CHAPTER 7

IMMUNISATION COVERAGE STATUS

INTRODUCTION

During September 1994, the Expanded Programme on Immunisation in South Africa, EPI(SA), was evaluated under the auspices of the Department of Health and the World Health Organisation (WHO)[1]. Four surveys were planned as part of the evaluation process. These were an immunisation coverage survey per province and nationally, a Knowledge-Attitudes-Practices (KAP) study of immunisation staff[2], a survey of the extent of participation of private health providers[3] in the immunisation programme, and a cold chain survey (to be published).

The EPI(SA) Review in 1994[1] found that the immunisation programme in South Africa functioned well under difficult circumstances and fragmented administration, and that it had great potential for growth in a unified programme. Whereas the review focused on the qualitative aspects of the programme, this report provides quantitative data.

The Directorate of Epidemiology in the Department of Health has regularly reported the immunisation coverage generated through the routine reporting system. These estimates are based on the number of doses given, which are collected at immunisation point level, and after various summation processes are submitted to this Directorate. These estimates were the only routine and regular indication of immunisation coverage for the former nine health regions in South Africa[4]. The 1993 coverage for the nine health regions was estimated to be 68% for BCG, 81% for OPV[3], 81% for DTP[3] and 77% for measles[4]. The obvious limitations of these data include the extent of reporting, the fragmentation of the services and reporting structures, and the repeated changes in the immunisation schedules and reporting forms in the past five years. Specifically, the reporting of BCG doses given was hampered by the lack of reporting by hospitals where most BCG doses are administered. The immunisation coverage released by the Department of Health reflected the immunisation services in the preventive and primary health care structures within the former Republic of South Africa, and did not include the doses given in former self-governing and independent territories in South Africa. The consequences of these limitations led, for example, to the former Natal province reporting consistently an OPV3 coverage4 in excess of 100%, since people from the adjoining KwaZulu areas received immunisation services in Natal, thereby contributing to the numerator without being included in the Natal population denominator.

The last immunisation coverage survey (based upon the 30x7 cluster sampling methodology) was conducted in 1990. The pre-Measles Strategy (1989/90) coverage was estimated to be 85% for BCG, 67% for DTP3, 69% for OPV3 and 63% for Measles and it included the former South African health regions as well as the self-governing territories of KwaZulu, KaNgwane, QwaQwa, Gazankulu, Lebowa and KwaNdebele[5]. The immunisation doses given in self-governing and independent territories were only sporadically reported to the South African Department of Health, thus hampering the assessment of comprehensive coverage. In those areas with own information units, data were often obtained by conducting immunisation coverage surveys; the data so collected were normally only circulated and used within the specific area, and occasionally

published or made available to the Department of Health. Furthermore, independent surveys, done by individual researchers, provided some additional information on local immunisation coverage. These surveys indicated that areas such as the former Venda[6], Gazankulu[7], Ciskei[8] and Bophuthatswana[9] had attained a high immunisation coverage, whereas areas such as the former Lebowa[10] and Transkei[11] had a very low coverage.

In addition to these difficulties, the immunisation schedule was not standardised within the whole country with some former independent territories following the "6, 10, 14 week schedule" for DTP/OPV recommended by the WHO, whereas most areas remained with the "3, 4«, 6 month schedule" used in the rest of South Africa at the time. Also, even within the former South African area, repeated changes in schedules, especially with measles schedules, left immunisation staff confused. In this study, the immunisation coverage in the country as a whole is reported for the first time.

METHODOLOGY

Immunisation coverage was assessed on the basis of documented (i.e. dates given) and reported doses received at the time of the survey. If a BCG scar was visible, this was taken as evidence of BCG vaccination, irrespective of whether the child was reported to have received such a vaccination or not. When comparing age cohorts, immunisation coverage was assessed on the basis of doses given before the first birthday.

Criteria for Immunisation Coverage

A child was considered to be fully immunised if he/she had received a dose of BCG and measles, and three doses of DTP and OPV vaccine. The assumptions in each set of results are included in the text and as footnotes in the tables.

RESULTS

Nationally, 91% of children one year of age were reported to have an immunisation card, although the card might not have been shown to the fieldworker during the survey; this percentage ranged from 85% in the Eastern Cape to 97% in Gauteng (Table 7.1). A BCG scar was seen in 63% of the children in the country with the lowest prevalence in Eastern Transvaal. Of all children one year of age in South Africa, 74% were considered to be fully immunised, although only 63% were fully immunised by their first birthday (Table 7.1); the lowest corresponding percentages were seen in the Eastern Cape, 58 and 50%, respectively. Overall, by the first birthday, Gauteng and the Western Cape had the highest coverage for most doses, whereas the Eastern Cape had the lowest coverage. The percentage of children that did not receive any immunisations at all varied from 1% in Gauteng to 6% in Eastern Transvaal and Eastern Cape, with a national average of 4%. Children in the rural areas were significantly more disadvantaged both in terms of being fully immunised or not being immunised at all; they were also less likely to possess an immunisation card or to have a visible BCG scar (Table 7.1; Fig. 7.1).

Table 7.1. Immunizations received by source of information and area of residence

Percentage of children aged 12 to 23 months who had received specific vaccines at any time before the survey and the percentage immunised before their first birthday, South Africa 1994.

	Percentage of children who received before their first birthday:												
	BCG	DTP1	DTP2	DTP3+	OPV1	OPV2	OPV3+	Measles	All	None	No. of Children	% with BCG scar	% Reported to have card
SOUTH AFRICA											**2166**	**63.4**	**91.0**
Immunised any time before survey													
Dates of immunisation recorded	78.4	79.3	76.5	70.1	77.3	74.6	68.1	73.8	63.0	-			
Recall/BCG scar	16.8	12.7	12.1	10.5	12.6	12.1	10.4	10.7	11.4	-			
Either source	95.2	92.0	88.6	80.6	89.9	86.7	78.5	84.5	74.4	3.9			
95% confidence interval	94.0;96.4	90.4;93.7	86.6;90.7	77.8;83.4;	88.3;91.5	88.3;88.7	75.7;81.3	82.1;86.9	71.4;77.4	2.7;5.0			
Immunised before first birthday[1]	**94.8**	**91.1**	**86.6**	**73.4**	**89.1**	**84.5**	**71.5**	**76.4**	**63.3**	**-**			
NORTHERN CAPE											**174**	**69.9**	**94.9**
Immunised any time before survey													
Dates of immunisation recorded	83.5	82.3	80.6	77.2	78.2	76.6	74.2	76.6	69.9	-			
Recall/BCG scar	14.7	12.5	11.0	9.8	14.3	13.7	12.6	12.0	11.0	-			
Either source	98.2	94.8	91.6	87.0	92.5	90.3	86.8	88.6	80.6	1.8			
95% confidence interval	95.7;100	91.1;98.6	86.9;96.4	80.8;93.1	88.1;96.6	85.1;95.4	80.3;93.2	82.5;94.6	72.9;88.4	0..0;4.3			
Immunised before first birthday[1]	**98.2**	**94.2**	**91.0**	**81.3**	**91.8**	**89.6**	**80.9**	**71.6**	**60.4**	**-**			
WESTERN CAPE											**169**	**66.8**	**95.8**
Immunised any time before survey													
Dates of immunisation recorded	83.4	84.5	82.8	76.2	79.8	77.4	71.5	83.9	69.7	-			
Recall/BCG scar	14.8	12.5	11.9	9.5	12.5	13.1	9.5	11.3	10.7	-			
Either source	98.2	97.0	94.7	85.7	92.3	90.5	81.0	95.2	80.4	1.8			
95% confidence interval	95.6;100.0	93.8;100	91.0;98.3	78.3;93.2	87.1;97.4	84.3;96.7	71.5;90.5	91.0;89.9	70.9;89.9	0.0;4.4			
Immunised before first birthday[1]	**98.2**	**97.0**	**92.6**	**81.0**	**92.3**	**89.1**	**75.6**	**89.1**	**72.2**	**-**			
EASTERN CAPE											**265**	**61.8**	**85.3**
Immunised any time before survey													
Dates of immunisation recorded	78.9	75.9	71.7	64.2	72.1	66.8	59.2	64.5	50.5	-			
Recall/BCG scar	13.2	9.0	7.9	6.0	9.0	7.9	6.4	7.1	7.5	-			
Either source	92.1	84.9	79.6	70.2	81.1	74.7	65.6	71.6	58.0	6.4			
95% confidence interval	88.4;95.7	78.6;91.1	71.9;87.2	61.7;78.7	75.7;86.5	67.3;82.1	57.6;73.7	62.7;80.5	48.7;67.4	2.8;10.0			
Immunised before first birthday[1]	**90.7**	**84.4**	**78.3**	**63.1**	**80.7**	**73.4**	**59.3**	**66.5**	**50.2**	**-**			

Table 7.1. Immunizations received by source of information and area of residence (continued)

