

# Mass measles vaccination in urban Burkina Faso, 1998

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**Objective** To assess the impact of the National Immunization Days (NIDs) on measles vaccine coverage in Burkina Faso in 1998.

**Methods** During the week after the campaign, in which measles vaccine was offered to children aged 9–59 months in six cities regardless of vaccination history, a cluster survey was conducted in Ouagadougou and Bobo Dioulasso, the country's two largest cities. Interviewers visited the parents of 1267 children aged up to 59 months and examined vaccination cards. We analysed the data using cluster sample methodology for the 1041 children who were aged 9–59 months.

**Findings** A total of 604 (57%) children had received routine measles vaccination prior to the campaign, and 823 (79%) were vaccinated during the NIDs. Among those who had previously had a routine vaccination, 484 (81%) were revaccinated during the NIDs. Among those not previously vaccinated, 339 (78%) received one dose during the NIDs. After the campaign, 943 (91%) children had received at least one dose of measles vaccine. Better socioeconomic status was associated with a higher chance of having been vaccinated routinely, but it was not associated with NID coverage.

**Conclusion** The mass campaign enabled a substantial increase in measles vaccine coverage to be made because it reached a high proportion of children who were difficult to reach through routine methods.

**Keywords:** Measles/prevention and control; Measles vaccine/administration and dosage; Immunization programs; Cluster analysis; Burkina Faso (*source: MeSH*).

**Mots clés:** Rougeole/prévention et contrôle; Vaccin antiorbilleux/administration et posologie; Programmes de vaccination; Sondage en grappes; Burkina Faso (*source: INSERM*).

**Palabras clave:** Sarampión/prevenición y control; Vacuna antisarampión/administración y dosificación; Programas de inmunización; Análisis por conglomerados; Burkina Faso (*fuentes: BIREME*).

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Voir page 299 le résumé en français. En la página 300 figura un resumen en español.

## Introduction

Supplemental measles vaccination campaigns are a key component of the WHO strategy to eliminate measles. In the Americas most countries have successfully conducted “catch-up” campaigns to improve vaccine coverage rapidly (1, 2). Burkina Faso, a country with

low coverage of routine measles vaccination, conducted two annual rounds of National Immunization Days (NIDs) against poliomyelitis in 1996 and 1997, with coverage exceeding 95% in each round (3). Because of the apparent success of the NIDs, additional interventions were included in 1998. In addition to the oral polio vaccine offered to children aged up to 59 months, vitamin A supplementation was offered to those aged 6–59 months during the first round in November. During the second round in December, measles vaccine was offered in six cities to those aged 9–59 months regardless of vaccination history.

Only a limited mass measles vaccination strategy was used in 1998 for three main reasons: the feasibility of safe, mass vaccination campaigns requiring injections had not been established; there was a larger number of health care workers trained to administer injections in urban settings; and there was the possibility that vaccinations in urban areas might reduce measles mortality and transmission in rural areas (4).

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Mass measles vaccinations have been proposed as a strategy to improve measles control, primarily in areas with high vaccine coverage (5, 6). Previous experience has suggested that mass vaccination campaigns might reach a large proportion of children who had already been vaccinated but not provide substantial benefit to those who had not been vaccinated through routine programmes, and that they might, therefore, have little impact on measles control (7). Whether the mass campaign is extended to cover other areas of Burkina Faso will partly depend on the ability to clarify campaign coverage issues. We conducted a detailed survey in Ouagadougou and Bobo Dioulasso, the two largest cities in Burkina Faso, immediately after the 1998 campaign. Parents were interviewed to collect information on socioeconomic status and to determine whether their children had participated in the immunization days; children's vaccination cards were also reviewed.

## Methods

We conducted a cluster survey (8, 9) in two cities within the areas covered by the measles vaccine campaign. Altogether, 121 clusters of 7 children were randomly selected in Ouagadougou (four health districts) and 60 clusters were selected in Bobo Dioulasso (two health districts) using a two-stage sampling method. The 30 sectors of Ouagadougou and the 25 sectors of Bobo Dioulasso were used as secondary stratification levels. The National Institute for Demography provided population estimates for each sector. The location of the first household to be surveyed was randomly identified on a map. Interviewers enrolled children from consecutive households. They were instructed to identify and collect data on all children in each household who were aged up to 59 months. After a household had been surveyed, interviewers moved to the next one, until a total of 7 children aged 0–59 months could be surveyed for each individual cluster.

The survey took place during the week immediately following the vaccination campaign. Data were collected using closed questions. Interviews were conducted with the principal caregiver of every child. If the caregiver was absent, interviewers registered the name of the child and returned to complete data collection.

