A mass campaign too often? Results of a vaccination coverage survey in the Dikgale-Soekmekaar district

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Objectives. To determine the routine and mass immunisation coverage in children aged between 12 and 23 months in the Dikgale-Soekmekaar district, Northern Province, South Africa.

Design. Cross-sectional community-based vaccination prevalence survey using a two-stage cluster sampling technique.

Methods. Data on the vaccination status of the children were obtained from the vaccination document of each child or by means of a vaccination history if the vaccination document was not available. A structured interview based on a field-tested questionnaire was conducted with one caretaker of each child.

Results. Each of the routine programme vaccines reached a coverage level of more than 90%, except for measles (85%) and *Haemophilus influenzae* (Hib) 1, 2, 3 (8%, 5% and 2% respectively). Seventy-nine per cent of all children were fully immunised through the routine services. The two polio mass campaign rounds reached coverage levels of 80% and 57% respectively. The measles campaign reached 75% of the study population. The overall measles coverage rate (routine and mass campaign) was 96%.

Conclusions. The routine immunisation service in the district functions very well. The polio mass campaign in the district was redundant. However, the measles campaign increased the coverage rate in the population to 96%, which exceeds the theoretical herd immunity level of 92 - 95%. This may have averted a measles outbreak in the district.

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Dikgale-Soekmekaar is a small rural district in the central region of the Northern Province of South Africa. It is the field site of a primary health care (PHC) and district development project of the University of the North and the Vrije Universiteit Brussel. The district has a total population of 114 242 (mid-year population estimates, 2000) and the health facilities in the district include 1 district hospital, 8 clinics and 3 mobile teams. Children are routinely immunised according to the national South African immunisation schedule.[1] The district started vaccinating against *Haemophilus influenzae* B (Hib) on 1 July 1999. A situation analysis of the district compiled in August 1999 revealed that no reliable vaccination coverage data were available for the district (district management team, situation analysis Dikgale Soekmekaar district, 1999).

Data on vaccination coverage are scarce in the entire Northern Province. In 1998 the *South Africa Demographic and Health Survey* estimated that 74.9% of children aged between 12 and 23 months were fully immunised.[2] Unfortunately the sample taken was small (149 children) and the possibility of variance between the different districts was not investigated. In 1990 one study in the Northern Transvaal region (covering only part of the current Northern Province, excluding the former homelands) showed that 50 - 57% of rural children aged 12 - 23 months were fully immunised.[3]

The eradication of smallpox through immunisation has been a major public health achievement. It has led to the hope of eliminating or eradicating other communicable diseases. In 1998 the World Health Organisation (WHO) committed itself to the global eradication of poliomyelitis. Since then, enormous progress has been made towards achieving this goal.[4] The recommended strategies for achieving polio eradication are the maintenance of a high routine immunisation coverage (at least 90% of children under 1 year), national immunisation days (NIDs), mopping-up campaigns, and acute flaccid paralysis (AFP) surveillance.[4]

Since 1995, South Africa, as part of the southern African region, has embarked upon mass immunisation campaigns to eradicate polio: two sub-national immunisation campaigns in 1995 (polio) and 1997 (polio and measles) (the Western Cape province was not targeted in these campaigns), and two national mass immunisation campaigns in 1996 and 2000 (both polio and measles).[5] The 1996 campaign sparked a lot of controversy.[6]

The 2000 campaign was conducted in the Northern Province in two rounds: a first phase from 29 May to 9 June 2000 (polio 1 and measles), and a second phase from 17 to 28 July 2000 (polio 2). The target groups of the campaign were all children

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under 5 years of age for polio, and children between 9 months and 5 years for the measles vaccination, regardless of immunisation status. The objectives of the campaign were to achieve and sustain a coverage rate of 90% or higher, to eradicate polio, and to reduce outbreaks of measles. The WHO recommends process evaluation and administrative estimates of immunisation coverage to evaluate NIDs.[7] The ultimate success of NIDs can only be proved when adequate stool samples from AFP patients have been found negative for wild poliovirus. The WHO does not recommend coverage surveys to evaluate NIDs, but because we had planned the fieldwork of our routine coverage survey just after the second round of the 2000 measles and polio campaign, we decided to estimate the mass campaign coverage in the district.

Therefore in this study we determined the routine and mass immunisation coverage for children aged between 12 and 23 months in the Dikgale-Soekmekaar district, Northern Province.

Methods

The study population consisted of all children aged between 12 and 23 months (born between 1 August 1998 and 31 July 1999) living in the villages of the Dikgale-Soekmekaar district. A cross-sectional survey was performed in the district during August 2000 in order to measure the vaccination coverage. We adapted the classic two-stage cluster sampling technique (or cluster survey method) designed by the Expanded Programme on Immunisation (EPI)[8] to the local situation. The enumerated areas (100 - 150 households) as designated for the 1996 population census constituted the sampling frame, from which we selected 30 clusters, with probability of selection proportional to size. Seven children were randomly selected from each cluster. In two small clusters we could not find seven eligible children. The remaining children were randomly selected from the cluster following the small one on the list of clusters.