	Percentage of children who received before their first birthday:										No. of Children	% with BCG scar	% Reported to have card
	BCG	DTP1	DTP2	DTP3+	OPV1	OPV2	OPV3+	Measles	All	None			
KWAZULU NATAL											**256**	**63.7**	**90.2**
Immunised any time before survey													
Dates of immunisation recorded	69.6	71.1	66.9	56.7	70.4	66.9	56.3	68.8	53.9	-			
Recall/BCG scar	24.6	20.3	19.5	16.4	20.7	19.5	16.4	17.2	16.8	-			
Either source	94.2	91.4	86.4	73.1	91.1	86.4	72.7	86.0	70.7	4.7			
95% confidence interval	91.1;97.2	87.3;95.6	81.3;91.4	65.1;81.0	87.3;94.8	81.3;91.4	64.4;81.0	80.7;91.3	62.7;78.8	1.6;7.7			
Immunised before first birthday[1]	**94.2**	**89.4**	**83.3**	**64.4**	**89.0**	**82.8**	**64.5**	**76.7**	**57.3**	**-**			
EASTERN TRANSVAAL											**252**	**58.0**	**87.0**
Immunised any time before survey													
Dates of immunisation recorded	77.8	78.2	75.4	73.0	76.6	73.4	71.0	69.5	64.3	-			
Recall/BCG scar	16.0	12.4	12.4	11.2	12.4	12.4	10.8	9.2	9.5	-			
Either source	93.8	90.6	87.8	84.2	89.0	85.8	81.8	78.6	73.8	6.2			
95% confidence interval	91.1;97.2	87.3;95.6	81.3;91.4	65.1;81.0	87.3;94.8	64.4;81.0	80.7;91.3	62.7;91.3	62.7;78.8	1.6;7.7			
Immunised before first birthday[1]	**94.2**	**89.4**	**83.3**	**64.4**	**89.0**	**82.8**	64.5	76.7	57.3	-			
NORTHERN PROVINCE											**282**	**68.3**	**92.5**
Immunised any time before survey													
Dates of immunisation recorded	83.0	86.2	85.8	81.2	85.1	84.1	79.1	83.0	73.1	-			
Recall/BCG scar	13.1	9.2	8.9	8.5	8.5	8.5	8.1	8.5	11.3				
Either source	96.1	95.4	94.7	89.7	93.6	92.6	87.2	91.5	84.4	2.8			
95% confidence interval	93.5;98.7	92.4;98.3	91.4;98.0	85.5;94.0	90.5;96.7	89.0;96.1	83.1;91.4	87.4;95.7	79.4;89.4	0.6;5.1			
Immunised before first birthday[1]	**96.1**	**95.0**	**91.9**	81.7	93.2	89.8	79.6	80.3	69.3	**-**			
GAUTENG											**188**	**60.5**	**96.8**
Immunised any time before survey													
Dates of immunisation recorded	80.5	82.5	80.9	76.1	81.5	80.9	75.6	77.2	71.4	-			
Recall/BCG scar	17.9	14.8	14.8	12.7	14.2	14.3	12.1	12.1	13.7	-			
Either source	98.4	97.3	95.7	88.8	95.7	95.2	87.7	89.3	85.1	1.1			
95% confidence interval	96.8;100	95.3;99.4	93.4;98.0	85.4;92.2	93.3;98.2	92.7;97.6	84.1;91.4	85.1;93.6	80.8;89.4	0.0;2.5			
Immunised before first birthday[1]	**98.4**	**96.7**	**95.1**	**83.2**	**95.1**	**94.5**	**82.2**	**81.9**	**75.6**	**-**			

Table 7.1. Immunizations received by source of information and area of residence (continued)

	Percentage of children who received before their first birthday:										No. of Children	% with BCG scar	% Reported to have card
	BCG	DTP1	DTP2	DTP3+	OPV1	OPV2	OPV3+	Measles	All	None			
NORTH WEST											**310**	**60.1**	**93.4**
Immunised any time before survey													
Dates of immunisation recorded	85.2	86.5	84.0	80.3	84.8	82.6	78.9	81.5	74.9	-			
Recall/BCG scar	11.4	6.6	6.7	6.1	6.6	6.8	6.1	6.3	7.1	-			
Either source	96.6	93.1	90.7	86.4	91.4	89.4	85.0	87.7	82.0	3.0			
95% confidence interval	94.6;98.7	90.0;96.2	87.3;94.2	81.2;91.5	87.9;94.9	85.6;93.2	79.8;90.2	82.6;92.6	75.7;88.2	1.5;5.0			
Immunised before first birthday[1]	**95.7**	**91.8**	**89.4**	**78.8**	**91.2**	**87.7**	**77.5**	**80.0**	**71.3**	**-**			
FREE STATE											**270**	**67.3**	**92.1**
Immunised any time before survey													
Dates of immunisation recorded	77.6	79.6	76.5	70.2	76.5	74.6	68.8	72.9	62.8	-			
Recall/BCG scar	18.6	12.3	10.4	11.2	10.4	10.0	10.0	10.0	9.9	-			
Either source	96.2	91.9	86.9	80.6	87.7	85.0	78.8	82.9	72.7	2.3			
95% confidence interval	93.6;98.8	87.4;96.3	80.3;93.5	72.7;88.6	82.1;93.2	78.1;92.0	70.5;87.0	70.5;87.0	64.6;80.8	0.1;4.5			
Immunised before first birthday[1]	**95.7**	**91.4**	**84.3**	**72.0**	**87.2**	**81.5**	**70.6**	**74.1**	**60.2**	**-**			
RURAL AREAS											**1204**	**61.1**	**88.6**
Immunised any time before survey													
Dates of immunisation recorded	77.2	78.4	74.6	67.1	76.3	72.5	64.7	71.1	58.0	-			
Recall/BCG scar	16.4	11.3	10.8	9.4	11.2	10.7	9.4	9.8	11.3	-			
Either source	93.6	89.7	85.4	76.5	87.5	83.2	74.1	80.9	69.3	5.2			
95% confidence interval	91.6;95.3	87.3;92.1	82.4;88.3	72.5;80.5	85.3;89.8	80.3;86.1	70.2;78.1	77.4;84.3	65.4;73.5	3.5;6.9			
Immunised before first birthday[1]	**92.9**	**88.5**	**82.5**	**67.9**	**86.6**	**80.1**	**66.0**	**71.9**	**57.1**	**-**			
URBAN AREAS											**962**	**67.2**	**94.9**
Immunised any time before survey													
Dates of immunisation recorded	80.3	80.7	79.6	75.0	78.9	77.9	73.4	78.0	70.9	-			
Recall/BCG scar	17.5	15.0	14.2	12.1	14.7	14.3	12.0	12.4	11.6	-			
Either source	97.8	95.7	93.8	87.1	93.6	92.2	85.4	90.4	82.5	1.8			
95% confidence interval	96.6;99.0	94.0;97.4	91.8;95.7	84.3;89.9	91.8;95.5	80.1;94.4	82.4;88.3	88.0;92.8	79.1;86.0	0.7;2.9			
Immunised before first birthday[1]	**97.7**	**95.2**	**93.0**	**82.1**	**93.1**	**91.5**	**80.3**	**83.6**	**73.0**	**-**			

