

Profile

Maternal, Newborn and Child Survival: data challenges

6

Edward Nicol and Debbie Bradshaw
Burden of Disease Research Unit, South African Medical Research Council

Introduction

The *Countdown to 2015 Initiative*¹ identified South Africa as one of 68 priority countries with a high burden of maternal and child mortality and one of the 10 countries with least progress towards achieving Target 4 of the Millennium Development Goals. As part of a mid-term review of progress towards meeting the goal, the initiative selected indicators to track programmes considered to be effective in improving the survival of mothers, newborns and children.^{2,3} The programmes were identified using evidence presented in the 2003 and 2005 Lancet series on Child and Neonatal survival.^{4,5}

Tracking progress using critical health service indicators is dependent on a country's health information system and the quality of data it produces. While the availability of health statistics for South Africa has improved considerably since 1994, the quality and scope of such statistics still needs attention. A recent review of the health information system by Statistics South Africa and the National Department of Health (NDoH) identified major weaknesses.^{6,7} These included uncertainty about the exact level of child mortality⁸ and maternal mortality³ and missing, incomplete or poor quality data for evaluating maternal, newborn and child health programmes.^{9,10,11}

In order to assess trends in the success of key, high-impact maternal, newborn and child survival interventions, with a view to identifying key policy and programmatic areas in each province, several data quality issues with discrepancies observed between routinely collected data and survey data were highlighted.^{1,2}

This profile highlights the data quality concerns for selected indicators. Different data sources were examined to assess their reliability, using nutritional status and immunisation coverage indicators. In an attempt to assess data quality, the stability of the Eastern Cape health data for the period 2006-2008 was explored, using the prevention of mother-to-child transmission of HIV (PMTCT) indicators.¹³

Data sources and methods

The data sources used in this study include the District Health Information System (DHIS) routine data reported in the District Health Barometer (DHB).¹⁴ The DHIS, reflecting data collected monthly from primary health care facilities and hospitals, has become a central component of health information for the

Table 1: Comparing anthropometric status based on the percentage of children under two standard deviations (95% confidence interval in brackets)

	EC	FS	GP	KZN	LP	MP	NC	NW	WC	SA
NFCS – 2005 (1-4 years)										
n	130	85	216	205	146	69	23	103	115	1092
Stunting	21.5 (13.6-29.5)	36.5 (24.3-48.7)	23.6 (19.0-28.2)	18.0 (12.4-23.7)	28.8 (19.5-38.1)	15.9 (9.0-22.9)	26.1 (20.2-32.0)	18.4 (11.2-25.7)	10.4 (2.9-18.0)	21.7 (19.2-24.2)
Underweight	8.5 (2.7-14.3)	16.5 (7.2-25.8)	8.3 (3.7-13.0)	4.4 (1.1-7.7)	13.0 (7.1-18.9)	5.8 (1.1-10.5)	52.2 (34.9-69.5)	12.6 (6.2-19.0)	8.7 (2.9-14.5)	10.1 (8.2-12.0)
Wasting	6.2 (1.8-10.5)	2.4 (0.0-5.8)	5.1 (2.2-8.0)	2.0 (0.0-3.9)	4.8 (0.9-8.7)	10.1 (2.8-17.5)	21.7 (7.4-36.1)	3.9 (0.0-8.3)	13.0 (5.5-20.6)	5.8 (4.4-7.2)
SADHS – 2003 (<5 years)										
n	149	89	269	51	173	130	38	112	149	1160
Stunting	28.5 (19.5-37.4)	32.9 (23.9-41.8)	26.5 (18.8-34.1)	13.3 (0.4-26.1)	26.5 (18.7-34.6)	22.2 (16.3-28.1)	37.1 (30.7-43.5)	24.0 (15.6-32.4)	34.7 (23.2-46.2)	27.4 (24.2-30.5)
Underweight	7.1 (1.6-12.6)	15.9 (9.0-22.8)	10.1 (5.5-14.6)	11.3 (0.0-22.9)	14.2 (8.9-19.5)	9.1 (4.8-13.4)	25.8 (19.8-31.8)	12.4 (7.3-17.4)	10.9 (5.5-16.3)	11.5 (9.8-13.5)
Wasting	0.8 (0.0-2.5)	8.4 (3.8-13.0)	4.2 (0.6-7.8)	7.5 (0.0-16.6)	5.3 (2.1-8.6)	6.0 (2.5-9.6)	10.0 (6.1-13.8)	6.0 (2.5-9.6)	6.2 (2.2-10.1)	5.2 (3.9-6.5)