We classified children as having been routinely vaccinated if they possessed a vaccination card that recorded one dose of measles vaccine at or after 9 months of age (10). Interviewers used indirect questioning to determine whether a child had received a dose of vaccine during the campaign. First they found out whether the caregiver was aware that the campaign had taken place. If so, they asked if the caregiver remembered the dates on which the campaign had taken place (two rounds separated by a one-month interval). Finally, the caregiver was asked to describe what the child had received (two pink

Table 1. **No. and % of children studied after mass measles vaccination campaign in Ouagadougou and Bobo Dioulasso, Burkina Faso, December 1998**

	No. of children	%
<b>Health district</b>		
Ouagadougou Kossodo	134	81
Ouagadougou Paul VI	81	8
Ouagadougou Pissy	316	30
Ouagadougou sector 30	181	17
Bobo Dioulasso sector 15	106	10
Bobo Dioulasso sector 22	223	21
<b>Age</b>		
9–11 months	61	6
12–23 months	285	27
24–35 months	230	22
36–47 months	228	22
48–59 months	237	23
<b>Sex</b>		
Male	526	54
Female	514	50
Unknown	1	0.1
<b>Education level of principal caregiver</b>		
No education	565	54
Primary	242	23
Secondary	202	19
University	32	3
<b>Possesses an immunization booklet</b>	835	80
<b>Routine measles immunization verified</b>	604	57
<b>Measles vaccine received during the NIDs</b>	823	79

NIDs = National Immunization Days.

Table 2. **Routine measles vaccine coverage and coverage during National Immunization Days (NIDs) among children aged 9–59 months, Ouagadougou and Bobo Dioulasso, Burkina Faso, December 1998**

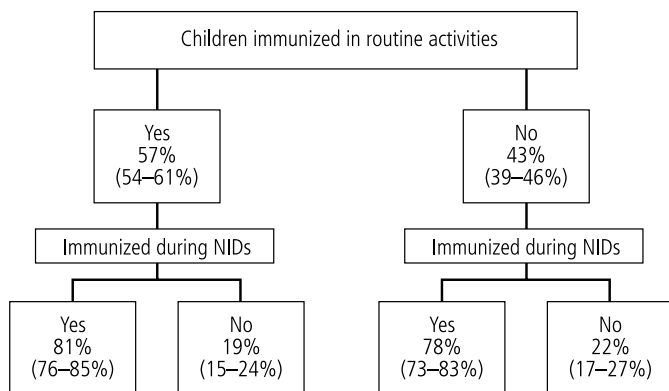
Education level of principal caregiver	Routine		NIDs	
	% of children vaccinated	95% CI	% of children vaccinated	95% CI
No education	49	44–53	79	74–83
Primary	65	59–72	82	76–88
Secondary	70	63–78	79	73–86
University	72	48–95	68	48–89

CI = confidence interval.

drops signified polio vaccine, red capsules vitamin A, and an injection measles vaccine).

We computed proportions and confidence limits with the CSAMPLE program included in EpiInfo version 6.04c (11). Cities were used as primary strata, the clusters were the primary sampling units, and the size of the population to be vaccinated in each city were the sample weights.

Fig. 1. Proportion (+ range) of children vaccinated against measles during the NIDs according to their routine vaccination status



NIDs = National Immunization Days

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## Results

A total of 1267 children aged 0–59 months grouped in 181 clusters were surveyed. We focused on the 1041 (82%) aged 9–59 months (Table 1) who were eligible to receive measles vaccine. There were 712 children in Ouagadougou and 329 in Bobo Dioulasso eligible for inclusion. There were vaccina-

tion booklets for 80% of children. Altogether, 604 (57%; 95% confidence interval (CI) = 54–61%) of children aged 9–59 months had had a measles vaccination documented before the campaign. Of the children surveyed, 823 (79%; 95% CI = 76–83%) received measles vaccine during the immunization days. In total, 943 of the 1041 children (91%; 95% CI = 88–93%) had received measles vaccine at least once either routinely or through the campaign.

Children whose principal caregiver had had no education were less likely than others to have been routinely vaccinated against measles prior to the campaign (49% in contrast to 68%; relative risk (RR) 0.71, 95% CI = 0.63–0.81). Routine coverage increased as the level of the caregiver’s education increased (Table 2).

The proportion of children who received measles vaccine during the NIDs was similar among children who had documented routine vaccination and those who did not (Fig. 1). Among the 604 who had had a routine vaccination, 484 (81%) were revaccinated during the NIDs. Among the 437 not previously vaccinated, 339 (78%) received one dose during the immunization days. Predictors of a missed routine vaccination were not associated with better coverage during the NIDs. In particular, children whose principal caregiver had had no education were as likely to be vaccinated during the immunization days as other children were (79% vs. 80%; RR 0.99, 95% CI = 0.91–1.07) (Table 2).