Figure 7.1. Vaccination coverage by first birthday

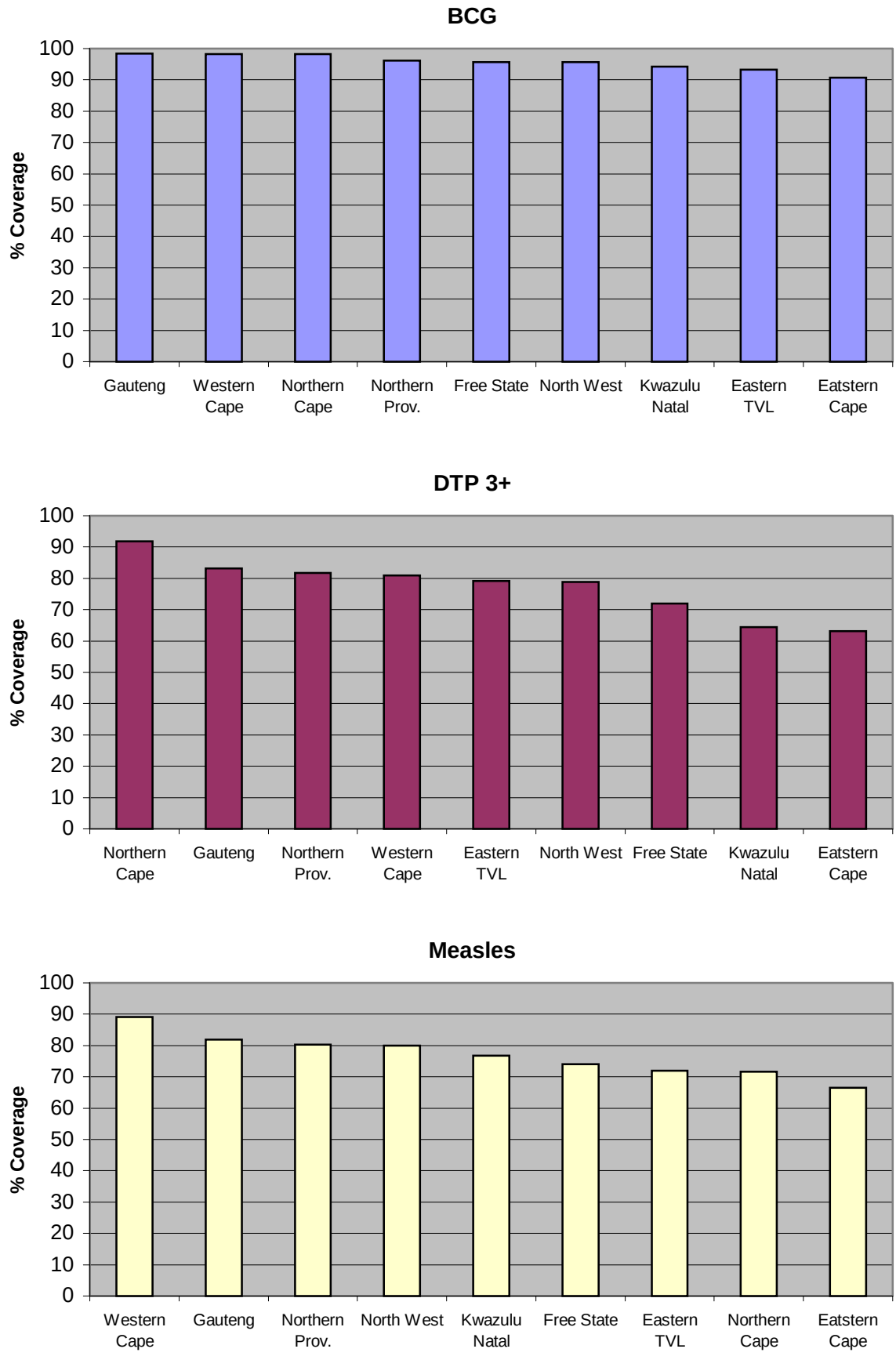
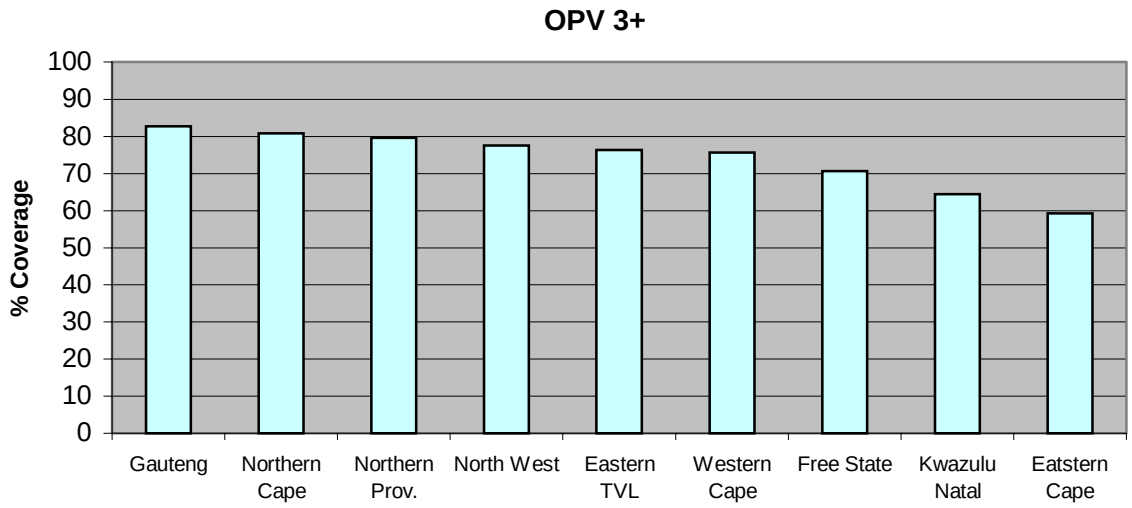


Figure 7.1. Vaccination coverage by first birthday (continued)



Drop-out rates are useful indicators of the failure of the immunisation service at certain points. The BCG to Measles rate would span the whole length of time of the primary immunisation service, thereby giving an indication of case holding from birth to the immunisation provision at nine months; the national percentage for this drop-out rate was 11%, with the highest (22%) being in the Eastern Cape (Table 7.2). In contrast, the DTP1 to Measles drop-out rate identifies a group of children that had already made contact with their immunisation provider (e.g. clinic) once after birth; the highest such drop-out rate was seen in the Eastern Cape (16%) and Eastern Transvaal (13%), with a national average of 8%. The DTP1 to DTP3 drop-out rate indicates the short-term case holding ability; it is quite unusual that the drop-out rate for DTP1 to DTP3 is higher than the DTP1 to Measles drop-out rate as was found in most provinces. The cases are thus lost to DTP3, but then found for measles immunisations three months later. This feature is most pronounced in KwaZulu/Natal, Western Cape and the rural areas (Table 7.2; Fig. 7.2).

Table 7.2. Drop-out rates

Percentage of children aged 21 to 23 months who received one specific vaccine but did not receive a subsequent vaccine, South Africa, 1994

	Northern Cape	Western Cape	Eastern Cape	KwaZulu Natal	Eastern Transvaal	Northern Province	Gauteng	North West	Free State	South Africa	Rural	Urban
Drop out rate between:												
BCG and Measles first dose	9.8	3.1	22.3	8.7	16.2	4.8	9.2	9.2	13.8	11.2	13.6	7.6
DPT1 and Measles dose	6.5	1.9	15.7	15.9	13.2	4.1	8.2	5.8	9.8	8.2	9.8	5.5
DPT1 and DPT 3	8.2	11.6	17.3	20.0	7.1	6.0	8.7	7.2	12.3	12.4	14.7	9.0

