Impact of a measles immunisation campaign on measles admissions to a Natal hospital

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Summary

During May and June 1990, a national mass measles immunisation campaign was undertaken in South Africa. This study is an assessment of the impact of the campaign on measles admissions to a provincial referral hospital that has specifically designated wards for children with communicable diseases. Data from the measles ward admissions book for the 18 months before the campaign (1 January 1989 - 30 June 1990) and 6 months after the campaign (1 July 1990 - 31 December 1990) were compared. Since the campaign, the average number of measles admissions has declined by 64,4% from 87 to 31 per month ($P < 0,01$). Before the campaign, 21,3% of measles patients admitted were aged 7 - 9 months compared with 27,6% after the campaign, highlighting the urgent need to improve the measles vaccination coverage in this age group. An analysis of the geographical source of patients showed that measles continued to occur after the campaign in most of the areas where it existed before the campaign. It is concluded that important gains have been achieved by the campaign. These will be rapidly eroded and epidemics of measles may occur if measles vaccination efforts wane and slump back to pre-campaign levels. It is important to capitalise on the momentum generated through the campaign by continuing to support efforts of existing health care services to improve and maintain high levels of measles immunisation coverage.

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Measles is a major cause of morbidity and mortality throughout South Africa[1] and especially in Natal.[2,3] During 1989, over 18 000 cases of measles were notified in South Africa.[4] Notwithstanding the fact that notifications underestimate the true extent of measles,[5] the available data are alarming, since a safe and effective vaccine against this disease has been available for about 15 years.

There has been much debate about the value of mass measles immunisation campaigns.[6,7] Successful mass immunisation campaigns, followed by longer-term programmes that capitalised on the momentum generated by the campaign, have been undertaken in Turkey[8] and Brazil.[9] In contradistinction, strengthening the existing health infrastructure and setting targets for vaccination levels demonstrated a marked effect on measles incidence in Finland.[10]

During May and June 1990, a mass measles immunisation campaign was undertaken in Natal as a joint venture by the Department of National Health and Population Development, the KwaZulu Health Department, the Natal Provincial Administration and the various local authorities in Natal. This campaign was part of the 'measles strategy'[11] and its main objectives were to improve measles immunisation coverage, to reduce the incidence of measles and, ultimately, to eradicate measles from South Africa.

In Natal/KwaZulu, the mass measles immunisation campaign took the form of an intensified vaccination effort within existing health services and did not involve the creation of special vaccination teams. The campaign and the importance of measles vaccination was widely publicised, especially through radio announcements.

Existing government health service facilities and staff undertook the task of identifying and vaccinating unvaccinated children between the ages of 9 months and 5 years. Staff in these facilities were motivated to increase vaccination efforts and retrained in vaccine storage, vaccination procedure and correct completion of 'Road-to-Health' cards. Emphasis during their in-service training focused both on maintaining the cold chain and on targeting areas and communities that were common sources of measles cases.

There was an almost three-fold increase in the number of doses of measles vaccine administered in Natal/KwaZulu during the 2-month campaign in Natal. According to local authority statistical returns, 2 422 doses of measles vaccine were administered during May 1989, 1 year before the campaign, compared with 6 750 doses during the height of the campaign in May 1990 (D. Wilson, Nursing Services, Department of National Health and Population Development — personal communication).

This study was undertaken to evaluate the impact of a mass measles immunisation campaign on measles admissions to a Natal hospital.

Subjects and methods

The study was conducted at Clairwood Hospital in Durban during October 1990 - February 1991. Clairwood Hospital is a provincial referral centre for children with communicable diseases and is the only hospital in Natal with wards specifically designated for patients with measles.

Evaluations of measles immunisation campaigns incorporate process indicators, such as the number of doses of vaccine administered, and/or output indicators, such as incidence of measles.[5] The most appropriate indicator of the success of a measles immunisation campaign is to demonstrate the magnitude of the alteration in the incidence of measles.

Incidence can seldom be calculated from hospital cases since the 'denominator', i.e. the number of persons at risk, is often not available. In this study the 'numerators', i.e. number of new cases of measles, were compared on the assumption that the change in the denominator is sufficiently small as a result of the temporal proximity of the periods being compared.