Source: National Department of Health, 2007;¹⁷ Labadarios et al., 2007.¹⁸

Department of Health's District Health System.¹⁵

Other data sources included:

- the 1998 and 2003 South Africa Demographic and Health Surveys (SADHS);^{16,17}
- the 2005 National Food Consumption Survey (NFCS);¹⁸ and
- data reported to the United Nations Children's Fund.^a

Data quality

Nutritional status

Anthropometric data from the 2005 NFCS¹⁸ were compared with 2003 SADHS¹⁷ data (Table 1). When comparing the prevalence of under-nutrition, it must be noted that the two data sources collected data for different ages – the NFCS survey included children 1-4 years while the SADHS included children <5 years and that the sample size (n) for some provinces was relatively small. Even when allowing for these influences, there is considerable variation between the estimates from the two surveys for the standard indicators: stunting based on height-for-age (H/A), underweight based on weight-for-age (W/A) and wasting based on weight-for-height (W/H). In addition, comparing the results from both surveys reveals that some values are not even within the confidence intervals of each other, especially with the wasting indicator.

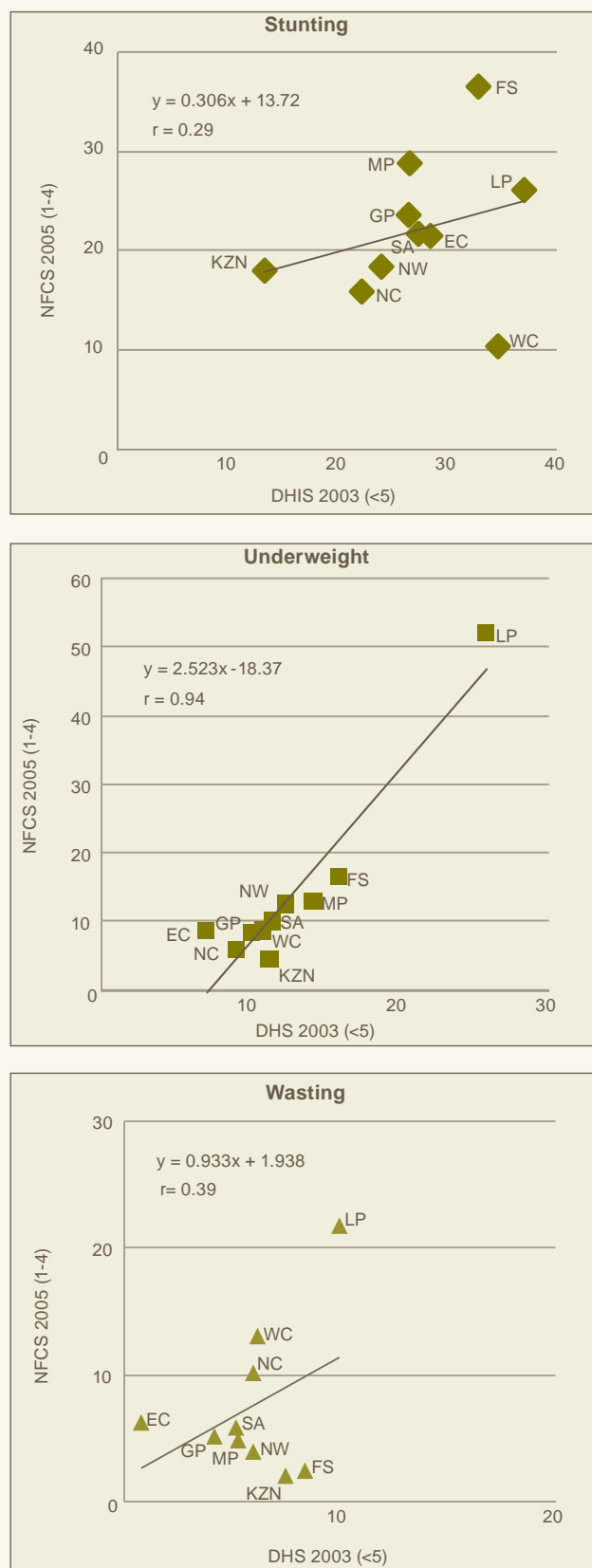
Figure 1 compares the survey results for all three under-nutrition indicators. The correlation for underweight ($r=0.94$) was stronger than for the other two indicators. There are, however, discrepancies between the two surveys for the Eastern Cape and for KwaZulu-Natal, suggesting that the small sample size can pose a problem for monitoring purposes.