Figure 7.2. Drop-out rates by time of survey

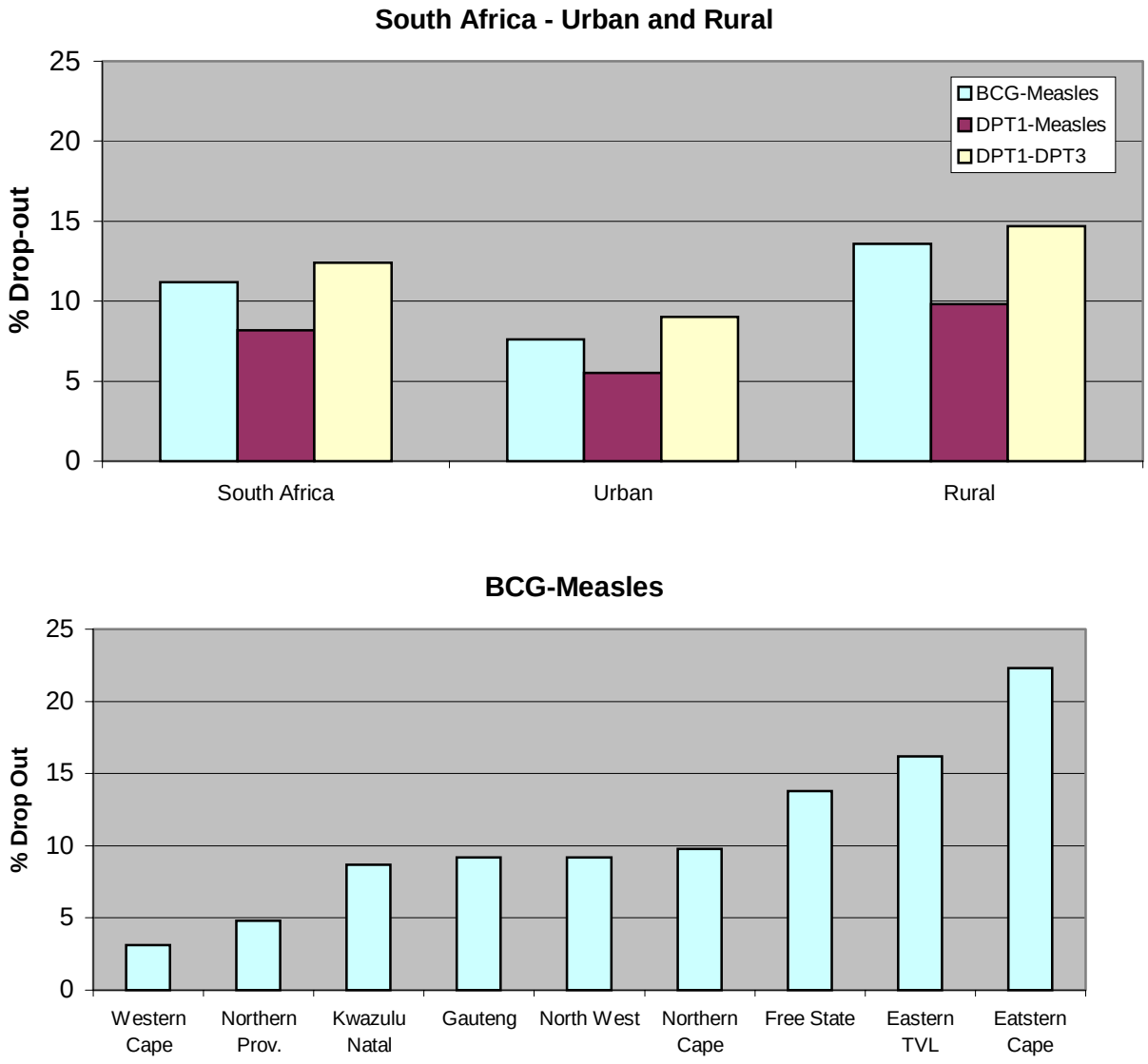
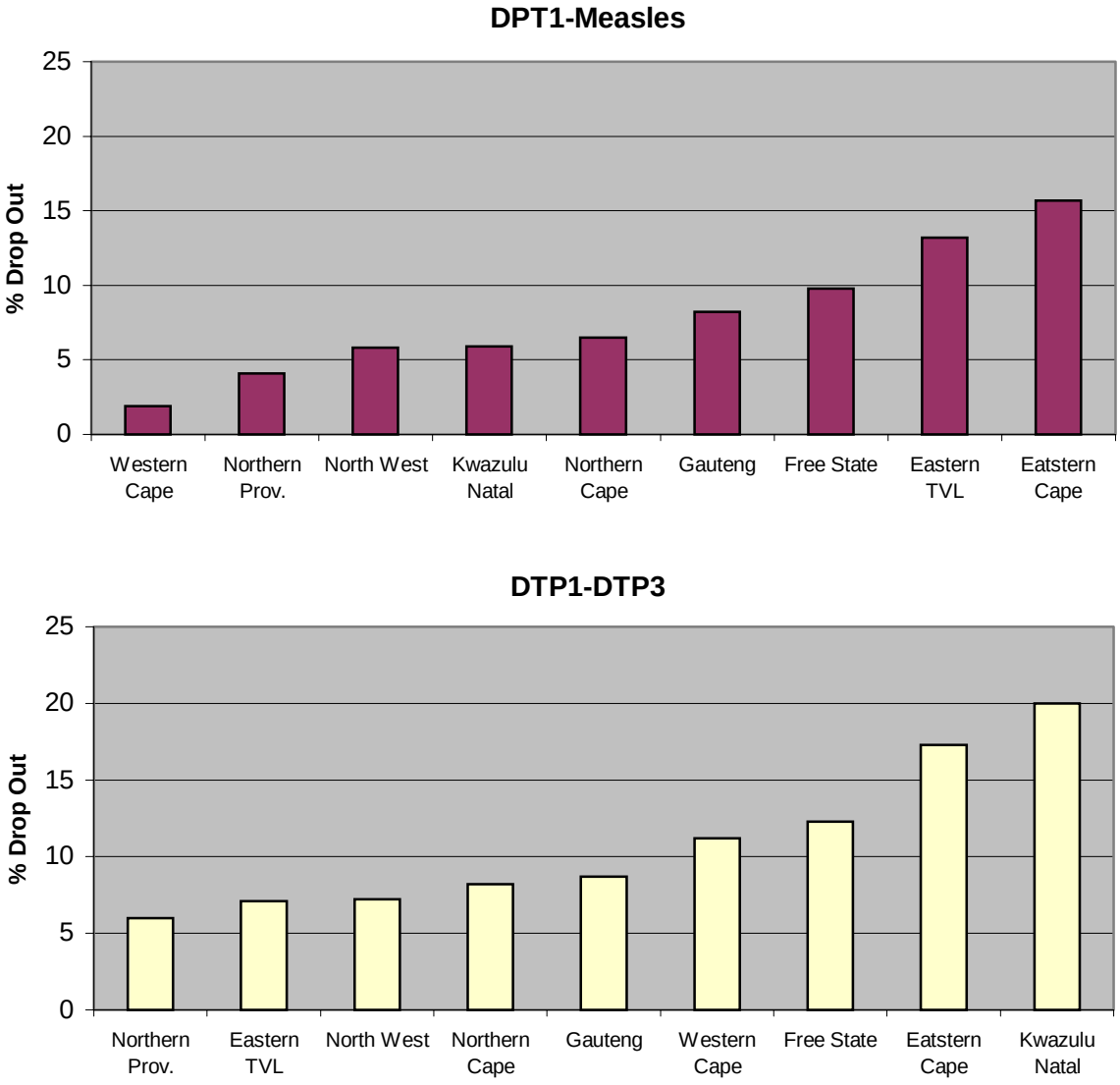


Figure 7.2. Drop-out rates by time of survey (continued)



Since data were collected from children aged 6-71 months, it was possible to detect trends in the coverage over the past five years, by dividing the total survey group into one year age cohorts. As most clusters in this survey were completed between July and October 1994, the age group 12-23 months roughly represents children born between October 1992 and July 1993. A trend of increased coverage was evident in every dose and in the percentage of fully immunised children (Table 7.3; Fig. 7.3). The measles dose showed consistently higher coverage in younger age groups, whereas a slight reduction in coverage of DTP3 and OPV3 was noted in the 3 year age group.

Table 7.3. Immunizations in the first year of life

Percentage of children aged 12 to 71 months immunized with BCG, DTP, OPV and Measles before their first birthday, by current age of child, South Africa, 1994

	Percentage of children who received before their first birthday:									No. of Children	% Reported to have card
	BCG	DTP1	DTP2	DTP3+	OPV1	OPV2	OPV3+	Measles	All		
Current age of child:											
12-23 months	94.8	91.1	86.6	73.4	89.1	84.5	71.5	76.4	63.3	2166	91.0
24-35 months	91.1	86.6	80.4	66.8	85.0	78.9	65.6	67.0	54.6	2285	84.7
36-47 months	90.7	84.2	77.8	63.7	82.7	75.9	61.8	65.6	53.1	221.9	82.5
48-59 months	86.4	80.8	74.4	65.3	78.4	72.6	63.5	63.0	53.6	2101	81.0
60-71 months	87.1	79.2	72.8	60.7	77.9	71.1	59.3	60.7	48.7	1623	80.7
12-71 months	90.3	84.9	78.9	66.5	83.1	77.2	64.9	67.3	55.3	10394	84.2

Note: It was not possible to obtain the above information directly for two groups of children, namely those for whom no birth date was given but for whom a dose was recorded (either based on dates or recall), and those for whom the dose was recorded based on recall. For these two groups, it was assumed that the proportion of immunisations given during the first of life was the same as amongst those children for whom the birth date was given and a date of immunisation was recorded.

Figure 7.3. Trends in immunisation coverage by age cohort

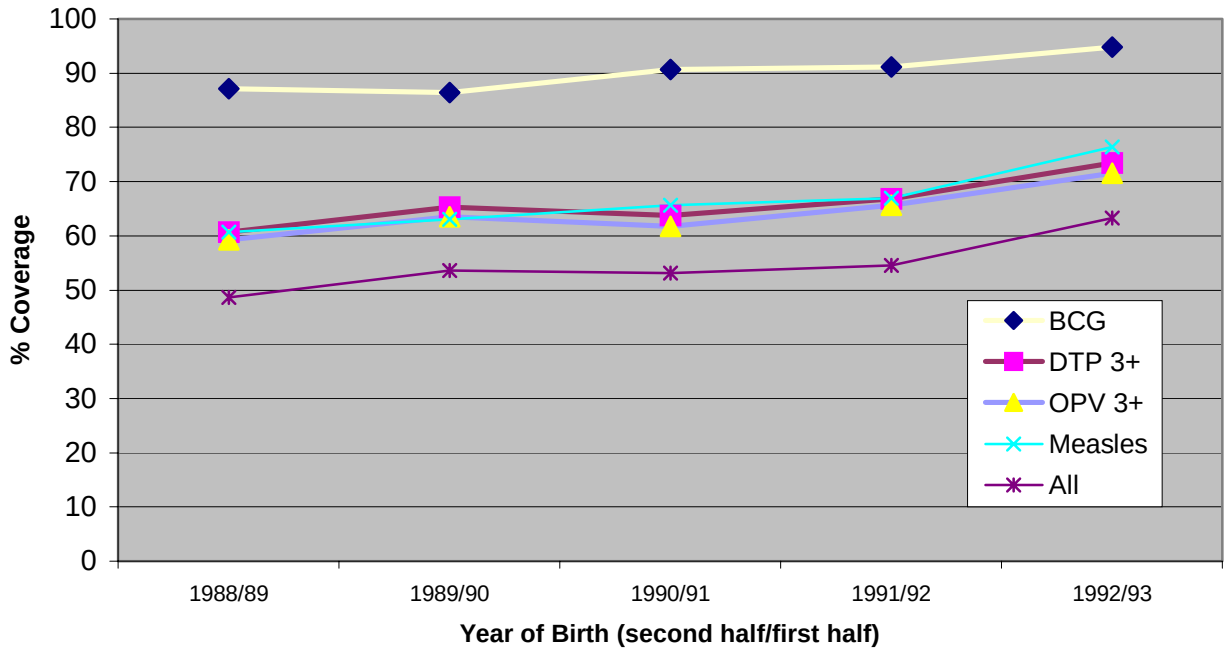


Table 7.4. The prevailing South African immunization schedule at the time of the survey

Vaccine Dose	Age of Child
Monovalent oral polio vaccine (MOPV); BCG	**At birth**
DPT1 and OPV1	**3 months**
DPT2 and OPV2	**4.5 months**
DPT3 and OPV3 **Measles (high risk areas)**	**6 months**
Measles	**9 months**
DPT and OPV booster **Measles**	**19 months**

Adherence to the South African primary childhood immunisation schedule (Table 7.4) was also calculated for children in whom the date of birth and the date of the immunisation was recorded. Adherence was categorised into "early", "early, but after WHO minimum age" (Table 7.5), "on schedule" and "late" (Table 7.6). A dose was "early", if it was given before the age required by the WHO schedule and before the time stipulated by the South African schedule. If the dose was classified as "early but after WHO minimum age", it was given too early according to the South African schedule, but after the age required by WHO. A dose was "on schedule", if it was given within two weeks of the date stipulated by the South African schedule. A "late" dose was any dose given after two weeks had lapsed from the stipulated scheduled age. For the later doses (i.e. those not given at birth), the percentage given on schedule nationally varied from 47% for DTP1 to 32% for measles (Table 7.6). As the immunisation schedule required a dose of measles vaccine to be given at 6 months in high risk areas in addition to the regular 9 month dose, this calculation is based on the assumption that, if the first dose of measles vaccine was given before 8« months of age and the second dose was given between 8« months and the first birthday, then the date of the second dose was used (Fig. 7.4).

