

**Childhood immunization in Bungoma County, Kenya from 2008 to 2011: the need for improved uptake**

**Short Report – Notes from the Field**

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**ABSTRACT**

Uptake of immunizations in children aged 1-2 years in Bungoma County, Kenya, was determined as part of six-monthly Health and Demographic Surveillance System surveys. There were 2699 children assessed between 2008 and 2011. During this time period, full immunization significantly declined from 84% to 58%, and measles vaccine uptake particularly declined from 89% to 60% ( $p < 0.001$ ). In each year, there was a significant fall-off for the third doses of oral polio and pentavalent vaccines ( $p < 0.001$ ). The findings are of concern and indicate the need for understanding the reasons for a decline coupled with intensified programmatic action to rectify the situation.

## SITUATION

Although childhood immunization is recognized as a cost-effective public health intervention to prevent specific communicable diseases, vaccination coverage in low- and middle-income countries may be poor.<sup>1</sup>In 2008,WHO estimated that 1.5 million deaths in children under five years of age were due to vaccine-preventable diseases.<sup>2</sup>Kenyan immunization policy dictates that all infants receive Bacille Calmette Guerin (BCG) vaccine at birth, oral polio vaccine at birth, 6, 10 and 14 weeks, pentavalent vaccine (to prevent diphtheria, tetanus, whooping cough, hepatitis B and haemophilus influenza type B) at 6, 10 and 14 weeks and measles vaccine at 9 months.<sup>3</sup> According to national policy an infant is regarded as having full immunization coverage if eight scheduled vaccinations (excluding oral polio at birth) are completed before one year of age.

Despite a well-established Expanded Programme on Immunization (KEPI), the national reported immunization coverage in Kenya for 2008 was 77%, with coverage in the Western Region reported at 73% and some districts at below 50%.<sup>4</sup> These data are based on one-off national demographic surveys conducted every five years on a sampled population, and in interim years on data provided by health facilities. The relatively poor immunization coverage in Kenya is of concern, and there is a need for accurate and longitudinal data in the last five years to assess whether or not there has been improvement.

In Bungoma County, Western Region, the Webuye Health and Demographic Surveillance System (HDSS) was set up in 2007. Amongst its many objectives was data collection on childhood immunizations at households every six months. The aim of this study was to use the Webuye HDSS to report on immunization uptake in children aged 1-2 years in Bungoma County between 2008 and 2011.

## ASPECT OF INTEREST

This was a cross-sectional study of routinely collected data from HDSS surveys. The HDSS, established in 2007 as a collaborative research programme between Moi University (Kenya) and Ghent University (Belgium), was implemented in an area of 120 km<sup>2</sup> and included both rural and semi-urban areas with approximately 73,000 individuals in 13,000 households.<sup>5</sup> The first survey was carried out in 2008 using paper-based questionnaires, with subsequent semi-annual surveys with each cycle lasting 3 months (a total of eight surveys until 2011). In each survey, the same trained community interviewers visited 13,000 separate households to collect longitudinal health-related data including information on childhood immunizations. Completeness of questionnaires was checked by field supervisors, and checked data were sent to data officers for entry into the HDSS database.

All children aged 1-2 years recorded in the HDSS database from January 2008 to December 2011 were included in the study. Data variables included year of registration and immunization status by vaccination type and were extracted into an Excel spreadsheet and analyzed in Stata.IC.v11.1 (College Station, TX: Stata Corp LP). Statistical comparisons of vaccination uptake between years were done by logistic regression and chi-square test of trend, with levels of significance set at 5%. Approval for this secondary analysis of HDSS data was obtained from the Moi University-VLIR UOS Steering Committee, Medecins Sans Frontieres Ethics Review Board, Geneva, Switzerland, and the Ethics Advisory Group of the International Union against Tuberculosis and Lung Disease, Paris, France.

Immunization uptake for each vaccine is shown in **Table 1**. Over the total four year period, 90% or more of children received each scheduled vaccine except for measles vaccine which was received by 74% of children. For each year, there was a significant decline in uptake

of the third doses of both oral polio vaccine and pentavalent vaccine compared to first dose. The uptake of the eight vaccines (with the exception of measles vaccine) at scheduled times was similar between 2008 and 2010, but there was a significant decrease in 2011 compared with 2008 ( $p < 0.001$ ). There was a progressive and significant decline in uptake of measles vaccine from 2008 to 2011 ( $p < 0.001$ ).

Immunization status for all vaccines combined is shown in **Table 2**. Over the full study period, 70% of children were assessed as fully immunized with only 2% having no immunization at all. However, from 2008 to 2011, there was a significant decrease in children with full immunization uptake and a corresponding increase in those with partial immunization.

