Evaluation of a mass measles immunisation campaign in a rapidly growing peri-urban area

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Summary

A mass measles immunisation campaign, with a target coverage rate of 85 - 90%, was launched in Khayelitsha, a rapidly growing urban township in the Cape Town area. Cross-sectional surveys of the measles immunisation status of resident 6 - 23-month-old infants were conducted immediately before, immediately after, and approximately 2 months after the campaign in order to determine the effectiveness of a mass campaign in boosting coverage in an area with a high influx rate. Immunisation coverage rates were 55% in the first survey, 76% in the second, and 72% in the third. In the first survey, coverage rates for children born in Cape Town were 1,4 times higher than those born elsewhere. This trend continued throughout the survey. Duration of stay in Cape Town also influenced coverage, with rates for the recently arrived children being considerably lower than those for the more established Cape Town residents. The influx rate between the second and third survey (over the Christmas period) was 9,1% per month. Failure to reach the targeted rate is attributed to the influx rate, campaign design and implementation, and factors related to child and career mobility. Alternative immunisation strategies, with social awareness playing a key role, are being urgently investigated.

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Measles became a notifiable disease in the RSA in 1979.[1] Measles notification rates per 100 000 population were 105 and 14 for blacks and whites respectively in 1987.[2] There was a marked downward trend in the incidence of measles in the western Cape from 1980 to 1984, but in the mid-summer months of 1985 and 1986 it once again reached epidemic proportions.[3,4] The summer peaks were in contradistinction to previous experience where measles incidence reached peaks in the winter months.[5] It was suggested that this change in pattern was related to increased population movement from the rural areas of Transkei and Ciskei (±1 500 km from the Cape) to the western Cape, predominantly over the Christmas period.

Although not entirely restricted to the black population, by far the greatest problem was centred around the rapidly growing new township of Khayelitsha, with its large proportion of squatters in two areas known as Site B and Site C. In these two areas there is site-and-service provision with plots of 60-90 m², piped water, waterborne or bucket sewerage and garbage removal. People build their own shacks. Khayelitsha was first settled in late 1983 and at present (mid-1988) has an estimated population of 250 000.

Since these two areas were most affected by the recent increase in the occurrence of measles, an intensive measles containment strategy was initiated. The World Health Organisation's Expanded Programme on Immunisation (EPI) served as a guide.[6] The key elements of the Khayelitsha programme consisted of a mass measles immunisation campaign, over and above the routine child health clinics (run three times a week in both areas). This was done a month before Christmas, with the object of preventing the expected measles outbreak over the 1987 Christmas/New Year period by increasing herd immunity.

The methods and results of evaluation of the mass measles immunisation campaign are presented.

Subjects and methods

A mass immunisation campaign was conducted in Site B and Site C from 16 November to 2 December 1987. A team of 19 health workers (trained staff, clerks and a driver) with 4 vehicles worked for a total of 13 working days to cover the entire area. An attempt was made to administer measles vaccine to all children between 6 months and 6 years of age and it was hoped to attain 85 - 90% coverage.

Site B was selected for the cluster sample surveys since it was considered to be more unstable than Site C in respect of influx into the area. An estimated 73 000 people lived in Site B at the time of the first survey — 55 000 in shacks and 18 000 in tents.

A cross-sectional survey following EPI guidelines for immunisation surveys[7] was conducted immediately before the start of the immunisation campaign, immediately thereafter

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(within 1 week) and again approximately 2 months later. The sampling scheme in all three cross-sectional studies involved selecting 32 clusters of at least 7 children who resided within the area. To ensure that tents and shacks were represented in proportion to their sample size, 8 clusters were chosen from the tent area and 24 from the shack area. Suitable maps were available for the shack area. Using a grid system, the maps were used to randomly select 24 starting points.

For the tents, which were arranged in equal-sized rows, systematic sampling was used to select 8 rows. Within each row, the starting tent was determined by dividing rows into quadrants and into a north-south direction and selecting within one of the eight options randomly. For both the tent and shack areas selection of subsequent houses involved moving from the starting house and always turning left until the next house with an eligible child was found.

A pre-tested and pilot questionnaire was administered by 5 Health Department staff (1 acting as field manager) of the Western Cape Regional Services Council. The staff members were carefully trained at the beginning of each survey to administer the questionnaire. The initial survey took 4 days to complete with later surveys taking 3 days.

The inclusion criteria for children were: (*i*) 6 - 23 months old; and (*ii*) had lived in the selected household in Site B for at least 1 week before the survey. Visitors from other areas on the day of the survey were excluded.

The questionnaire was constructed to obtain information about the respondent and the child-minder and also the child's birth place, date of birth, documented evidence of measles immunisation ('Road to Health' card) and duration of stay in Cape Town.

Results

Quality of information

In general, questions did not have more than one missing value, the two exceptions being a question asking whether the respondent thought that the child had been immunised against measles, and a question as to whether the child had had measles. Absence of birth date and failure to fulfil the criteria for age and residence resulted in exclusions. Of the 233 children in the first survey, 94,4% were included in the analysis compared with 94,6% of 224 children in the second survey and 92,9% of 225 children in the third survey.

Demographic information

Approximately 70% of the children observed in each of the three surveys were born in the Cape Town area. Transkei accounted for two-thirds of non-Cape Town births. According to the first survey 84% of children were cared for by their mothers. This figure did not differ significantly in the second and third surveys.

In the first survey 83% of the children were found to have resided in Cape Town for at least 4 months. The influx of children between July and November was about 4% per month. In the second survey, it was found that 6,6% of children had entered Cape Town in the month preceding the survey. Of the children included in the third survey, 14,4% entered Cape Town after Christmas. This amounts to an influx of 9,1% per month.