Table 7.5. The WHO criteria for validity

BCG (Bacillus Calmette Guerin)	Any dose given before first birthday
DTP (Diphteria, Tetanus, Pertusis vaccine)	Minimum age: 6 weeks Minimum interval between doses: 4 weeks
OPV (Oral polio vaccine)	Minimum interval between doses: 4 weeks Dose given at birth as regarded to be “priming dose” and is taken into consideration for coverage calculations
Measles vaccine	One dose after 39 weeks (8.5 months)

Source: World Health Organisation: The EPI coverage survey: 1991

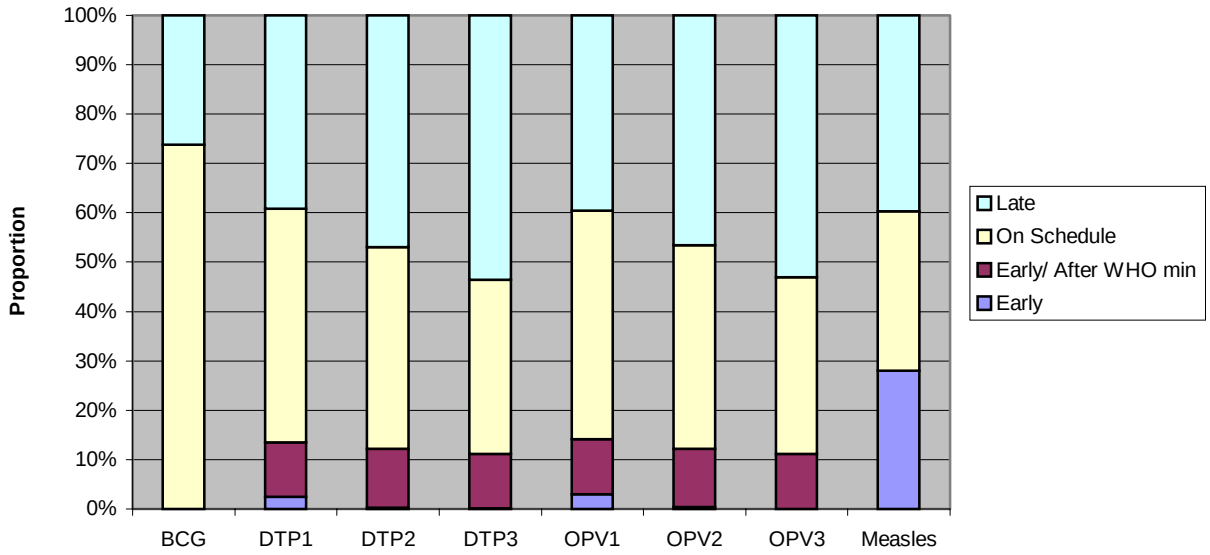
Table 7.6. Adherence to immunisation schedule

Percentage of children aged 12 to 23 months who received specific vaccines early, on time or late, according to prevailing measles schedule, South Africa 1994.

	Northern Cape	Western Cape	Eastern Cape	KwaZulu Natal	Eastern Transvaal	Northern Province	Gauteng	North West	Free State	South Africa	Rural	Urban
BCG- first dose												
On schedule (birth + 2 weeks	80.5	81.4	71.9	78.5	69.0	75.9	79.5	57.0	77.3	73.8	67.0	84.1
Late	19.5	18.6	28.1	21.5	32.0	24.1	20.5	43.0	22.7	26.2	33.0	15.9
DPT- first dose												
Early	0.7	0.0	3.5	0.0	4.1	1.3	0.0	10.0	1.0	2.4	2.8	1.8
Early but after WHO minimum of 6 weeks	2.8	0.0	23.7	1.7	10.2	2.5	3.8	40.5	3.5	11.1	10.9	11.2
On schedule (3 months ~ 2weeks)	56.3	74.4	40.1	44.7	43.1	47.1	71.1	21.3	54.9	47.3	37.2	62.7
Late	40.2	25.6	32.7	53.6	42.6	49.1	25.1	28.1	40.6	39.2	48.1	24.3
DPT- second dose												
Early	0.0	0.0	1.1	0.0	0.6	0.0	0.0	0.4	0.0	0.3	0.5	0.0
Early but after WHO minimum of 10 weeks	2.8	0.7	22.8	3.5	12.2	5.1	1.3	42.0	5.2	11.9	12.1	11.4
On schedule (4.5 months ~ 2weeks)	42.7	60.8	33.2	40.5	42.0	37.3	65.7	22.0	38.4	40.8	30.3	56.4
Late	54.5	38.5	42.9	56.0	45.2	57.6	33.0	35.6	56.4	47.0	57.1	32.2
DPT- third dose												
Early	0.0	0.0	0.6	0.0	0.6	0.0	0.0	0.0	0.0	0.1	0.2	0.0
Early but after WHO minimum of 14 weeks	2.3	2.3	18.3	5.5	14.2	4.0	0.7	37.8	5.0	11.1	12.1	9.7
On schedule (4.5 months ~ 2weeks)	37.0	52.8	29.9	34.0	31.5	31.7	61.6	16.8	33.3	35.2	24.4	50.3
Late	60.7	44.9	51.2	60.5	53.7	64.3	37.7	45.4	61.7	53.6	63.3	40.0
OPV – first dose												
Early	0.8	1.5	4.7	0.6	5.2	1.7	0.0	10.6	1.0	3.0	3.7	1.9
Early but after WHO minimum of 6 weeks	2.9	0.7	24.3	1.7	9.9	2.6	3.9	40.4	3.1	11.1	11.0	11.3
On schedule (3 months ~ 2weeks)	56.2	69.4	38.8	43.0	42.4	47.2	70.7	21.5	54.9	46.4	36.4	61.5
Late	40.1	28.4	32.2	54.7	42.5	48.5	25.4	27.5	41.0	39.5	48.9	25.3
OPV – second dose												
Early	0.0	0.0	0.1	0.6	1.1	0.0	0.0	0.4	0.0	0.4	0.7	0.0
Early but after WHO minimum of 10 weeks	3.0	1.5	22.1	3.5	12.5	5.2	1.3	42.5	4.8	11.8	12.0	11.4
On schedule (4.5 months ~ 2weeks)	42.7	63.0	36.0	39.4	41.5	36.8	65.8	22.2	38.7	41.2	30.5	56.7
Late	54.3	35.5	40.8	56.5	44.9	58.0	32.9	34.9	56.5	46.6	56.8	31.9
OPV – third dose												
Early	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Early but after WHO minimum of 14 weeks	2.4	3.2	17.9	6.3	15.2	4.1	0.7	37.9	4.6	11.2	12.3	9.7
On schedule (6 months ~ 2weeks)	36.0	53.4	33.7	34.2	31.3	31.2	60.7	16.6	33.4	35.7	25.2	50.2
Late	61.6	43.4	48.4	59.5	52.9	64.7	38.6	45.5	62.0	53.1	62.4	40.1
Measles – first dose												
Early	7.6	9.9	27.8	29.7	20.7	37.3	26.9	36.4	15.1	28.0	32.4	21.6
On schedule (9 months ~ 2weeks)	31.8	52.9	27.2	30.8	34.8	18.9	44.2	26.7	49.0	32.3	24.9	42.9
Late	60.6	37.2	45.0	39.5	44.5	43.8	28.9	36.9	35.9	39.7	42.7	35.5

Note: The above results are based on those children for whom a birth date was given, and on those immunisations for which a date was recorded

Figure 7.4. Proportion adherence to schedule



According to the prevailing South African schedule, doses of OPV and DTP should have been delivered six weeks apart. At the national level, with small interprovincial differences, only a small percentage of doses (2-3%) were given within too short an interval (thus making their effectiveness doubtful), as compared with the much higher percentage (29-35%) of doses that were given within too long an interval between the doses (Table 7.7, Fig. 7.5).