The total number of admissions, for all diagnoses, to Clairwood Hospital, which was obtained from the hospital inpatient register, was used as an indication of whether the size of the hospital's catchment population was changing. All admissions, adult and paediatric, were used because data on the number of paediatric admissions only were not available.

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The number of measles admissions to Clairwood Hospital during the periods January 1989 - June 1990 and July 1990 - December 1990 were compared to assess the measles immunisation campaign. Since the campaign was undertaken during May and June 1990, the former months represent the pre-campaign period while the latter depict the post-campaign period.

The number of patients admitted with a diagnosis of measles to Clairwood Hospital from January 1985 to December 1990 was obtained from the measles ward admission book. In addition, demographic and mortality data on measles patients were collected from the measles ward admissions book for the period January 1989 to December 1990. Data on vaccination status were unfortunately not available for this study period.

Statistical analysis included the use of the χ^2 and Kruskal-Wallis tests.

Results

Since the measles immunisation campaign, the average number of measles admissions has fallen by 64,4% from 87 to 31 per month ($P < 0,01$). During this period there was little change in the monthly average of the number of patients admitted to Clairwood Hospital for all diagnoses; 2 637 per month during the pre-campaign and 2 527 per month during the post-campaign period (P = NS).

The decline in measles admissions occurred during July 1990 and remained constantly low until December 1990 (Fig. 1). The number of measles patients admitted during July - December 1990 is substantially lower than measles admissions during the same months for the years 1985 - 1989 (Fig. 2). During the latter 6 months of 1990, 1,2% of admissions were for measles. This proportion was significantly lower ($P < 0,001$) than that for 1989 (3,2%), 1988 (3,4%), 1987 (3,3%) and 1986 (5,3%).

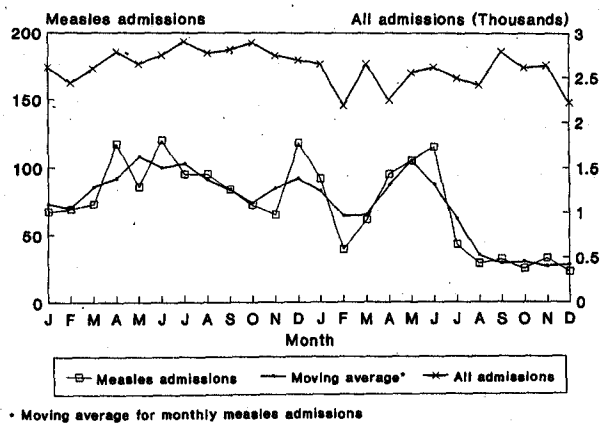

Fig. 1. Monthly admissions to Clairwood Hospital, January 1989 - December 1990.

During the pre-campaign period, the measles mortality rate was 5,5% (87/1 568) compared with 3,4% (6/185) during the post-campaign period (P = NS).

Male patients constituted 51,7% and 50,3% of measles admissions during the pre-campaign and post-campaign periods, respectively (P = NS). The mean age of patients during the pre-campaign period was 24,5 months (standard error (SE) = 0,7) compared with 27,9 months (SE = 2,6) during the post-campaign period (P = NS). During the pre-campaign period, 21,3% of measles patients admitted were aged 7 - 9 months compared with 27,6% during the post-campaign period (Table I).

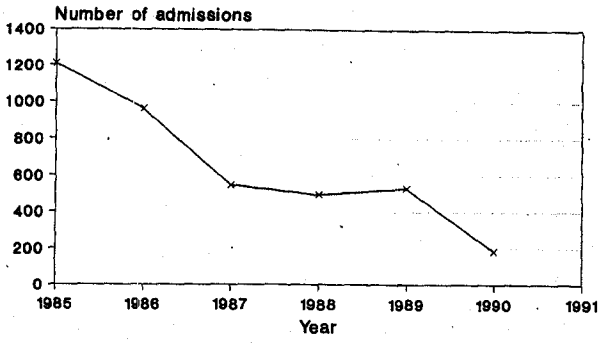

Fig. 2. Measles admissions to Clairwood Hospital for the 6 month-period July - December for the years 1985 - 1990.