Full immunisation

Analyses of the Eastern Cape DHIS data suggest an increase in the number of facilities reporting on immunisation. Figure 2 indicates some fluctuation in the number of health facilities that routinely reported data on infant immunisation between 2006 and 2008. In particular, the number of facilities in the Nelson Mandela Metropolitan area was much higher for the first few months of 2007 than for the other months, possibly reflecting the inclusion of immunisation campaign sites or mobiles.

Comparison of the Expanded Programme on Immunisation (EPI) coverage data obtained from the DHIS and the SADHS revealed differences in the full immunisation coverage estimates for 2001 and 2002 (Figure 3). The routine administrative data were higher than the survey data, even allowing for sampling variation indicated by the 95% confidence interval.

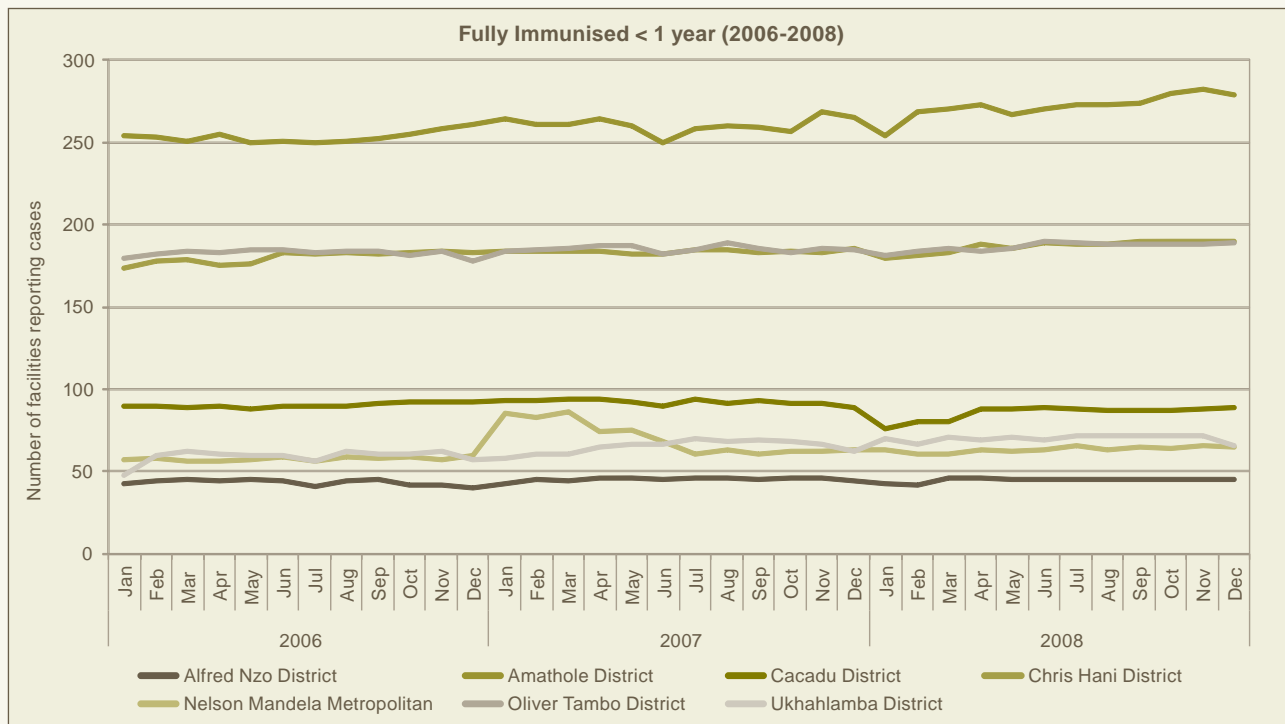
Figure 1: Comparing SADHS and NFCS anthropometry data



Source: Authors' analysis based on data from National Department of Health, 2007;¹⁷ Labadarios et al., 2007.¹⁸