Measles immunisation coverage

The measles immunisation coverage according to the 'Road to Health' card information was 55% in the first survey (95% confidence interval 48 - 61%), 76% in the second survey (95% confidence interval 72 - 82%) and 72% in the third survey (95% confidence interval 68 - 76%). After the immunisation campaign, coverage increased for all groups but the discrepancy between Cape Town-born children and those born outside Cape Town remained (Table I).

In the first survey coverage varied with the children's place of birth (Table I). With age adjustment, the overall odds of being immunised were 1,4 times higher for the group born in Cape Town than for those born elsewhere (95% confidence interval 1,1 - 1,9). Those children who were resident in Cape Town for the previous 4 months had a significantly higher rate of immunisation (58% compared with only 39%) than those who entered Cape Town after July ($\chi^2 = 4,59$; 1 df; $P = 0,003$). The odds of being immunised for children who had resided in Cape Town for over 1 month before the second survey (i.e. resident in Cape Town at the start of the campaign) relative to recent arrivals was 2,2 (age-adjusted odds ratio 2,2, 95% confidence intervals 1,5 - 3,4).

As mentioned, 14,4% of children included in the third survey were not resident in Cape Town before Christmas Day. Among those children who had been in Cape Town before Christmas, 63,2% of the 6 - 11-month-olds and 82,3% of the 12 - 23-month-olds were covered. In sharp contrast, only 33,3% of the 6 - 11-month-olds and 42,9% of the older group who had not been in Cape Town on Christmas Day were immunised against measles.

When the children living in shacks were compared with those living in tents, there were no significant differences between the two groups regarding proportion with proof of immunisation in any of the surveys.

Discussion

The dense population, high influx rate and poor socio-economic status of Khayelitsha renders it susceptible to epidemics of measles. In spite of regular immunisation services at health clinics in this area, coverage against measles was 55% before the mass campaign. Although this compares favourably with similar rates in Kinshasa, Zaïre,[8] it is by no means sufficient to

TABLE I. PROOF OF MEASLES IMMUNISATION BY PLACE OF BIRTH AND AGE

		First survey		Second survey		Third survey	
Age group	Place of birth	No. of children	% with positive proof	No. of children	% with positive proof	No. of children	% with positive proof
6-11 mo.	**Cape Town**	**37**	**45,9**	**40**	**70,0**	**35**	**60,0**
	Other	**13**	**23,1**	**13**	**53,9**	**12**	**50,0**
13-23 mo.	**Cape Town**	**118**	**64,4**	**126**	**82,2**	**108**	**80,6**
	Other	**52**	**48,1**	**32**	**75,4**	**54**	**70,4**

prevent regular measles epidemics. This study showed that while a mass campaign can significantly increase measles immunisation coverage, the levels attained were well below those anticipated. It is likely that failure to reach the targeted rate was related to factors associated with the design and implementation of the campaign as well as to factors related to child and carer mobility in the townships.

The study also showed that in the presence of high in-migration, the benefits of such a campaign may be short-lived, especially when immunisation coverage is low in the child's birth place. A recently completed immunisation coverage survey (using EPI methods) showed that measles vaccine coverage was 47,1% in children 12 - 23 months old in Transkei.[16] This is similar to the 48,1% coverage found in our initial survey for children 12 - 23 months old born outside Cape Town and suggests that migrant children are not a selected group of rural children in terms of immunisation coverage (Transkei children accounted for two-thirds of non-Cape Town born children).

There is international debate about the effectiveness of the mass campaign approach versus the infrastructural development approach.[9] Adversaries of the campaign strategy are mainly concerned with the lack of sustainability of such an approach.[10] The absence of a properly utilised maintenance programme following a mass immunisation campaign can lead to an epidemic because of the accumulation of susceptibles.[6] Supporters of the campaign strategy point out that the social and political mobilisation generated by mass campaigns provide a favourable climate for the establishment of health care services, including a long-term immunisation programme. Joseph[9] advocates a combined approach incorporating mass campaigns and also infrastructural development, instituted by each country to suit its own particular needs and infrastructure.

Mass immunisation campaigns have been launched in three countries (Turkey, Indonesia and Brazil) in recent years.[11-13] In each country the campaign was supported by a long-term maintenance programme. Although coverage rates were well above 80% after all three campaigns, these rates were calculated using notoriously inaccurate target populations. The Kinshasa study, which incorporated a mass immunisation campaign followed by the introduction of a regular immunisation service, used cluster sample surveys to determine vaccination coverage.[8] The estimated coverage of 37% among 12 - 23-month-old children in 1977 rose to 62% in 1983, but thereafter stagnated. Measles epidemics were experienced in alternate years between 1980 and 1985.

It could be argued that immunisation coverage rates in urban slum areas should be higher than those in rural areas owing to greater distances and relatively fewer health facilities in the latter. However, a joint statement by the WHO and UNICEF suggests otherwise.[6] This international phenomenon is attributed to 'high migration rates, lack of social cohesion and friction between new immigrants and established authorities' in slum areas.

The WHO recommends that immunisation services be available at every contact with the health services,[14] an approach which Red Cross War Memorial Children's Hospital, Cape Town, has adopted.[15] The practicality of this approach in the already overburdened clinics remains in question, although it should by no means be dismissed.

Current research aimed at improving vaccine coverage in Khayelitsha is investigating the ways in which mothers newly arrived in urban areas obtain knowledge of the role and availability of immunisation services. We believe that community health workers could play an important role in identifying such mothers and assisting them to use local health services.

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