



Original Article

Measles Control in Côte D'Ivoire from 2006 to 2014

Lutte contre la rougeole en Côte d'Ivoire de 2006 à 2014

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RÉSUMÉ

Introduction. La Côte d'Ivoire a adhéré à l'Initiative Mondiale pour l'Élimination de la rougeole. Dans ce cadre, elle a élaboré à travers le Programme Elargi de Vaccination deux plans stratégiques quinquennaux (2001-2005 et 2007-2012) pour la pré-élimination de la rougeole. C'est dans ce contexte que nous avons réalisé ce travail dont le but était d'évaluer la lutte contre la rougeole en Côte d'Ivoire depuis son adhésion à l'Initiative Mondiale d'Élimination de cette maladie. Les objectifs de ce travail étaient de décrire l'évolution des cas de rougeole de 2006 à 2014, déterminer les performances de la surveillance de la rougeole de 2005 à 2014 et déterminer les performances de la vaccination de routine et des activités de vaccination supplémentaires de 2005 à 2014. **Méthodologie.** Nous avons réalisé une étude rétrospective qui a duré deux mois. Les données ont été collectées à partir d'une revue documentaire portant sur les activités de la lutte contre la rougeole en Côte d'Ivoire. Les informations recueillies ont été générées par les districts sanitaires puis compilées au niveau de la Direction de Coordination du Programme Elargi de Vaccination de Côte d'Ivoire. **Résultats.** La proportion de districts sanitaires ayant notifié au moins un cas suspect avec prélèvement a connu de grandes variations entre 2006 et 2014. Le taux de détection annualisée était conforme à la norme sur toute la période sauf en 2006. Le taux d'éruption fébrile non rougeoleuse n'était pas conforme à la norme en 2006, 2009 et 2010. L'incidence de la rougeole était au-delà de la norme de 2009 à 2011. La couverture vaccinale d'au moins 80% dans tous les districts n'a pas été atteinte sur la période 2005-2014. Sur l'ensemble des activités de vaccination supplémentaires l'objectif de couverture vaccinale supérieur ou égale à 95% dans 100% des districts sanitaires n'a pas été atteint. **Conclusion.** Des efforts restent à faire pour améliorer l'immunité de masse contre la rougeole à travers un renforcement de la vaccination de routine.

ABSTRACT

Background : Côte d'Ivoire joined the Global Measles Elimination Initiative. In this context, the country developed, through the Expanded Program on Immunization, two five-year strategic plans (2001-2005 and 2007-2012) for measles pre-elimination. It is in this context we carried out this study. The objectives of this study were to describe the evolution of measles cases from 2006 to 2014, to determine the performance of measles surveillance from 2005 to 2014, and to determine the performance of routine immunization and supplementary immunization activities from 2005 to 2014. **Materials and Methods:** We conducted a retrospective study that lasted two months. Data were collected from a literature review of measles control activities in Côte d'Ivoire. The information collected was generated by the health districts and compiled at the head office of the Expanded Program of Immunization of Côte d'Ivoire. **Results:** The proportion of health districts that reported at least one suspect case with a sample varied from 2006 to 2014. The annual detection rate was consistent with the standard from 2007 to 2014. Non-measles febrile eruptions rate was not consistent with the standard in 2006, 2009 and 2010. Measles incidence was above the standard from 2009 to 2011. **Conclusion.** Vaccination coverage of at least 80% in all districts was not achieved over the period 2005-2014. Of the total supplementary immunization activities, the goal of immunization coverage of 95% or more in 100% of the health districts has not been achieved. **Conclusion:** Efforts are needed to improve immunization against measles through strengthening routine immunization.

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INTRODUCTION

The fourth Millennium Development Goal (MDG) aimed for reducing the mortality of children under five by two-thirds of the 1990 level by 2015 [3]. One of the key strategies to achieve this goal was vaccination against vaccine-preventable diseases, including measles. To control this disease, the Global Measles Elimination Initiative has been launched in 2001 [4]. Strategies of this Initiative included:

- ✓ To increase immunization coverage for measles 1st dose in routine immunization;
- ✓ To provide a second measles immunization opportunity through the organization of Supplementary Immunization Activities (SIAs);
- ✓ To Improve case-by-case surveillance laboratory support ;
- ✓ To improve case management with vitamin A administration and adequate treatment of complications [5].