TABLE I. AGE DISTRIBUTION OF MEASLES ADMISSIONS TO CLAIRWOOD HOSPITAL DURING THE PRE- AND POST-CAMPAIGN MONTHS

	Pre-campaign (1 Jan 1989 – 30 Jun 1990)	Post-campaign (1 Jul 1990 – 31 Dec 1990)
Age (mo.)	% (N = 1 506)	% (N = 185)
< 7	12,1	9,2
7 – 9	21,3	27,6
10 – 12*	18,3	11,4
13 – 60	39,5	41,0
> 60	8,8	10,8
	100,0	100,0

* Difference between pre- and post-campaign periods is statistically significant ($P < 0,05$).

During both the pre- and post-campaign periods the four most commonly recorded residential addresses of patients admitted to Clairwood Hospital with measles were the same (in order of decreasing frequency): Umlazi; KwaMashu; Inanda; and Umbumbulu. During the pre-campaign period, 5 or more measles patients admitted to Clairwood Hospital came from each of 33 areas throughout Natal. Since the campaign, at least 1 measles patient has been admitted to Clairwood Hospital from 25 (75,8%) of these areas.

Discussion

Following the measles immunisation campaign in Natal, Clairwood Hospital experienced a 64,4% decline in measles admissions. The decline, which occurred 2 months after the start of the campaign, can be ascribed to the measles immunisation campaign, since there were no other interventions that could have had such a large influence on measles admissions during mid-1990.

The expected upward trend in the age of patients who developed measles after the campaign had not yet materialised. Between 20% and 30% of measles patients admitted to Clairwood Hospital were aged 7 - 9 months (Table I). Similar percentages of measles patients younger than 9

months have been reported elsewhere: 27,2% in Cape Town;[12] 28% at Clairwood Hospital in 1985/86;[3] and 36% at Baragwanath Hospital.[13]

The increase, subsequent to the campaign, in the proportion of patients aged 7 - 9 months, accompanied by a decrease in the proportion of patients aged 10 - 12 months, highlights the need for measles vaccine at 6 months of age. This supports the World Health Organisation's recommendation to immunise children in developing countries at 6 months with 'high-titre' Edmonston-Zagreb vaccine.[14] This recommendation has been previously advocated for South Africa[15] and is in the process of being implemented.

There was little change in the geographical source of measles admissions to Clairwood Hospital after the campaign, indicating that measles transmission is continuing in the major black townships around Durban, albeit at a lower level. Subsequent to the campaign, measles continued to spread in more than three-quarters of the areas in which it had been occurring before the campaign.

The incidence of measles usually demonstrates marked seasonal variation.[16] During 1990 the seasonal variation in the incidence of measles was interrupted by the campaign, an effect similar to the loss of seasonal peaks in measles incidence in Finland following the nationwide vaccination programme.[10]

The translation of measles admissions into measles incidence is conditional on there being no changes in either Clairwood Hospital's catchment population or its admission criteria for measles during 1990. There is no documented evidence of mass migration away from the areas served by Clairwood Hospital; it is more likely that the hospital's catchment population increased by a small margin due to the urbanisation process. It is very unlikely that Clairwood Hospital's admission criteria were changed to admit only severe cases of measles after the campaign, since the measles mortality rate did not change substantially after the campaign. It is therefore reasonable to conclude that the incidence of measles has declined.

For this reason, data on measles admissions to Clairwood Hospital can be useful to generate a gross indicator to monitor the measles control efforts in Natal. An attempt was made to use changes in the number of measles admissions at Edendale Hospital as an indicator of the effectiveness of mass measles immunisation campaigns in the Edendale/Vulindlela districts of KwaZulu in 1987 and 1988.[17] However, this study reported only that there was a decrease in measles admissions but provided no indication of the extent of the decrease.