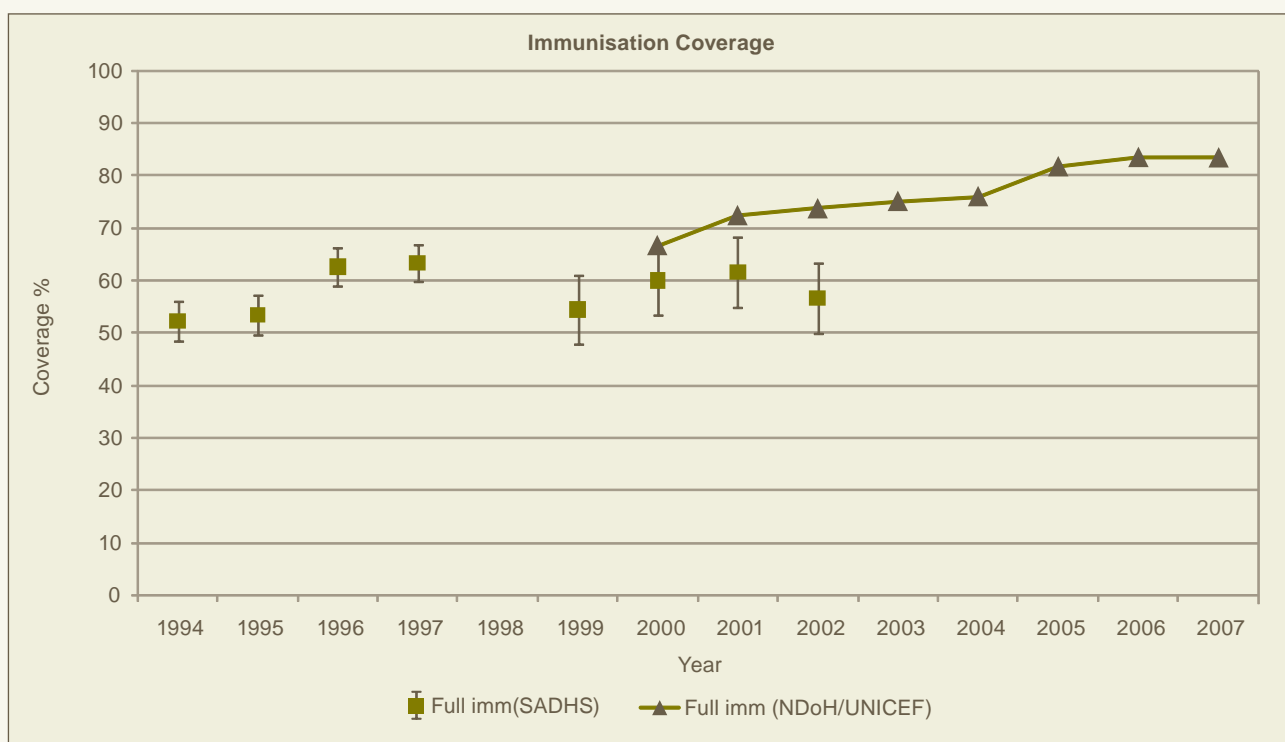
a Personal communication: N. Ngongo, December 1, 2008.

Figure 2: Number of facilities reporting immunisation in the Eastern Cape province, by district, 2006-2008



Source: EC DHIS 2006-2008.¹⁶

Figure 3: Immunisation coverage with 95% confidence interval based on DHIS and SADHS



Source: Authors' analysis based on data from the National Department of Health, 2007;¹⁷ Labadarious et al., 2007;¹⁸ Barron et al., 2009.¹⁴

Table 2 compares the indicator definitions from the two data sources (SADHS and DHIS) to assess whether these could account for the observed differences. *The Countdown to 2015 Initiative* identified two indicators for immunisation coverage, the percentage of children aged 12-23 months immunised against measles and the percentage of children aged 12-23 months who received three doses of DPT (diphtheria, pertussis and tetanus) combination vaccines. The SADHS indicator definition for full immunisation is effectively the same as the *Countdown Initiative's* version. The DHIS, however, emphasizes the practical aspects when defining immunisation coverage as: the percentage of all children who are less than one year who complete their primary course of immunisation (BCG; OPV 1,2 & 3; DPT-Hib 1,2 & 3; HepB 1,2 & 3; and 1st measles at nine months).

