Avoiding missed opportunities for immunization in the Central African Republic: potential impact on vaccination coverage

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Quantified in the study are the extent of missed opportunities for immunization and the potential increases in vaccination coverage and timeliness that could be achieved by using all health centre visits to administer childhood vaccinations in the Central African Republic. The data were collected during a national vaccination coverage survey of 642 children aged 12–23 months from three areas: rural, urban, and the capital, Bangui. Dates of all vaccination visits and other health centre visits were obtained from combined vaccination/health cards.

Nationwide, 70% of all opportunities for valid measles vaccine were missed. Of these, 28% occurred at visits when at least one vaccine was given, while 72% occurred at other health centre visits. If there had been no missed opportunities to administer all vaccinations due when at least one vaccine was given, the coverage would have increased from 53% to 67% for the diphtheria–pertussis–tetanus series, from 54% to 70% for measles, and from 34% to 59% for all antigens. If there had been no missed opportunities at any visit, the corresponding increases would have been to 70%, 76%, and 65%. For measles, 46% of the potential increase depends on recognizing that an earlier dose of the vaccine was invalid and on revaccinating. Days-at-risk for measles (after the age of 270 days) would have been reduced by a mean of 74 days per subject with a health card had no opportunities been missed.

The method used serves as a valuable adjunct to evaluations of missed opportunities based on exit interviews at health facilities. It may be feasible and useful to incorporate it in vaccination coverage surveys in other countries where all health facility visits are recorded on similar home-based cards.

Introduction

In 1986, the Central African Republic initiated an accelerated immunization programme, which became fully operational in 1988. As part of the programme, a policy of vaccinating eligible children at all health facility contacts was adopted (referred to subsequently as the “all-visits” policy). National surveys conducted in 1985 and in 1989 indicated that there had been a substantial increase in vaccination coverage. For example, coverage of 12–23-month-olds with measles vaccine increased from 30% in 1985 to 57% in 1989.6

However, in 1989 the Ministry of Health obtained evidence that the “all-visits” policy was not being widely implemented. In 1990, the national vaccination coverage survey required interviewers to record all dates of health facility visits for curative care and growth monitoring. The Ministry of Health undertook this expanded survey for the following reasons: to estimate the maximum gain in vaccination coverage that could be realized by using all opportunities for vaccination; and to establish baseline data for monitoring future changes in missed vaccination opportunities, thus allowing evaluation of new vaccination policies and health worker training programmes. The present article describes the methods used and results obtained in the 1990 missed opportunity analysis.

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Methods

A stratified national vaccination coverage survey of children aged 12–23 months was conducted in Central African Republic from 14 May to 31 May 1990. Included were children from villages and small towns (the “rural” stratum); from towns and cities with populations of 5000–40,000 (the “urban” stratum); and from Bangui (the national capital). With one exception the sampling procedures followed WHO guidelines. The starting point in each cluster was selected randomly from houses enumerated in a wedge-shaped area (expanding from the centre of the cluster to its outside edge), rather than from houses located along a line between the centre and the edge. This method was considered to be more effective in equalizing the likelihood of choosing houses in the periphery and at the centre of the cluster.

The dates of all childhood vaccinations (BCG, diphtheria–pertussis–tetanus (DPT) 1–3, poliovirus vaccine 0–3, measles, and yellow fever) and all other health facility visits (for growth monitoring and illness episodes) were copied from the children’s health booklets (referred to subsequently as “cards”). In the Central African Republic, one health card is used to record the dates of all health facility visits. The dates when vaccinations are administered are recorded in one section of the card, and those of health facility visits for all other reasons are noted in other sections. Maternal recollection of additional vaccination doses was also recorded, but we omitted such data since we could not verify the doses or specify the dates when they were administered. Only card-documented vaccine doses were included in the analysis.

Adherence to the all-visits policy was expressed as the proportion of all opportunities to vaccinate that were not missed. Missed opportunities were further categorized as occurring during either vaccination visits (including visits that combined vaccinations and other services) or other visits. For DPT3, the analyses were restricted to children who had received the prior doses (whether valid or not). For measles, adherence was calculated in two ways — including and excluding missed opportunities that followed an invalid measles dose (administered before a child was aged 270 days). The latter exclusion reflects the likelihood that health workers recognized the complete absence of measles vaccination more readily than the incorrect timing of a recorded dose.

Vaccination coverage was reported using three proportions, as described below. For each proportion, the denominator was taken to be all subjects, including those with and without health cards.

- **Valid coverage** was defined as the percentage of subjects whose vaccination dates met the following minimum age and interval requirements of the Central African Republic’s Expanded Programme on Immunization: DPT1/poliovirus vaccine 1 should be given at or after 6 weeks of age; measles vaccine, at or after 9 months of age (270 days was used in the analysis); and that the interval between the first and second, and the second and third doses of DPT and oral poliovirus vaccine be at least 4 weeks. If the DPT or poliovirus vaccine doses were non-valid, the subsequent doses were renumbered accordingly, e.g., reported dose 2 became valid dose 1 if reported dose 1 had been given too early. Vaccines given after a child was 1 year of age were accepted if otherwise valid.

