	provWC	0.0%	4 714		

Notes