Unlike the SADHS, which is a population-based survey, data for the DHIS are only captured from the public sector health facilities and are collected monthly and annualised. One would expect the SADHS immunisation coverage values to be higher since the survey captures children up to 23 months as against the DHIS which captures children less than 12 months

and uses a less restrictive definition. As such, the children reflected in the SADHS data have had a longer period to be immunised and are drawn from a larger pool. That the DHIS coverage values are greater than the SADHS survey estimates contradicts expectations. One possibility is that the population figures used in the DHIS are incorrect. Yet an evaluation of the DHIS denominator values suggests that this would not affect the indicator value substantially at provincial level.

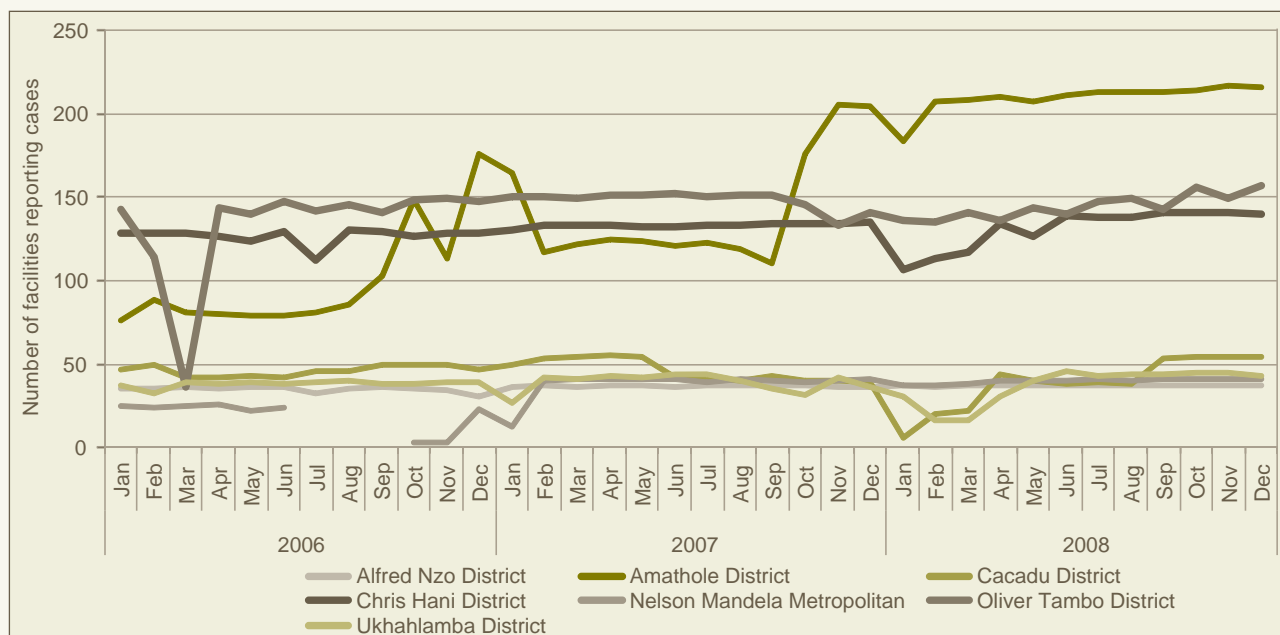
A detailed study comparing global survey data on DPT3 coverage with that from routine/administrative records found that, on average, estimates from administrative records are higher than survey estimates and that some of the difference seemed to be associated with international incentives.¹⁹ This suggests that the differences in these data sources could result from measurement errors in the administrative data. These errors can occur as a result of incorrect recording in health centres and incomplete capturing of immunisation records. Errors could also be ascribed to incorrect denominator values due to using outdated census records, to incomplete population registries or to inaccurate population projections.