- **Simultaneous coverage** was defined as the percentage of subjects who could have received specified valid vaccinations if all needed vaccines had been given on the dates when at least one vaccination was administered. For the analysis, these visits were termed “vaccination visits”, although they could have been initiated for another reason. For example, using this measure all children who received any vaccination after 270 days of age would be considered as vaccinated for measles. Simultaneous coverage was calculated first because it requires only minor behavioural changes by health workers, since the children were already receiving some vaccination services and had their vaccination cards checked.

- **Finally, all-visits coverage** was defined as the percentage of subjects who could have received valid vaccinations if all documented health centre visits (including vaccination visits) had been used to vaccinate eligible children. The difference between all visits and simultaneous coverage represents the additional increase in coverage caused by taking advantage of non-vaccination health centre visits, after already avoiding missed opportunities at vaccination visits. For a child with missed opportunities for the same vaccine dose at both vaccination and non-vaccination health centre visits, the increase in coverage was credited to simultaneous vaccination. This method minimizes the coverage gain attributed to non-vaccination visits.

A missed opportunity for vaccination was defined as a vaccination visit or other health centre visit by a child who did not receive a vaccination for which he or she was eligible. Health cards do not record the presence of contraindications to vaccina-
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Immunization policy in the Central African Republic encourages the immunization of all age-eligible children, unless they are sick enough to warrant hospitalization. In our analysis, eligibility was decided solely on the basis of age, since no information on hospitalizations was collected. Missed opportunities for simultaneous vaccination would be unaffected, since by definition these children were considered well enough to vaccinate. Full coverage was defined as BCG, DPT1–3, poliovirus vaccine 1–3, and measles, in keeping with the Ministry of Health definition.

Days-at-risk for measles was defined as the age in days at measles vaccination minus 270 days for children who had received a valid measles vaccination. For children who had not received a valid measles vaccination, days-at-risk for measles was defined as their age in days on 31 May 1990 minus 270 days. Means for this variable include only subjects with health cards.

Vaccination coverage at specific ages in months was calculated using only children who had reached these ages at the time of the survey. Coverage was calculated only up to 21 months of age because of diminishing sample size beyond this age.

Data were analysed at the Centers for Disease Control and Prevention using Statistical Analysis System (SAS) version 5.18 (1) and PROC SESA-DAAN software (2). National results for all means and percentages were weighted by the proportion of the population of the Central African Republic living in each of the study strata, adjusted for slight differences in area sample sizes. The proportions used were as follows: 0.578 (rural), 0.237 (urban), and 0.184 (Bangui). c

Results

Vaccination information was obtained for 642 children, 84.5% of whom (national weighted mean) had a health card (Table 1). Among children with a health card, the mean number of vaccination visits was 4.1 and the mean number of health facility visits for other reasons was 8.8. A total of 72% had at least one card-documented health facility visit for non-vaccination purposes; 36.7% had at least one such visit after 270 days of age (the minimum age for measles vaccination).

Adherence to the all-visits policy

Nationwide, 61% of all opportunities for valid DPT1 and 62% of all opportunities for valid DPT3 vaccination were missed (Table 2). For measles, 70% of all opportunities for valid vaccination were missed nationwide. These proportions were similar in the three geographical areas but were slightly higher in urban areas and Bangui.

For DPT1, 19% of the missed opportunities nationwide occurred at visits when another vaccine was given, and 81% when no other vaccine was given (Table 3). The results for DPT3 were similar, although only 11% of missed opportunities occurred at the visits when another vaccine was given. A total of 28% of missed opportunities for measles vaccination occurred at visits when another vaccine was given, while 72% were at non-vaccination visits. For all three vaccines, the rural area had the highest proportion of missed opportunities that occurred when another vaccine was given, but in all the study strata most missed opportunities occurred at non-vaccination visits.

Nationwide, 70% of missed opportunities for measles vaccination occurred when no previous measles dose had been given, and 30% occurred when an earlier dose was invalid (Table 4). The proportion that occurred when no previous dose had been received was higher in Bangui (80%) than in rural and urban areas.

Vaccination coverage: valid and potential

The highest valid coverage levels for all antigens were found in Bangui, followed by the urban and then the rural area. DPT3, measles, and full vaccination coverage levels are shown in Table 5 and Fig. 1. If vaccination visits had been used to administer all DPT doses that were due, national valid coverage for the full DPT series would have increased from 53% to 67%; avoiding missed opportunities at all health facility visits would have further increased valid coverage to 70%. Thus, once all missed opportunities at vaccination visits were avoided, the more numerous missed opportunities at non-vaccination visits yielded little additional benefit. National valid vaccination coverage for measles would have increased from 54% to 70% by using vaccination visits, and to 76% by using all health facility visits. The biggest potential improvements in measles coverage from using all health facility visits were in rural areas (48% to 70%) and in urban areas (57% to 79%). The greatest potential increase of a coverage measure was for full vaccination coverage (34% to 65%); this increase was greatest in urban areas (38% to 75%).