Table 7.7. Adherence to immunisation scheduled intervals between doses

Percentage of children aged 12 to 23 months who received DTP and OPV vaccines too soon, on time or late, according to prevailing immunisation schedule, South Africa 1994.

	Northern Cape	Western Cape	Eastern Cape	KwaZulu Natal	Eastern Transvaal	Northern Province	Gauteng	North West	Free State	South Africa	Rural	Urban
Interval between DPT1 and DPT2												
Too short (<28 days)	0.7	2.2	2.7	3.6	2.1	1.7	0.7	3.5	1.0	2.3	2.7	1.8
On schedule (6 weeks ~ 2 weeks)	69.0	73.1	68.4	65.4	73.6	69.7	85.5	55.5	54.9	68.3	60.7	79.5
Too long	30.3	24.7	28.9	31.0	24.3	28.6	13.8	41.0	44.1	29.4	36.6	18.7
Interval between DPT2 and DPT3												
Too short (<28 days)	0.0	0.0	3.6	1.4	2.7	1.3	0.6	2.6	0.5	1.7	2.1	1.2
On schedule (6 weeks ~ 2 weeks)	70.1	76.3	62.7	63.3	65.3	61.9	77.1	53.7	54.9	63.9	57.3	73.2
Too long	29.9	23.7	33.7	35.3	32.0	36.8	22.3	43.7	44.6	34.4	40.6	25.6
Interval between OPV1 and OPV2												
Too short (<28 days)	1.6	2.3	2.3	3.6	1.1	1.7	1.3	3.3	1.0	2.3	2.4	2.0
On schedule (6 weeks ~ 2 weeks)	68.0	76.1	68.6	65.2	74.5	67.9	84.9	55.9	53.9	68.2	60.3	79.6
Too long	30.4	21.6	29.1	31.2	24.4	30.4	13.8	40.8	45.1	29.6	37.3	18.4
Interval between OPV2 and OPV3												
Too short (<28 days)	0.0	0.0	3.9	1.4	2.8	1.4	0.7	2.6	1.1	1.8	2.2	1.4
On schedule (6 weeks ~ 2 weeks)	69.7	74.9	60.2	63.8	64.9	61.8	75.5	53.1	53.3	63.1	56.6	72.0
Too long	30.3	25.1	35.9	34.8	32.3	36.8	23.8	44.3	45.6	35.1	41.2	26.6

Note: The above results are based on those children for whom a birth date was given, and on those immunisations for which a date was recorded

Figure 7.5. Proportion adherence to dosing interval

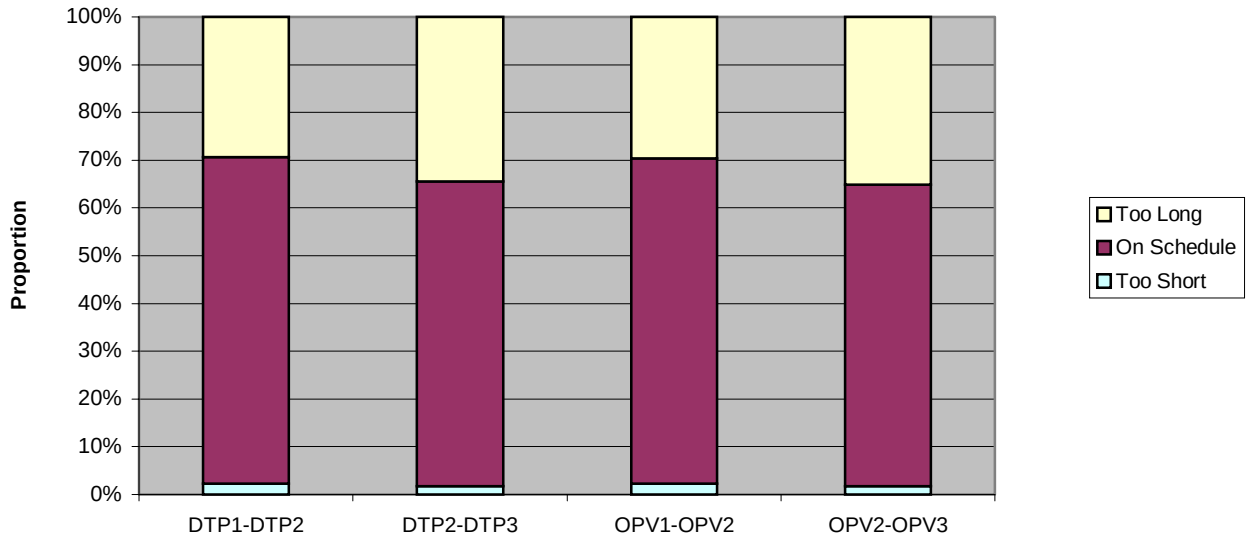


Table 7.8. Provider of immunisations by area of residence

Percentage of children aged 12 to 23 months who received specific vaccines at hospitals, fixed clinics, mobile clinics or from private clinics, South Africa 1994.

	Northern Cape	Western Cape	Eastern Cape	KwaZulu Natal	Eastern Transvaal	Northern Province	Gauteng	North West	Free State	South Africa	Rural	Urban
BCG – First dose												
Hospital	68.9	63.4	55.4	48.7	26.2	50.9	35.3	23.9	59.3	46.0	44.4	48.3
Fixed clinic	21.5	33.8	44.1	48.3	58.8	33.9	64.7	57.5	23.6	46.5	43.3	50.9
Mobile clinic	9.0	2.1	0.5	3.0	15.0	14.1	0.0	18.2	17.1	7.2	12.0	0.6
Private	0.6	0.7	0.0	0.0	0.0	1.1	0.0	0.4	0.0	0.3	0.3	0.2
DPT – First dose												
Hospital	0.0	0.0	10.7	0.5	0.0	0.0	7.4	0.6	5.4	3.9	5.1	2.2
Fixed clinic	79.7	94.4	82.6	98.0	80.4	52.8	99.4	69.8	70.9	82.7	71.9	97.3
Mobile clinic	19.	5.6	6.7	1.5	19.6	39.8	0.0	24.8	25.5	13.4	23.0	0.5
Private	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Measles – First dose												
Hospital	0.0	2.2	6.8	0.6	0.0	6.4	0.0	4.3	1.3	2.8	3.7	1.6
Fixed clinic	80.5	92.7	98.9	81.0	49.0	100.0	70.5	72.0	83.0	83.0	71.3	98.0
Mobile clinic	18.7	5.1	9.6	0.5	19.0	44.6	0.0	25.2	26.7	14.2	71.3	98.0
Private	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

The provider of the vaccination (fixed clinics, hospitals, mobile clinics and private immunisers) was also documented during the survey. Only minor differences regarding the provider for different doses of the same vaccine, e.g. DTP1, DTP2 and DTP3, were seen. As expected, the later doses (i.e. those not given at birth) were mostly given in the clinics (Table 7.8; Fig. 7.6); this pattern remained consistent at national level with a very small variation between doses (82% for DTP3 and 83% for OPV1; not shown in the Table 7.8).

Figure 7.4. Provider of vaccines

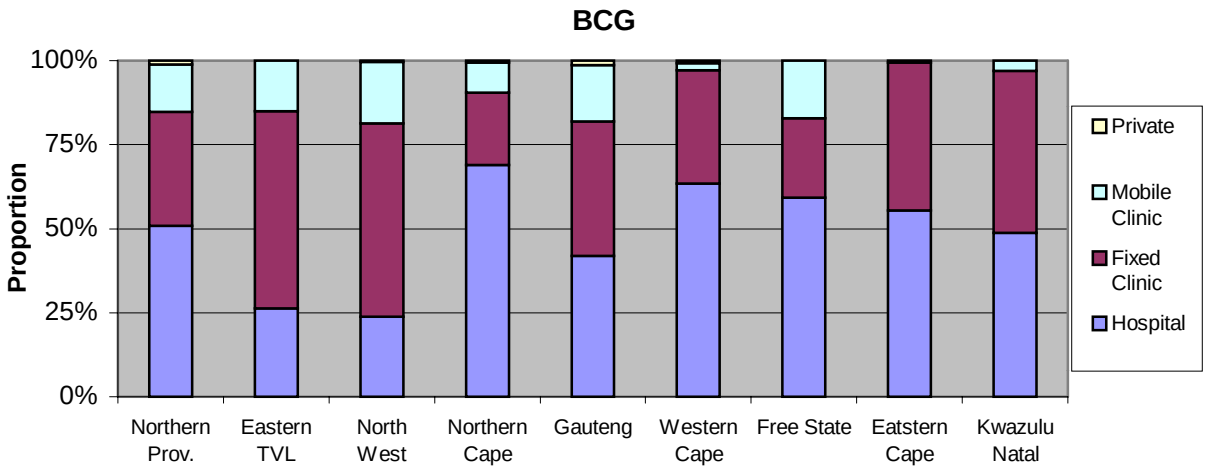


Figure 7.4. Provider of vaccines (continued)