Table 2: Comparing immunisation indicator definitions for SADHS and DHIS

Immunisation Coverage		
Period	SADHS 1998 and 2003	DHIS 2000-2008
Definition	Percentage of children aged 12-23 months who have received BCG, OPV 1, 2 & 3, DPT-Hib 1, 2 & 3, HepB 1, 2 & 3, and a measles vaccine	The percentage of all children in the target area under one year who complete their primary course of immunisation during the month (annualised). A Primary Course includes BCG, OPV 1,2 & 3, DPT-Hib 1,2 & 3, HepB 1,2 & 3, and 1st measles at 9 months
Numerator	Number of children aged 12-23 months who have received BCG, OPV 1, 2 & 3, DPT-Hib 1, 2 & 3, HepB 1, 2 & 3, and a measles vaccine	Number of children under one year who had received BCG, OPV 1,2 & 3, DPT-Hib 1,2 & 3, HepB 1,2 & 3, and 1st measles at 9 months
Denominator	Total number of children aged 12-23 months surveyed	The number of children less than one as per the latest population projection for the year of measurement derived from population census
Comments	<ul style="list-style-type: none"> ➤ The target population for both the denominators and numerators differ – the SADHS used children aged 12-23 months while the DHIS used children under one year ➤ There are concerns about the numbers used for the DHIS denominator at disaggregated levels, but this is not an issue at provincial level ➤ There are data quality concerns about the 2003 SADHS 	

Source: Authors' compilation based on data from National Department of Health, 2007;¹⁷ Labadarious et al.,2007;¹⁸ Barron et al, 2009.¹⁴

Figure 4: Number of facilities reporting on women receiving Nevirapine at antenatal care or labour in the Eastern Cape, by district 2006-2008



Source: EC DHIS 2006-2008.¹⁶

Prevention of mother-to-child transmission of HIV

The Eastern Cape DHIS data suggest an increase in the number of facilities reporting on the rollout of the PMTCT programme. Data gaps and inconsistencies were, however, observed and reporting has been erratic in some districts for the period 2006-2008. Other major methodological problems exist with these indicators, including the limitations of routine versus cohort data, the disconnections between the numerators and denominators and the systematic under-reporting of the denominators.

Figure 4 shows a data gap in the facilities reporting Nevirapine doses to women at antenatal care, or in labour, in Nelson Mandela Metropolitan for the period June to October 2006. While this could be attributed to a number of factors, it is illustrative of the breakdown in data flow from the facilities to the district and the lack of adequate supervision with regular feedback regarding data management and the incompleteness of the data. This finding is consistent with a study conducted in KwaZulu-Natal that identified concerns about the validity of the DHIS data for PMTCT in that setting.²⁰ The District Health Barometer, which reports on data from the DHIS, has also identified data quality issues.¹⁴ The publication reiterates the problems involved in data collection and agrees that “the data underlying the PMTCT programme is less than optimal, specifically the Nevirapine uptake in mothers and children, which is indicative of management neglect of the programme from the national to facility level”.¹⁴ Even though this indicator is no longer a main PMTCT indicator and has been left out of

the 2008/09 District Health Barometer because of concerns over data quality, the problems relating to this indicator are likely to be relevant to other indicators as well.²¹

Conclusions

- Exploration of the Eastern Cape DHIS data suggests that reporting on immunisation is more stable than for PMTCT, which is a much newer programme. Information relating to some key indicators, such as the provision of Cotrimoxazole, is not routinely available.
- There is currently little data to give reliable provincial information on nutritional status of children. The sample size of the available surveys is insufficient to provide stable provincial-level data to monitor under-nutrition in children.
- The routine administrative immunisation data values appear to be higher than survey-based estimates. While matching international trends, this could be partly influenced by the system of international incentives aimed at achieving high immunisation levels.²⁰
- Although the DHIS is a central component of the Department of Health’s information system and the data are used for international comparisons, some indicator definitions differ from the World Health Organization standard and the large quantity of data collected at district level impacts negatively on quality of the DHIS data.¹⁵

Recommendations

It is clear that the quality of the health information required to monitor Maternal, Newborn and Child survival in South Africa is problematic. In particular, routine data systems need to be strengthened and larger sample sizes are needed for surveys to enable sub-national monitoring. Efforts to improve the health information system and population health data must continue, as monitoring progress and inequities is essential. Institutional capacity to collect, analyse and utilise health data at national, provincial and local levels must be strengthened.

Regular and reliable national health information would make it possible to monitor the change in coverage of key interventions. Graphic representation of the provincial variation in the progress made would enable provinces to benchmark their progress easily and to prioritise their interventions.