The decline in measles admissions to Clairwood Hospital was sustained throughout the period July 1990 - December 1990. However, it is still too early to determine whether the post-campaign low levels of measles occurrence will continue in the long term. Experience from other campaigns suggests that campaigns result in a temporary interruption in the transmission of the virus.[18] An evaluation of a mass measles immunisation campaign in a peri-urban area demonstrated that the effects of the campaign were short-lived due to the high influx rate of unvaccinated children from rural areas.[18]

If the measles vaccination efforts wane, and slump back to pre-campaign levels, a measles epidemic is likely to result because of the accumulation of susceptible newborns.[19] This is an important consideration, since the socio-economic conditions, such as overcrowding,[2] which contribute to the spread of measles remain.

To prevent further epidemics of measles, the high measles vaccination coverage rate obtained during the campaign needs to be maintained. It remains a challenge to all who were involved in the 1990 National Measles Immunisation Campaign to maintain the momentum for immunisation and to continue the efforts to attain herd immunity against measles.

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REFERENCES

1. Reynolds LG, Hussey G, Kettles AN. The continuing scourge of measles (Editorial). *S Afr Med J* 1987; **71**: 611.
2. Loening WEK, Coovadia HM. Age-specific occurrence rates of measles in urban, peri-urban and rural environments: Implications for time of vaccination. *Lancet* 1983; **2**: 324-326.
3. Wittenberg DF. Measles experience in Durban (Correspondence). *S Afr Med J* 1987; **71**: 191.
4. Department of National Health and Population Development. The measles strategy: pre-campaign vaccination levels. *Epidemiological Comments* 1990; **17** (10): 8-14.
5. IJsselmuiden CB, Küstner HGV, Barron PM, Steinberg WJ. Notification of five of the EPI target diseases in South Africa: an assessment of disease and vaccination reporting. *S Afr Med J* 1987; **72**: 311-317.
6. Barron PM, Buch E, Behr G, Crisp NG. Mass immunisation campaigns — do they solve the problem? *S Afr Med J* 1987; **72**: 321-322.
7. Thomas T, Kibel MA. Measles vaccination campaign — 1990 (Editorial). *S Afr Med J* 1990; **77**: 1-2.
8. Bertran M, Reid RS. The national immunisation campaign of Turkey. *Assignment Children* 1985; **69/72**: 265-300.
9. Risi JB, Becker RA, Franzosi IT. Immunisation campaigns in Brazil. *Assignment Children* 1985; **69/72**: 381-395.
10. Peltola H, Karanko V, Kurki T, Hukkanen V, Virtanen M, Pentinnen K *et al.* Rapid effect on endemic measles, mumps and rubella of nationwide vaccination programme in Finland. *Lancet* 1986; **1**: 137-139.
11. Department of National Health and Population Development. Measles eradication. *Epidemiological Comments* 1989; **16**(9): 1-14.
12. Kettles AN. Differences in trends of measles notifications by age and race in the western Cape, 1982-1986. *S Afr Med J* 1987; **72**: 317-320.
13. Harrisberg J, Radcliffe M, Kala U, Hartman E, Bolton K. Measles outbreak at Baragwanath Hospital — a plea for action (Correspondence). *S Afr Med J* 1988; **73**: 62.
14. World Health Organisation. Expanded programme on immunisation — Global Advisory Board: Part I. Measles control. *Wkly Epidemiol Rec* 1990; **65**: 5-12.
15. Kiepiela F, Coovadia HM, Loening WEK, Coward P, Abdool Karim SS. Loss of maternal measles antibody in black South African infants in the first year of life — implications for age of vaccination. *S Afr Med J* 1991; **79**: 145-148.
16. Department of National Health and Population Development. Eight years of measles notification. *Epidemiological Comments* 1988; **15**(6): 2-31.
17. Dammann DF, Solarsh GC, Patrick ME, IJsselmuiden CB. Vaccination coverage of under-fives, validity of records, and the impact of mass campaigns in the Edendale/Vulindlela district of KwaZulu. *S Afr Med J* 1990; **78**: 729-733.
18. Kearney M, Yach D, Van Dyk H, Fisher SA. Evaluation of a mass measles immunisation campaign in a growing peri-urban area. *S Afr Med J* 1989; **76**: 157-159.
19. WHO/UNICEF. *Expanded Programme on Immunization; Planning Principles for Accelerated Immunization Activities.* Geneva: World Health Organisation, 1985.