Implementing strategies of this Initiative has reduced the burden of measles which remains one of the major causes of early childhood death. Indeed, in 2014, 114,900 deaths due to measles were reported worldwide or nearly 314 deaths per day or 13 per hour [1]. The intensification of immunization activities has led to a significant reduction of measles-related deaths. Between 2000 and 2014, the number of deaths prevented by measles vaccination was estimated at 17.1 million, making this vaccine the best investment in public health [1].

In Africa, the extent of measles has dropped considerably but this disease remains a major public health problem. According to the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), the annual number of measles cases in Africa dropped from more than 1 million in the early 1980s to 520,102 in 2000.

This decline continued over the period 2001-2008, where the number of reported cases decreased from 492,116 to 37,010 (a 92% decrease). However, in 2009, suspected cases of measles increased and were estimated to 83,625 in Africa [2].

Côte d'Ivoire joined the Global Initiative for Measles Elimination. In this context, the country developed two five-year strategic plans (2001-2005 and 2007-2012) for measles pre-elimination through the Expanded Program on Immunization (EPI). These plans enabled the implementation of case-by-case eruptive fever surveillance in 2005, the implementation of the Reach Each District strategy in 2006 [6], and the organization of a catch-up vaccination campaign in 2005 [7], as well as three follow-up campaigns in 2008 [5], 2011 [8] and 2014 [9].

It is in this context that we carried out this work which aimed for evaluating measles control in Côte d'Ivoire since the country joined the Global Measles Elimination Initiative. The objectives of this work were:

- ✓ To describe the evolution of measles cases from 2006 to 2014;

- ✓ To determine the performance of measles surveillance from 2005 to 2014;
- ✓ To determine the performance of routine immunization and supplementary immunization activities from 2005 to 2014.

METHODS

Type, period and duration of the study

We conducted a retrospective study over the period 2005-2014. The duration of the study was two months.

Data collection

The data were collected from a literature review on measles control activities in Côte d'Ivoire. The documents used were the EPI action plans, EPI epidemiological surveillance reports, EPI annual reports and measles supplementary immunization activities (SIAs) reports. Information collected was generated by the health districts and compiled at the EPI head office.

Variables

Variables included in the study were grouped in 3 categories:

- ✓ Category 1 included routine immunization variables (national and district measles immunization coverage, national measles immunization coverage from WHO-UNICEF estimate);
- ✓ Category 2 included measles supplementary immunization activities variables (national and district immunization coverage, national immunization coverage from survey);
- ✓ Category 3 included measles surveillance variables (measles expected cases per year, notified suspect cases, proportion of sampled cases, percentage of district having notified at least one suspect case with blood sample, proportion of blood samples received in the laboratory within 72 hours after sampling, proportion of blood samples with IgM positive, annual detection rate, non-measles febrile eruptions rate, and measles annual incidence).

Data analysis

Data have been analyzed using Excel and Epi Info 3.5.1.

WHO key indicators used in this study included:

- ✓ Percentage of districts having notified at least one measles suspect case with blood sample (the expected percentage is greater or equal to 80%);
- ✓ Proportion of measles IgM positive blood samples (the expected proportion is less or equal to 10%);
- ✓ Annual detection rate (the expected rate is greater or equal to 2/100 000);
- ✓ Non-measles febrile eruptions rate (the expected rate is greater or equal to 2/100 000 inhabitants);
- ✓ Measles annual incidence (the expected incidence is less than 5/1 000 000 inhabitants);

- ✓ Measles immunization coverage (the expected coverage is greater than 90% at national level and greater 80% at health district level);
- ✓ Measles immunization coverage during SIAs (the expected coverage is greater than 95% in all districts).

RESULTS

Measles surveillance performance

Except in 2006, notified measles suspect cases were greater than expected cases. Proportion of health districts having notified at least one case of suspect case with blood sample varied from 2006 to 2014. Proportion of measles IgM positive blood samples was greater than the standard (less or equal to 10%) from 2009 to 2012. Annual detection rate was within the standard from 2007 to 2014. Non-measles febrile eruption was not within the standard in 2006, 2009, and 2010. Measles incidence was above the standard from 2009 to 2011..

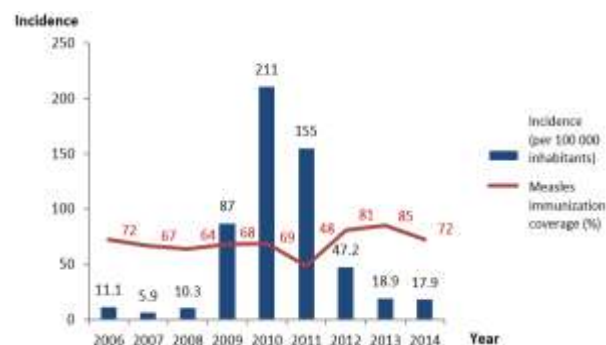


Figure 1: Evolution of measles incidence and immunization coverage in Côte d'Ivoire from 2006 to 2014

Measles incidence evolution in Côte d'Ivoire had an appearance of a bell from 2006 to 2014 with a peak in 2010. Immunization coverage undulated from 2006 to 2014 with a minimum coverage of 48% in 2011 and a maximum of 85% in 2013.