Altogether, 98 (9%) of the children had not received a dose of measles vaccine, either routinely or during the campaigns (Table 3). The risk of not being vaccinated was slightly higher for boys than for girls (RR 1.56, 95% CI = 1.09–2.24).

The coverage estimates found in the survey were substantially different from those obtained from information on the number of doses administered (Table 4). For the six districts combined, the administrative information suggested that coverage was 107%, while coverage measured by the survey was 79% (95% CI = 76–83%). Thus, the administrative method overestimated actual coverage by 35%. In addition, the district with the highest administrative coverage (Bobo Dioulasso sector 22) was also that with the lowest coverage as measured by the survey.

## Discussion

This survey provides useful information for the development of measles control strategies in Burkina Faso. In Ouagadougou and Bobo Dioulasso administering a supplemental dose of measles vaccine, regardless of vaccination history, increased the proportion of children who received at least one dose of measles vaccine from 57% before the campaign to 91%. The campaign also allowed a high proportion of children who are harder to reach routinely to be vaccinated. Finally, findings from this survey suggest

Table 3. Characteristics of children aged 9–59 months found never to have received measles vaccine, Ouagadougou and Bobo Dioulasso, Burkina Faso, December 1998

	No. never vaccinated	Total surveyed	% not vaccinated	95% CI
<b>Place of residence</b>				
Ouagadougou Kossodo	14	134	10	4–17
Ouagadougou Paul VI	8	81	10	4–17
Ouagadougou Pissy	39	316	12	8–16
Ouagadougou sector 30	7	181	4	1–7
Bobo Dioulasso sector 15	1	106	1	0–3
Bobo Dioulasso sector 22	29	223	13	7–19
<b>Age</b>				
9–11 months	8	61	14	5–23
12–23 months	28	285	9	5–12
24–35 months	22	230	10	6–14
36–47 months	21	228	10	6–15
48–59 months	19	237	8	4–12
<b>Sex</b>				
Male	59	526	12	9–15
Female	39	514	7	5–10
<b>Education level of principal caregiver</b>				
No education	63	565	11	8–14
Primary	21	242	8	4–12
Secondary	9	202	5	2–8
University	21	32	17	0–36

CI = confidence interval.

that coverage estimates using administrative data on the number of doses given did not adequately identify districts with high and low coverage.

Measles vaccination campaigns have not always achieved satisfactory results. In Manila, Philippines, for example, in a context of routine coverage approaching 90%, the proportion of non-vaccinated children that could be reached by one campaign remained low (7). In other places, campaigns did not reach a large enough proportion of children (12, 13). Data in this report suggest that a carefully planned measles vaccination campaign conducted in a setting of moderate-to-low routine coverage can vaccinate a much larger number of children than routine activities alone, particularly among those who are hard to reach.

Mass vaccination campaigns complement, but are not substitutes for, routine vaccination activities. Campaigns do not allow all the antigens included in the Expanded Programme on Immunization to be administered (10). They also require large numbers of health staff, trained to administer injections, to be mobilized, and they require financial resources. Effective measles control requires a combination of several strategies (1). In developing a national plan for measles control, it is necessary to strengthen disease surveillance, to ensure higher routine coverage with one-dose measles vaccine, and to anticipate that additional mass campaigns might be necessary to compensate for the growth in the numbers of susceptible children over time. Previous experience suggests that after a mass campaign the number of measles cases might increase rapidly within a few years if proper measures are not taken (14).

This report illustrates three different ways of estimating vaccine coverage: reviewing vaccination cards, calculating from data on the number of doses administered, and interviewing caregivers immediately after a campaign. Each method has limitations. In this study, only children's vaccination cards were used to determine whether a child had been vaccinated routinely, thus there is a possibility that children who had been vaccinated but whose cards did not reflect this may have been misclassified as unvaccinated (15). Assessing vaccine coverage through the number of doses administered is common (16). Although such data are frequently used to make operational decisions, there are concerns about accuracy (17). Data from this survey suggest that the administrative method did not adequately identify districts with low coverage during the campaign. Most of the discrepancies were probably caused by incomplete information on the number of children of the appropriate age and the

Table 4. Comparison of estimates of measles vaccine coverage found by the survey and found using data on the number of doses administered, Ouagadougou and Bobo Dioulasso, Burkina Faso, 1998

Health district	Coverage estimate	
	Survey <sup>a</sup> %	No. of doses administered
Ouagadougou Kossodo	84 (78–91)	103
Ouagadougou Paul VI	83 (76–89)	114
Ouagadougou Pissy	72 (64–79)	87
Ouagadougou sector 30	87 (82–93)	108
Bobo Dioulasso sector 15	94 (91–98)	118
Bobo Dioulasso sector 22	70 (63–77)	122

<sup>a</sup> Values in parentheses are 95% confidence intervals.

vaccination of children who fell outside the selected age group. Because the survey relied only on the caregivers' statements to determine which, if any, vaccinations had been received during the campaign, there is the potential for misclassification (18). However, maternal reports can provide useful information on vaccine coverage (19). Additional precautions taken for the survey, such as conducting interviews less than 10 days after the campaign and using indirect questioning, are likely to have improved the reliability of the estimates of coverage.