Oral consent to participate in the study was obtained from one of the caretakers of each child. If available, vaccination-document information was recorded for each child. One of the caretakers, preferably the main caretaker of each child, was interviewed in the local language, using a field-tested questionnaire. We obtained information on participation in the mass campaign, on the vaccination history if the vaccination document was not available, and on socio-economic conditions in the household. We asked for reasons why children were not fully immunised and enquired where caretakers normally took their children for immunisation. The child was considered fully immunised if s/he had received all routine vaccines, excluding Hib, since coverage for this vaccine was expected to be low. Data entry and analysis were done using EpiInfo version 6.04b software. Double data entry and checking were used to minimise errors. The ethics committee of the University of the North gave ethical clearance for the study.

Results

Two hundred and ten children were selected. All caretakers consented to participate in the study. Three children did not meet the age criteria and were excluded. Of the remaining 207 children, 173 (84%) had a vaccination document available. Reasons given for not having the document available were document lost, document elsewhere, or never had one. We

Table I. Routine vaccination coverage per vaccine according to card, history and combined, Dikgale-Soekmekaar district, August 2000

	Children with a card (*N* = 173)			Children without a card (*N* = 34)			All children (*N* = 207)		
	N	%	95% CI	*N*	%	95% CI	*N*	%	95% CI
BCG	172	99	97 - 100	31	91	76 - 98	203	98	95 - 100
Polio 0	169	98	94 - 99	30	88	73 - 97	199	96	93 - 98
Polio 1	172	99	97 - 100	30	88	73 - 97	202	98	95 - 99
Polio 2	171	99	96 - 100	29	85	69 - 95	200	97	93 - 99
Polio 3	164	95	90 - 98	27	79	62 - 91	191	92	88 - 96
DTP 1	172	99	97 - 100	30	88	73 - 97	202	98	95 - 99
DTP 2	171	99	96 - 100	29	85	69 - 95	200	97	93 - 99
DTP 3	166	96	92 - 98	26	76	59 - 89	192	93	88 - 96
Hepatitis B 1	170	98	95 - 100	30	88	73 - 97	200	97	93 - 99
Hepatitis B 2	167	97	93 - 99	29	85	69 - 95	196	95	91 - 97
Hepatitis B 3	162	94	89 - 97	26	76	59 - 89	188	91	86 - 94
Measles	152	88	82 - 92	23	68	50 - 83	176	85	79 - 90
Hib 1	14	8	5 - 13	2	6	1 - 20	16	8	5 - 12
Hib 2	10	6	3 - 10	1	3	0 - 16	11	5	3 - 9
Hib 3	5	3	1 - 7	0	0	-	5	2	1 - 6
Fully immunised (excl. Hib)	141	82	76 - 87	22	65	49 - 81	163	79	73 - 84

interviewed the main caretaker in 85% of cases. The coverage data per vaccine and the percentage of fully immunised children in the routine immunisation programme are presented in Table I. The overall routine coverage (combination of card and history) is excellent for all vaccines, except for Hib 1, 2 and 3, with levels of 8%, 5% and 2% respectively. The group of children who had no immunisation card available had lower coverage rates for every individual vaccine, and a lower percentage of them were fully immunised. The difference in the number of fully immunised children between these two groups was statistically significant ($p < 0.05$, relative risk (RR) = 1.91 (95% confidence interval (CI) 1.10 - 3.31)).

Reasons given by main caretakers whose children were not fully immunised were lack of information (9 instances), fear of complications (5), negative attitude of nurses (4), no time to go for immunisation (4), no vaccines available in the clinic (4), illness of the child (4), distance of the clinic (3), don't care/forgot about it (3), and other (9).

The communities of the Dikgale-Soekmekaar district rely mainly on the fixed clinics for immunisation services; 193 of 206 children (94%) go to the fixed clinics (this includes the PHC clinic at the hospital) for their vaccinations. Only 13 children (6%) use the mobile services for immunisation.

The dropout rates for routine polio (4%), DTP (5%) and hepatitis B (6%) are low (Table II). The dropout rate between the routine polio 1 and routine measles is the best measure of the sustainable initiative of parents with regard to vaccinating their children. Thirteen per cent of children who started with the polio 1 vaccine did not receive the measles vaccine. Fig. 1 illustrates this dropout.

Table II. Dropout rate for selected vaccines, routine immunisation services, Dikgale-Soekmekaar District, August 2000

Vaccination	Dropout rate (%)
Polio 3/polio 0	4.0
DTP 3/DTP 1	5.0
Hepatitis B 3/hepatitis B 1	6.0
Measles/polio 1	12.9
Measles/polio 3	7.9

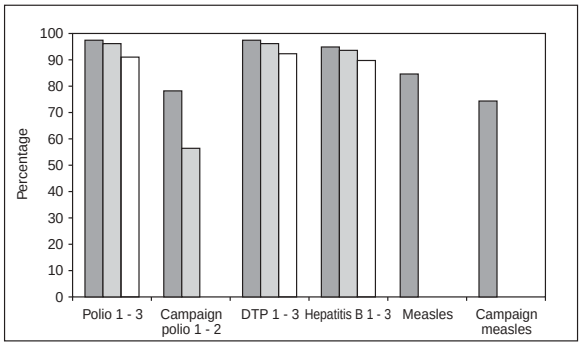

Fig. 1. Routine and mass campaign vaccination coverage per vaccine (N = 207), Dikgale-Soekmekaar district, August 2000.