Routine immunization performance in terms of measles immunization coverage

Administrative immunization coverage was greater than 80% only in 2012 and 2013. However, WHO-UNICEF immunization estimate was less than 80% from 2006 to 2014. The objective of at least 80% immunization coverage in all health districts had not been reached over the period 2005-2014.

Table 1: Measles surveillance performance in côte d'Ivoire from 2006 to 2014

surveillance indicators	Standard	2006	2007	2008	2009	2010	2011	2012	2013	2014
Number of expected cases		198	203	213	425	440	452	464	476	491
Number of notified suspect cases		141	303	437	438	912	1059	1042	565	623
Percentage of districts having notified at least one measles suspect case with sample	>=80%	53	83	79	77	87	84%	95%	99%	93%
Number of cases with measles positive IgM		11	6	11	184	435	317	111	45	44
Proportion of measles IgM positive samples	<=10%	7.8%	1.7%	2.7%	42.7%	50.4%	39%	11%	8%	7%
Annual detection rate	>=2/100 000	1,42	2,99	4,10	2,06	4,14	4,69	4,49	2,37	2,53
Non-measles febrile eruptions rate	>=2/100 000	1,31	2,93	3,96	1,19	1,98	2,04	3,73	4,55	2,33
Measles annual incidence	<5/1 000 000	1,11	0,59	1,03	8,7	21,1	15,5	4,72	1,89	1,79
Measles outbreak							25	6		

Table 2: Routine immunization performance concerning measles immunization coverage in Côte d'Ivoire from 2006 to 2014

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
National IC* (%)	50	72	67	64	68	69	48	81	85	72
WHO-UNICEF IC estimates (%)	84	73	67	63	67	70	49	74	76	63
**HD with IC < 50% (%)	47	11	9	10	11	36	57	7	0	0
HD with IC between 50% and 79% (%)	49	52	65	68	71	24	42	32	29	78
HD with IC ≥ 80% (%)	4	36	26	22	18	40	1	61	70	22

*IC = Immunization coverage **HD = Health districts

Table 3: Measles SIAs results in Côte d'Ivoire from 2006 to 2014

Designation	2005	2008	2011	2014
Target	9 mois à 14 ans	9 à 59 mois	9 à 59 mois	9 mois à 9 ans
Target population	8 997 667	3 229 541	6 157 776	10 472 134
Population vaccinated	7 894 327	3 081 499	5 820 653	9 640 512
Administrative IC*	88 %	95%	95%	92%
**HD with IC>=95%	35%	70,8%	73%	64%
*IC from survey	95%	71,3%	90,96%	94,7%

*IC = Immunization coverage **HD = Health districts

In 2008 and 2011, objective of 95% administrative immunization coverage have been achieved during the SIAs. During the same years, immunization coverage from survey was less than 95%. From 2005 to 2014, objective of 95% immunization coverage during SIAs in all health districts has not been achieved.

DISCUSSION

Measles incidence evolution

From 2006 to 2014, the trend in measles incidence had a bell-like appearance with a peak in 2010. Measles cases decreased gradually from 2011. This change in measles incidence could be explained by several factors.

Firstly, immunization services supply in Cote d'Ivoire was inadequate. Indeed, the immunization coverage survey carried out in 2010 in the context of the EPI external review revealed that the strategy Reach Each District was not sufficiently implemented in some health districts. This inadequate supply of immunization services was observed for all immunization strategies (fixe, out of reach, and mobile). Some vaccines were not administered in order to reduce vaccine loss rate [10].

Secondly, immunization services use was inadequate. Although access to immunization services, characterized by DTP1 and TT1 coverage (greater than 90%), was good, continuity in immunization services use, characterized by drop-out rates, was not good. Indeed, in 2011, only 33 (21%) of 82 health districts had a drop-out rate less than 10% [11, 12] and the DTP1-M (Diphtheria tetanus pertussis first dose – Measles) drop-out rate was 26% nationally [13].