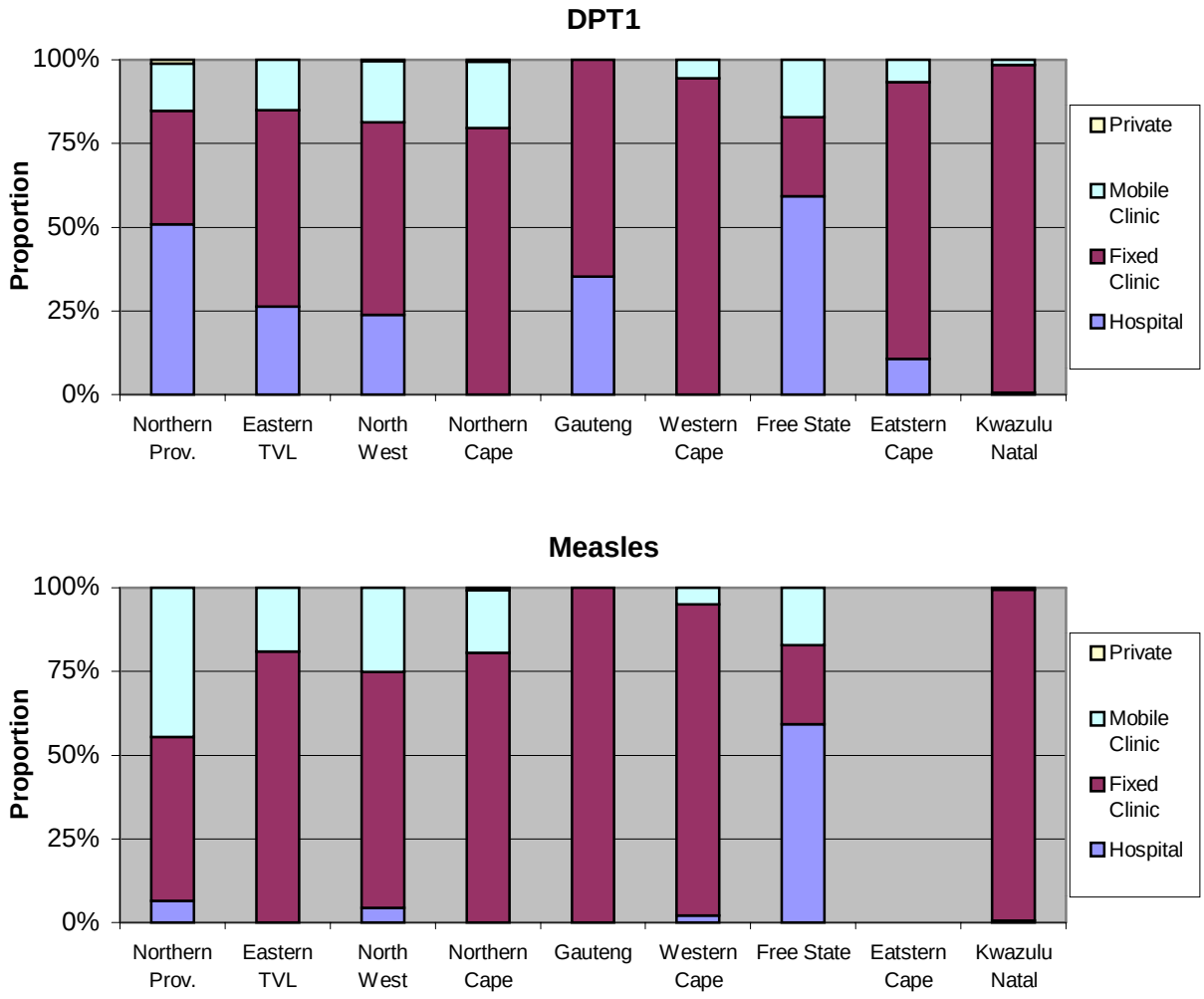


Table 7.9. Immunizations received by socio-economic factors

Percentage of children aged 12 to 23 months who received specific vaccines at any time before the survey, South Africa 1994.

	Percentage of children who received before their first birthday:										No. of Children	% Reported to have card
	BCG	DTP1	DTP2	DTP3+	OPV1	OPV2	OPV3+	Measles	All	None		
Type of housing												
Formal	96.6	94.0	91.9	84.8	91.7	90.2	82.6	87.5	79.0	2.8	1385	93.0
Traditional	91.4	87.7	81.0	70.1	85.6	78.6	68.5	77.8	64.3	6.9	469	86.0
Informal	96.5	92.5	89.8	84.3	92.2	89.2	83.0	84.9	78.5	2.3	272	91.6
Highest education attained by mother:												
<Standard 5	92.5	87.6	83.6	74.2	85.4	81.3	72.9	79.5	69.3	6.6	770	87.5
Standard 5	95.2	93.3	88.7	79.9	91.0	87.0	77.2	83.8	72.8	3.1	595	90.9
Standard 8	99.0	96.5	93.2	87.0	93.3	90.7	83.7	91.2	80.4	1.0	409	94.7
Standard 10	98.7	96.9	96.1	91.0	96.0	95.3	89.6	90.3	84.2	0.8	256	96.6
Tertiary Education	99.2	97.5	97.4	89.3	94.9	94.9	86.8	91.9	81.0	0.8	87	93.9

Families living in formal and informal types of housing had higher coverage for all doses than families living in traditional homes (Table 7.9). Children living in traditional houses were more likely not to be immunised at all (7%), whereas the percentage of children not immunised at all and living in formal and informal houses was lower i.e. 3 and 2%, respectively. Children of less educated mothers achieved a lower coverage for all doses than those of more educated mothers (Table 7.9).

DISCUSSION

The immunisation coverage for South Africa as a whole and for each province has been shown to be higher than anticipated from the regular reporting. This is especially the case with BCG coverage, previously reported to be 69%[4] but now being estimated to be 95%.

In relation to neighbouring countries in the Southern African Sub-region[12], Lesotho has a similar coverage as South Africa, whereas coverage in Swaziland is reported to be higher, that of Namibia and Zimbabwe lower, with Botswana and Mozambique having an even lower coverage, similar to the reported average coverage for the whole of the WHO African region (Table 7.10).

Table 7.10. Immunisation coverage: comparison with neighbouring countries

	BCG	DPT3	OPV3	Measles
South Africa (94S)	**95**	**81**	**79**	**85**
Lesotho (92)	97	80	82	85
Swaziland (92S)	97	89	86	85
Mozambique (93)	66	49	49	62
Zimbabwe (92)	82	73	72	72
Botswana (92)	50	59	58	58
Namibia (92S)	91	70	70	76
African region (WHO)	**64**	**50**	**49**	**49**

Figures in brackets indicate the year of assessment. An “S” next to the year indicates that the rates were obtained from a survey rather than from routine reporting.

In this study, 95% of one year old children are immunised with BCG but only 63% have a visible scar. This may not be surprising, since the proportion of children who develop a BCG scar after immunisation is very variable depending on the age of the child at the time of immunisation, and the period lapsed after immunisation. In a study in Malawi[13] for instance, the proportion of visible scars seen in children immunised at birth ranged from 43%, if examined longer than two years after immunisation, to 100% if examined at 7-12 months after immunisation.

Immunisation coverage trends are encouraging with a consistent upward trend nationally for all antigens. The marked increase in the coverage of one year old children indicates a renewed interest and confidence in immunisations over the past two years. The effect of the "Measles Strategy" (the period in 1990/91 of accelerated immunisations for all antigens) is evident in the DTP and OPV immunisations in the four year old age group with the subsequent slowing of immunisation, as demonstrated in the three year old age group. Measles vaccination followed an unwavering upward trend from the coverage of 60% by the first birthday in the current five year olds to the 76% coverage for the current one year olds, an increase of more than 16% over four years. The slight reduction in the coverage of DTP3 and OPV3 in three year olds is probably due to the intensifying awareness of measles vaccination caused by the "Measles Strategy" in 1990/91 and the subsequent epidemic in 1992, as confirmed by the continued increase in measles coverage during this period.

For some time, the former Bophuthatswana had been following the WHO recommended "6, 10, 14 week schedule" for DTP and OPV doses. This is reflected in the North West figures where the "Early but after WHO minimum age" proportion (40% for OPV1) is much higher than in other provinces; to a lesser extent, this is also reflected in the Eastern Transvaal (10%), because it switched to the WHO schedule in 1994, and in the Eastern Cape (24%) where areas of the Transkei were providing services according to the WHO schedule. By comparison, the corresponding percentages in the other provinces ranged from 1% of OPV1 doses in the Western Cape to 4% in Gauteng and would be considered to have been given in the time stipulated by the WHO schedule and before the South African minimum.

Only 37-47% of doses after birth are given according to the prevailing schedule. For DTP3 and OPV3, 9% of each of the doses is given after the age of one year, indicating a lack of case holding, which is only caught up again with subsequent visits after the first birthday. Although a dose given later than stipulated by the schedule is still immunogenetic and, therefore, definitely protects the child, the child nevertheless is left unprotected up until that later point of immunisation. The high prevalence of measles vaccine doses (28%) given too early (and not followed up at 9 months) is probably due to the confusion regarding the correct times of measles immunisation. This confusion probably arises from the partially introduced high titre Edmonston Zagreb vaccine which was supposed to be given at 6 months. A further point of confusion may have been the "high risk area" clause in the South African schedule in which the six month dose may have been misunderstood as replacing the nine month dose.
Rural areas and provinces such as the Northern Province, North West, Free State, Northern Cape and Eastern Cape rely on mobile services to a greater extent than the other provinces or urban areas. This is a reflection of the sparsely populated areas in these provinces. Fixed clinics are the backbone of the immunisation services in all provinces, and in some areas, such as Gauteng, even the only provider of later immunisations. Hospitals play a secondary role in most provinces, except in the Eastern Cape and Northern Province. The private providers of immunisation play a small role in the immunisation programme.