## **DISCUSSION**

This is the first study in rural and semi-urban Kenya to document immunization uptake based on longitudinal health demographic surveillance surveys. The findings are of concern. Only 70% of children were fully immunized during the total four year period although these results are better than recent data from other African countries.<sup>6,7</sup> There was evidence of a progressive decrease in full immunization coverage, with a significant decrease in uptake in 2011, and for measles vaccine a progressive decrease in uptake during the four years.

The strengths of this study were the large number of households surveyed, its longitudinal nature, the use of the same community trained interviewers and methodology at each six-month survey and attention paid to following internationally agreed recommendations for reporting on observational studies.<sup>8</sup> Limitations relate to the lack of information about whether the denominator of children receiving every scheduled dose of vaccine changed with

time, whether vaccine dosages were administered according to scheduled timings and risk factors associated with poor immunization uptake.

Despite these limitations, there are important implications from this study. First, it will be important to ensure that full courses of oral polio and pentavalent vaccines are completed by all children through community awareness campaigns and secure stock levels of vaccines. Second, more attention must be paid to measles vaccine uptake, not only in Kenya but elsewhere, as measles is re-emerging as important and potentially fatal infectious disease.<sup>9,10</sup> Finally, this study illustrates the value of the demographic surveillance systems to obtain reliable community-level estimates of key health program coverage indicators that can support program and policy development.

In conclusion, this study shows low immunization uptake in Bungoma County, Kenya, particularly for measles vaccination, and emphasizes the need to reinvigorate and continually evaluate the immunization services in the area, the region and the country.

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## **CONFLICT OF INTEREST**

No conflicts declared.

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**Table 1: Immunization uptake in each year and for the four years in total by vaccine type, Bungoma County, Kenya: 2008-2011**

Vaccine Types and Schedules	2008 N*=746 n (%)	2009 N*=760 n(%)	2010 N*=683 n(%)	2011 N*=510 n(%)	Total N*= 2699 n (%)
BCG	730(98)	744 (98)	672 (98)	481(94)	2627 (97)
OPV1	731(98)	741(97)	665 (97)	458(90)	2595 (96)
OPV2	723 (97)	733(96)	645 (94)	448 (88)	2549 (94)
OPV3	696 (93)	689(91)	609(89)	416 (82)	2410 (89)
PENTA1	733(98)	742(98)	666 (97)	458(90)	2599 (96)
PENTA2	724 (97)	730 (96)	657(96)	449 (88)	2560 (95)
PENTA3	689 (92)	698 (91)	624(91)	424(83)	2435 (90)
Measles	663(89)	556 (73)	478(70)	307 (60)	2004 (74)

N\* = Total number of children aged between 1-2 years included in the survey during the year.  
n (%) =number (%) of children who received the vaccine

BCG = Bacille Calmette Guerin vaccine at birth; OPV1 = oral polio vaccine at 6 weeks; OPV2 = oral polio vaccine at 10 weeks; OPV3 = oral polio vaccine at 14 weeks; PENTA1 = pentavalent vaccine (to prevent diphtheria, tetanus, whooping cough, hepatitis B and haemophilus influenza type B) at 6 weeks; PENTA2 = pentavalent vaccine at 10 weeks; PENTA3 = pentavalent vaccine at 14 weeks; Measles = measles vaccine at 9 months.

The difference in vaccine uptake between the years was analyzed statistically by logistic regression using STATA IC 11.1. For all vaccines apart from measles, there was no difference between 2008 and 2010. However, when 2011 was compared with 2008, there was a significant decrease in vaccine uptake for all vaccines ( $p < 0.001$ ). For measles vaccine, there was a significant decrease from 2008 to 2009 and from 2010 to 2011 ( $p < 0.001$ ).

The differences in vaccine uptake between OPV1 and OPV3 and between PENTA1 and PENTA3 for each year were analyzed statistically using the chi-square test, and for each year significant differences were identified ( $p < 0.001$ ).

**Table 2: Immunization status for the four years combined and for each year, Bungoma County, Kenya: 2008-2011**

Vaccination uptake	Total N*2699 n (%)	2008 N*746 n (%)	2009 N*760 n(%)	2010 N*683 n(%)	2011 N*510 n(%)	p value
Fully immunized <sup>a</sup>	1902 (70)	629 (84)	522 (69)	455 (67)	296 (58)	<0.0001
Partially immunized <sup>b</sup>	748 (28)	109 (15)	231 (30)	217 (32)	191 (37)	<0.0001
Not immunized <sup>c</sup>	49 (2)	8 (1)	7 (1)	11 (1)	23 (5)	<0.0001

N\* = Total number of children aged between 1-2 years included in the survey during the year.  
n (%) = number (%) of children who received the vaccine.

<sup>a</sup> Full immunization = vaccination with all eight vaccines as shown in Table 1 during the first year of life

<sup>b</sup> Partial immunization = vaccination in which at least one vaccine as shown in Table 1 is missing during the first year of life

<sup>c</sup> No immunization = no vaccines at all given in the first year of life

P value based on chi-square test for trend