Thirdly, shortage of vaccine and consumables has been observed. In 2010, Côte d'Ivoire experienced shortage of several vaccines including measles vaccine. In 2011, in addition to vaccine shortage, the country experienced auto-disable syringes penury [14]. This situation could explain the large number of measles cases notified in 2010 and 2011 in Côte d'Ivoire.

Fourthly, the country experienced a socio-political crisis in 2010-2011. Indeed, Côte d'Ivoire has experienced a socio-political crisis since 2002. Indeed, Côte d'Ivoire experienced a socio-political crisis since 2002. This crisis which intensified in the third quarter of 2010, after the presidential elections, culminated in

the second quarter of 2011 in an armed conflict which led to disorganization of the health system and the closure of immunization services in some health districts [14]. To control measles effectively, the Ivorian health authorities organized, with the support of WHO and UNICEF, a follow-up campaign against measles in November 2011 [8]. Efforts to control vaccine-preventable diseases in general and particularly measles continued in 2012 by implementation of immunization weeks [15, 16]. These efforts resulted in measles incidence reduction to fewer than 5 cases per 1,000,000 inhabitants between 2012 and 2014.

Measles surveillance performance

Measles surveillance performance was assessed on the basis of indicators. The first indicator was the percentage of districts that reported at least one suspect case of measles with a sample. From 2006 to 2009 Côte d'Ivoire achieved a low performance on this indicator as it was below the standard of at least 80% for 3 out of 4 years. Elsewhere, in the Democratic Republic of Congo, this indicator was also less than 80% over the period 2007 to 2011 [17]. In 2010, 73% (29) of African countries had achieved this target [18]. In Côte d'Ivoire, efforts have been made to improve measles surveillance, enabling the country to have from 2010 to 2014 more than 80% of districts that have reported at least one suspected case of measles with sample.

The second indicator was the number of notified measles suspect cases. Regarding this indicator, Côte d'Ivoire achieved good performance. Indeed, between 2007 and 2014 the number of notified measles suspect cases was greater than the expected number of cases.

The third indicator was the rate of non-febrile eruptions. Concerning this indicator, Côte d'Ivoire achieved good performance. Indeed, over the period 2007-2014, the country reached the objective of a non-febrile eruption rate of at least 2 cases per 100 000 inhabitants. In 2010, 63% (25) of African countries had achieved this objective [18].

EPI performance in terms of measles immunization coverage

Over the period 2005-2014, measles immunization coverage remained below 90%. In Mozambique, a similar study showed that measles immunization

coverage was above 80% over the period from 2005 to 2011 with coverage above 90% in 2006 and 2007 and from 2009 to 2011 [10].

Measles immunization coverage below 90% reflected an inadequate continuity in immunization services use. For example, from 2005 to 2014 tuberculosis vaccine coverage (BCG) and the first dose of diphtheria, tetanus and pertussis (DTP1) vaccine were higher than those of measles vaccine [10, 11, 19, 20, 21]. In 2011, measles vaccine coverage was at its lowest level (48%). This low coverage could be explained by the socio-political crisis in the country, from 2010 to 2011, which had a negative impact on immunization services [22]. Despite efforts to improve immunization coverage, the target of 90% measles immunization coverage has not been achieved by the country. Therefore, we can say that Côte d'Ivoire has not met measles elimination targets for routine immunization.

Supplementary immunization activities performance

From 2005 to 2014, four measles SIAs have been conducted in Côte d'Ivoire. WHO recommended an objective of at least 95% immunization coverage (confirmed by a survey) for each SIAs. This objective was achieved only in one out of four SIAs. Supplementary immunization activities are an essential component of the measles elimination strategy. Indeed, when the Pan American Health Organization members decided to eliminate measles, they adopted a strategy with three complementary components: 1) implementation of a catch-up campaign targeting children aged 9 months to 14 years, regardless of their immunization status or they have had measles; 2) Routine immunization with measles vaccine, measles and rubella vaccine (RR) or measles, mumps and rubella vaccine (MMR); and 3) implementation of periodic campaigns, roughly every 4 years, targeting children aged 1 to 4 years, regardless of whether they have had the disease or their immunization status. According to the Center for Disease Control and Prevention (CDC), the application of this strategy has considerably reduced the transmission of measles on the American continent. For example, many countries reported zero cases of measles for 3 years. Most countries in the Americas report sporadic cases or zero cases of measles [23].

CONCLUSION

From 2006 to 2014, measles control in Cote d'Ivoire showed mixed results. Performance of measles surveillance was good since the country had good performance for two out of three indicators. However, efforts are needed to improve immunization against measles through strengthening routine immunization.

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