The socioeconomic status of a family is an important determinant of the immunisation coverage. It is obvious that the results of this study may be confounded by the fact that persons living in traditional type of homes may be more removed from health facilities. The education of the mother is also important in determining the coverage level achieved by the child. Similarly, these results may be confounded by the inaccessibility of services to the less educated.

The immunisation figures allow for the categorisation of the nine provinces into four groups with similar immunisation coverage features. The first group includes Gauteng and the Western Cape, the second, Northern Province, Northern Cape and North West, the third, Eastern Transvaal, Free State and KwaZulu/Natal, whereas Eastern Cape, the fourth group, would fall into a category of its own. The widely disparate composition of the new provinces strongly suggest that, within provinces, a great variation of coverage is likely, depending on the incorporation of former administrations within the new provinces, accessibility of services, health budgeting and manpower.

Gauteng and Western Cape

These two provinces include the most densely populated areas and have the highest per capita income. Furthermore, they have a large proportion of the medical, nursing and other health personnel. In the past, they received a larger proportion of the health budget and, generally, experienced fewer problems regarding the lack of accessible clinic facilities.

Apart from the consistently high coverage figures for the whole primary series, a striking feature of the Western Cape is the considerable difference between the DTP3 (81%) and the OPV3 (76%) coverage by first birthday. The reasons for this are not clear, especially because both immunisations are usually given at the same time and a similar coverage rate would have been expected. A possible explanation would be the tendency of overworked health workers to enter the date of immunisation into the DTP field, which appears first on the immunisation card, and then to place "ditto" marks in the OPV field below, thus causing many OPV fields to be left without a clear date. Another unusual feature also found especially in the Western Cape (as well as in KwaZulu/Natal) is that measles coverage is notably higher than the DTP3/OPV3 coverage rates. Again, the reasons are not clear, except for a possibly increased awareness of measles following the "Measles Strategy" and subsequent measles epidemic in 1992. Furthermore, a stricter adherence to the policy of immunising children against measles only, on admission to a paediatric ward to prevent nosocomial infections, may have been followed. For example, none of the DTP and 2% of measles vaccine doses were administered in the hospital in the Western Cape.

Since the lifting of the Influx Control Laws, these provinces have experienced (as have other large urban areas in the country) the greatest movement of population into their jurisdiction with the subsequent development of large informal settlements. The immunisation status in these informal settlements is very variable and largely dependent on the enthusiasm and resources of the local administration. Despite the good overall coverage in both the Western Cape and Gauteng, it has been shown that pockets of lower coverage remain within these areas; in a study in Alexandra township[14] (Gauteng), for example, it was found that children not bearing the Alexandra Clinic's Health Card (implying persons who had recently moved into the area) were significantly more likely to be less immunised. Similarly, a study in Khayelitsha and New Shanty[15] (Western Cape) found that, among other factors, the children who had stayed in the area less than six months had significantly lower levels of immunisation.

Northern Province, Northern Cape and North West

These provinces showed remarkably high coverage rates. All are sparsely populated and the population in the Northern Province and North West are mostly rural. They include four of the former national states which, until the 1994 elections, functioned under their own administrations. In addition, the Northern Province is considered to be the poorest province with the lowest per capita income[16]. All three provinces show similar drop-out rates between the DTP1 dose and the measles dose. Comparing the coverage figures at the time of the survey to the coverage rates by the first birthday, the Northern Cape presents with a rather large percentage (17%) of measles immunisation given after one year of age indicating an initial loss to follow-up.

The extent of mobile services, especially in the Northern Province, is highlighted by the finding that more than 42% of DTP3, OPV3 and measles doses are provided by mobile clinics in this area. It is evident that these clinics provide an extensive service. Should such clinics be curtailed because of financial pressures without replacement with accessible, fixed clinics, immunisation services in these areas would be severely harmed.

Eastern Transvaal, Free State and KwaZulu/Natal

These three provinces, although rather varied in composition and structure, display similar coverage rates. Eastern Transvaal now includes the former KaNgwane and KwaNdebele. KwaZulu/Natal has a history of two separately administered regions, which were geographically inextricably linked. KwaZulu/Natal displays the same unusual feature as the Western Cape of a substantially higher coverage rate for measles than for DTP3 to OPV3 possibly as a result of added measles immunisations given in paediatric wards and outpatient departments to prevent nosocomial infections or the increased awareness in the post-epidemic period after 1992. The Eastern Transvaal is the only province displaying a higher OPV3 coverage than DTP3 coverage. Clinics are the main provider of immunisations in these areas.

Eastern Cape

This province covers the areas of the former Transkei, the former Ciskei and the former South African health region of the Eastern Cape. Coverage figures are consistently lowest in this province. Drop-out rates from DTP1 to DTP3 are the highest in the country as is the number of totally or partially unimmunised children. Strengthening of the immunisation services in this province should, therefore, receive urgent attention.

Immunisations are again mostly provided by the clinics; hospitals seem to play a secondary, but important, role in the provision of services. The predominance of hospitals as preventive health service providers probably arises from earlier times, when the hospitals were the main, and often the only, provider of an integrated health service. This approach has been evident in those areas of South Africa where health wards with a centrally placed hospital provided all services.

RECOMMENDATIONS

The findings of this survey support many of the recommendations of the EPI(SA) Review1 and support the need for the unification of fragmented health services, the vaccination schedule, vaccination strategies, private sector involvement, polio eradication and social mobilisation. Specific recommendations arising from this survey focus on the improvement of the effectiveness of the national immunisation programme.

SAVACG offers its assistance in the implementation of those recommendations for which it has the relevant expertise and infrastructure. In terms of the recommendations made in this chapter, SAVACG can assist with recommendations 7.2.4.

7.1 Short-term

7.1.1 A surveillance driven programme should be developed using disease surveillance data to guide management decisions; such a system should allow for rapid reporting and response as well as the control of outbreaks with targeted immunisation responses.

7.1.2 Training in case definition, case detection and reporting procedures should be given to all health workers that may come into contact with vaccine preventable diseases.

7.1.3 Effective management should be established by defining the function of the EPI coordinators at every level. It should include human resource development, budgeting, logistic planning, disease surveillance, outbreak response, policy development, and forecasting. These tasks should be allocated to one person at each level. Successful management should also ensure the integration of services at health facility level, the maintenance of a national, provincial and regional support structure for EPI and the preparation of an annual report.

7.1.4 Public awareness of immunisation should be increased by advocating the use of community health workers to talk about immunisations in the language and idiom of the community; using every opportunity to talk to clinic attenders about immunisation and other aspects of preventive and primary care; developing a capacity at every level for dealing with questions and complaints by clients in a quick and meaningful way; encouraging the printed and electronic media to augment public understanding; and educating and re-educating the medical and nursing professionals.

7.1.5 "Missed opportunities" should be avoided by promoting the routine checking of the immunisation card with every visit to any health facility or provider; and by providing immunisation services every working day.

7.1.6 Rural communities should be especially targeted and reached by identifying underserviced areas; creating and maintaining integrated primary health care mobile services to communities in such a need; collaborating with other state departments (Agriculture, Education, Police services, National Defence Force) to make full use of existing transport and distribution structures.

7.2 Medium-term

7.2.1 A functional referral system should be established for immunisations that cannot be given immediately in non-immunisation health facilities; opportunities for immunisations should also be created by offering evening or weekend clinics.

7.2.2 A child register (computerised or manual) should be set up at each clinic to assist with the identification and follow-up of children who have missed their follow-up date; developing a strategy to follow-up children who have not returned; and establishing a community network to assist in tracing of children.

7.2.3 "Mopping-up" campaigns should be introduced to eliminate pockets of low coverage by creating a feasible and specific campaign master plan on actions to be taken in distinct low coverage areas; encouraging provincial managers to eliminate low coverage areas with limited "mopping-up" or "raking" strategies; and training regional and district staff on how to manage such campaigns.

7.2.4 A plan for the development of a comprehensive monitoring quality control and impact assessment of the national immunisation programme should be established and implemented.

7.2.5 Adverse events following immunisation should be recorded and managed effectively by establishing clear national policy guidelines; creating a reporting and response mechanism from immuniser to national coordinator, so that any adverse events following immunisation do not harm the immunisation provision; and training staff at all levels to deal with such events in a sympathetic and helpful manner.

7.3 Long-term

7.3.1 A lifetime health record for each person should be established by devising a "self-retained health record" which will contain information on birth history, immunisation, growth monitoring, serious diseases, such as tuberculosis, allergies, and any chronic treatment.

7.3.2 The creation of an accessible, client-friendly service is of crucial importance and should be achieved by integration of services, social mobilisation, education and training, and research.

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