References

- 1 Bryce J, Daelmans B, Dwivedi A, Fauveau V, Lawn JE, Mason E, et al. Countdown to 2015 for maternal, newborn, and child survival: the 2008 report on tracking coverage of interventions. *Lancet*. 2008; 371: 1247-58.
- 2 Bhutta AZ, Chopra M, Axelson H, Berman P, Bryce J, Bustreo F, et al. Countdown to 2015 Decade Report (2000-2010): Taking Stock of Maternal, Newborn and Child Survival. New York: UNICEF; 2010.
- 3 Bradshaw D, Chopra M, Kerber K, et al. Every death counts: saving the lives of mothers, babies and children in South Africa. *Lancet*. 2008; 371(9608):243-60.
- 4 Darmstadt GL, Bhutta ZA, Cousens S, Adam T, Walker N, de Bernis L. Evidence-based, cost-effective interventions: how many newborn babies can we save? *Lancet*. 2005; 365: 977-88.
- 5 Jones G, Steketee RW, Black RE, Bhutta ZA, Morris SS, et al. How many child deaths can we prevent this year? *Lancet*. 2003; 362: 65-71.
- 6 Statistics South Africa. Assessment of the Health Information System in South Africa, 2009. Pretoria: Statistics South Africa; 2009.
- 7 Rohde JE, Shaw V, Hedberg C, Stoops N, Venter S, Venter K, et al. Information for Primary Health Care. In: Barron P, Roma-Reardon J, editors. *South African Health Review 2008*. Durban: Health Systems Trust; 2009.
URL: http://www.hst.org.za/upload/files/chap13_08.pdf
- 8 Bradshaw D, Dorrington R. Child mortality in South Africa – we have lost touch. *S Afr Med J*. 2007; 97(8):582-583.
- 9 Doherty TM, McCoy D, Donohue S. Health systems constraints to optimal coverage of the prevention of mother-to-child HIV transmission programme in South Africa: lessons from the implementation of the national pilot programme. *Afr Health Sci*. 2005; 5 (3): 213-8.
- 10 Doherty T, Besser M, Donohue S, Kamoga N, Stoops N, Williamson L, et al. An Evaluation of the PMTCT of HIV Initiative in South Africa. Durban: Health Systems Trust; 2003.
URL: <http://www.hst.org.za/publications/599>
- 11 Garrib A, Stoops N, McKenzie A, Dlamini L, Govender T, Rohde J, et al. An evaluation of the District Health Information System in rural South Africa. *S Afr Med J*. 2008; 98 (7): 549-522.
- 12 Nicol E, Bradshaw D. Data Challenges in Monitoring Progress around Maternal, Newborn and Child Survival. A paper presented at the 4th Population Association of South Africa Conference. University of the Western Cape; July 2009.
- 13 Nicol E. Monitoring Progress around Child Survival: Immunisation and PMTCT Coverage in the Eastern Cape. Poster presented at the South African Medical Research Council Research Day. Cape Town; September 2009.
- 14 Barron P, Day C, Monticelli F, Sello E, editors. *District Health Barometer 2007/08*. Durban: Health System Trust; 2009.
URL: <http://www.hst.org.za/publications/850>
- 15 Muschel J. District Health Information Systems. In: Crisp N, Ntuli A, editors. *South African Health Review 1999*. Durban: Health Systems Trust; 1999.
URL: http://www.hst.org.za/uploads/files/chapter12_99.pdf
- 16 National Department of Health, Medical Research Council, Macro International. *South Africa Demographic and Health Survey 1998*. Full Report. Pretoria: National Department of Health; 2002.
- 17 National Department of Health, Medical Research Council, Orc Macro. *South Africa Demographic and Health Survey 2003*. Full Report. Pretoria: National Department of Health; 2007.
- 18 Labadarios D, Swart R, Maunder EMW, Kruger HS, Gericke GJ, Kuzwayo PMN, et al. *The National Food Consumption Survey-Tortification Baseline: South Africa, 2005*. Pretoria: Nutrition Directorate; 2007.
- 19 Lim SS, Stein DB, Charrow A, Murray CJL. 2008. Tracking progress towards universal childhood immunisation and the impact of global initiatives: a systematic analysis of three-dose diphtheria, tetanus, and pertussis immunisation coverage. *Lancet*. 2008; 372: 2031-46.
- 20 Mate KS, Bennett B, Mphatswe W, Barker P, Rollins N. Challenges for routine health system data management in a large public programme to prevent mother-to-child HIV transmission in South Africa. *PLoS ONE*. 2009; 4(5): e5483.
- 21 Day C, Monticelli F, Barron P, Haynes R, Smith J, Sello E, editors. *District Health Barometer 2008/09*. Durban: Health System Trust; 2010.
URL: <http://www.healthlink.org.za/publications/864>