The two polio mass campaign rounds reached coverage levels of 80% and 57% respectively (Table III). Although the measles campaign reached only 75% of the study population, the campaign managed to raise overall measles coverage by 11%, from 85% to 96%. Fig. 1 also compares routine and mass campaign coverage.

Table III. Dikgale-Soekmekaar district, mass campaign vaccination coverage 2000: survey data (children aged 12 - 23 months) and administrative coverage (age 0 - 5 years (polio) and 9 months - 5 years (measles))

	Survey, all children (N = 207)			Administrative coverage
	N	%	95% CI	%
Polio 1	165	80	74 - 85	97
Polio 2	117	57	50 - 63	81
Measles	156	75	69 - 81	108

Discussion

Routine vaccination coverage in the Dikgale-Soekmekaar district is excellent. The coverage for Hib is low because most of the children studied were born before the introduction of the vaccine and were not eligible for vaccination. Since the vaccine is given together with polio and DTP, and given the high coverage of these vaccines, we expect a high Hib coverage in the future.

The coverage rate for children without a card available was lower for all vaccines compared with the rate for children who had a card available. Our analysis showed that the two groups did not differ in level of education or socioeconomic status (data available on request). The Dikgale-Soekmekaar population is relatively homogeneous socioeconomically. A possible explanation for the difference is that having a vaccination document and child immunisation status are obviously linked. These two factors are both an expression of the concern and awareness of parents with regard to health issues. Concerned parents who keep a road-to-health card will be more likely to have children who are fully immunised compared with parents without a card. Several African studies have also established the reliability of maternal recall of immunisation history.[9-12]

The 85% measles coverage rate is also very good, but is below the theoretical herd immunity level of 92 - 95%.[13] This is reason for concern because the district might experience a measles outbreak with this level of coverage. Caretakers

probably tend to forget to attend a clinic for this vaccine administered at 9 months. Health care workers should be aware of this and should be encouraged to take advantage of every opportunity to administer the measles vaccine.

On the other hand, the mass campaign coverage is disappointingly low. We compared our data with the available administrative coverage (number of doses given/target population based on 1996 census) in the district (Table III). The difference in coverage rate is remarkable. We consider our data to be more reliable than the administrative estimates. Firstly, the methodology we have used is obviously more robust. Secondly, the administrative coverage is probably an overestimate owing to a considerable undercount in the 1996 census data and possibly owing to the immunisation of children older than 5 years during the mass campaign. Dammann *et al*. came to a similar conclusion in a survey in KwaZulu-Natal.[14]

The low mass campaign coverage is not unexpected given the way in which the mass campaign was conducted in the district. The campaign was poorly planned and organised and the clinics were not involved, neither in the community mobilisation or during the campaign itself. The community was not properly informed. Staff morale was low during the campaign, partly because the campaign did not respond to a felt need, and partly because of concerns regarding not receiving overtime pay.

The district's polio mass campaign did not reach its objective, viz. to break the chain of transmission by reaching a 90% coverage rate in the 12 - 23-month age group. We see no reason why children outside the age group targeted by the campaign should have a different mass campaign coverage. Our data show that the polio campaign served no purpose in the Dikgale-Soekmekaar district, given the low mass campaign coverage and the high routine coverage. On the contrary, the campaign diverted resources that might have been used to strengthen PHC delivery at clinic level. We observed that middle management personnel (clinic supervisors and PHC co-ordinators) spent a lot of time planning, executing and evaluating the mass campaign. Their time and energy is more needed to supervise and support health care workers in rural clinics. Of course, we cannot generalise our results to the whole of the Northern Province or to the rest of South Africa. Nevertheless, we may ask whether this particular polio campaign was not a case of one campaign too many, especially as there has been no detection of the wild-type poliovirus in South Africa since 1989.[15] The global eradication initiative of the WHO has not planned any further polio mass campaigns in South Africa. The focus over the next 5 years will be on strengthening and maintaining a high routine coverage and on AFP surveillance. Both objectives require the strengthening of PHC delivery through a district health system.

Fortunately, every cloud has a silver lining — the mass campaign managed to reach children who were not immunised for measles. The combined routine and mass campaign coverage for measles in the district is 96%, which is above the herd immunity level of 92 - 95%. The mass campaign might have averted a measles outbreak. However, the same result might have been achieved and sustained by strengthening PHC services. This would also have had positive effects on other services provided.

Conclusions

This study shows that routine immunisation is functioning very well in the Dikgale-Soekmekaar district. The mass campaign managed to bring the measles coverage to an even higher level, but the two polio rounds were redundant. We cannot generalise our results to the rest of South Africa, but consider that the focus of the Department of Health should be on strengthening the delivery of PHC through a district health system, rather than on programmes such as another routinely performed mass campaign. The focus on health systems will have the added advantage of sustainability.

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