In Ouagadougou and Bobo Dioulasso, poor coverage of measles vaccination could rapidly be compensated for through mass vaccination campaigns because coverage during campaigns is less influenced by socioeconomic factors than routine coverage. In 1999, Burkina Faso developed a national strategic plan for measles control and conducted a thoroughly evaluated national campaign. Follow-up campaigns are planned for 2001 as well as improvements in routine coverage and strengthened surveillance activities to achieve sustainable measles control. ■

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**Conflict of interests:** none declared.

## Résumé

### Vaccination de masse contre la rougeole dans les zones urbaines du Burkina Faso, 1998

**Objectif** Évaluer l'impact des journées nationales de vaccination sur la couverture vaccinale antirougeoleuse au Burkina Faso en 1998.

**Méthodes** La semaine suivant cette campagne, la vaccination antirougeoleuse a été offerte aux enfants de 9 à 59 mois dans six villes, quel que soit leur statut

vaccinal antérieur, et une enquête a été réalisée par sondage en grappes à Ouagadougou et Bobo Dioulasso, les deux plus grandes villes du pays. Les enquêteurs ont interrogé les parents de 1267 enfants de moins de 60 mois et ont examiné les carnets de vaccination. Nous avons analysé les données selon la méthode du sondage en grappes pour les 1041 enfants qui étaient âgés de 9 à 59 mois.

**Résultats** Au total, 604 enfants (57 %) avaient reçu une vaccination antirougeoleuse de routine avant la campagne et 823 (79 %) ont été vaccinés pendant les journées nationales de vaccination. Parmi les enfants qui étaient déjà vaccinés, 484 (80 %) ont été

revaccinés pendant la campagne, et parmi ceux qui n'avaient pas encore été vaccinés, 339 (78 %) ont reçu une dose de vaccin. Après la campagne, 943 enfants (91 %) avaient reçu au moins une dose de vaccin antirougeoleux. Un meilleur niveau socio-économique était associé à de plus grandes chances pour l'enfant d'avoir reçu une vaccination de routine, mais n'était pas associé au taux de couverture des journées nationales de vaccination.

**Conclusion** La campagne de vaccination de masse a permis d'augmenter sensiblement la couverture vaccinale car elle a pu toucher une forte proportion d'enfants difficiles à atteindre par les méthodes classiques.

## Resumen

### Vacunación masiva contra el sarampión en zonas urbanas de Burkina Faso, 1998

**Objetivo** Evaluar la repercusión de los Días Nacionales de Inmunización (DNI) en la cobertura de vacunación antisarampionosa en Burkina Faso en 1998.

**Métodos** Durante la semana posterior a la campaña, en la que se ofreció vacunación antisarampionosa a los niños de 9 a 59 meses de seis ciudades con independencia de sus antecedentes de vacunación, se llevó cabo una encuesta por conglomerados en Ouagadougou y Bobo Dioulasso, las principales ciudades del país. Los encuestadores visitaron a los padres de 1267 niños de hasta 59 meses de edad y examinaron sus fichas de vacunación. Analizamos los datos correspondientes a un total de 1041 niños de 9 a 59 meses de edad, empleando métodos adecuados para muestras por conglomerados.

**Resultados** En total, 604 niños (57%) habían recibido vacunación antisarampionosa sistemática antes de la

campaña, y 823 (79%) fueron vacunados durante los DNI. Entre los que se habían beneficiado anteriormente de la vacunación sistemática, 484 (80%) fueron revacunados durante los DNI. Entre los no vacunados previamente, 339 (78%) recibieron una dosis durante los DNI. Al terminar la campaña, 943 niños (91%) habían recibido como mínimo una dosis de vacuna antisarampionosa. Un mayor estatus socioeconómico se asociaba a una mayor probabilidad de haberse beneficiado de la vacunación sistemática, pero no así de la cobertura de los DNI.

**Conclusión** La campaña masiva permitió ampliar sustancialmente la cobertura vacunal contra el sarampión, pues se dio alcance a una alta proporción de los niños que difícilmente se benefician de las intervenciones sistemáticas.

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