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Table 1: Possession of a health card and frequency of vaccination and other health facility visits among the study sample of 12–23-month-olds, Central African Republic, 1990

<table>
<thead>
<tr>
<th>No. in area:</th>
<th>Rural</th>
<th>Urban</th>
<th>Bangui</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total sample size</td>
<td>220</td>
<td>210</td>
<td>212</td>
<td>220</td>
</tr>
<tr>
<td>No. with health cards</td>
<td>174 (79.1)</td>
<td>184 (87.6)</td>
<td>209 (98.5)</td>
<td>220 (84.5)</td>
</tr>
</tbody>
</table>

Frequency of health centre contacts:

- Mean vaccination visits per subject with card: 3.5, 4.6, 5.1, 4.1
- Mean non-vaccination visits per subject with card: 5.1, 13.0, 13.6, 8.8
- Total: 8.6, 17.6, 18.7, 12.9

No. with ≥1 non-vaccination health facility visits:

- At any age: 92 (52.9), 170 (92.4), 207 (99.0), (72.0)
- At ≥270 days of age: 44 (25.3), 87 (47.3), 114 (54.5), (36.7)

* Weighted data.

* Figures in parentheses are percentages.

* Percentage of those with cards.

Potential gains in measles coverage reflected missed opportunities of several types. As noted above, most potential increases resulted from simultaneous vaccination, leaving little potential benefit from non-vaccination visits. The main exception was measles coverage in Bangui and other urban areas: in such areas, vaccines other than measles were usually administered before the minimum age of 270 days for measles vaccine, providing few chances to administer this vaccine. Also, most increases (54%) represented vaccinations of children who had never been vaccinated, rather than replacing vaccinations that had been administered too early (prior to 270 days of age).

Days-at-risk for measles

If all health facility visits had been used as opportunities to vaccinate, days-at-risk for measles could potentially have been reduced nationally by a mean of 74 days per child with a health card (Table 6). The overall potential reduction was greatest in rural areas and lowest in Bangui, but the geographical pattern of findings varied by measles vaccination status. For all children who had a documented valid measles

Table 2: Frequency of missed opportunities for vaccination, by antigen, among the study sample of 12–23-month-olds, Central African Republic, 1990

<table>
<thead>
<tr>
<th>Antigen</th>
<th>No. in area:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rural</td>
</tr>
<tr>
<td><strong>DPT1</strong></td>
<td></td>
</tr>
<tr>
<td>No. of missed opportunities</td>
<td>223 (57)*</td>
</tr>
<tr>
<td>No. of valid vaccinations</td>
<td>167 (43)</td>
</tr>
<tr>
<td>Total</td>
<td>390</td>
</tr>
<tr>
<td><strong>DPT3</strong></td>
<td></td>
</tr>
<tr>
<td>No. of missed opportunities</td>
<td>143 (58)</td>
</tr>
<tr>
<td>No. of valid vaccinations</td>
<td>104 (42)</td>
</tr>
<tr>
<td>Total</td>
<td>247</td>
</tr>
<tr>
<td><strong>Measles</strong></td>
<td></td>
</tr>
<tr>
<td>No. of missed opportunities</td>
<td>228 (68)</td>
</tr>
<tr>
<td>No. of valid vaccinations</td>
<td>105 (32)</td>
</tr>
<tr>
<td>Total</td>
<td>333</td>
</tr>
</tbody>
</table>

* Figures in parentheses are the percentages of the total opportunities to vaccinate for each geographical area.
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Table 3: Frequency of missed opportunities for vaccination, by antigen and whether another vaccine was given, among the study sample of 12–23-month-olds, Central African Republic, 1990

<table>
<thead>
<tr>
<th>No. in area:</th>
<th>Rural</th>
<th>Urban</th>
<th>Bangui</th>
<th>Nationala</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Missed opportunity for DPT1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Another vaccine was given</td>
<td>47 (21)b</td>
<td>46 (16)</td>
<td>61 (15)</td>
<td>(19)</td>
</tr>
<tr>
<td>No other vaccine was given</td>
<td>176 (79)</td>
<td>245 (84)</td>
<td>354 (85)</td>
<td>(81)</td>
</tr>
<tr>
<td>Total</td>
<td>223</td>
<td>291</td>
<td>415</td>
<td></td>
</tr>
<tr>
<td><strong>Missed opportunity for DPT3c</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Another vaccine was given</td>
<td>16 (11)</td>
<td>30 (10)</td>
<td>31 (10)</td>
<td>(11)</td>
</tr>
<tr>
<td>No other vaccine was given</td>
<td>127 (89)</td>
<td>272 (90)</td>
<td>280 (90)</td>
<td>(89)</td>
</tr>
<tr>
<td>Total</td>
<td>143</td>
<td>302</td>
<td>311</td>
<td></td>
</tr>
<tr>
<td><strong>Missed opportunity for measles</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Another vaccine was given</td>
<td>86 (38)</td>
<td>40 (11)</td>
<td>51 (16)</td>
<td>(28)</td>
</tr>
<tr>
<td>No other vaccine was given</td>
<td>142 (62)</td>
<td>308 (89)</td>
<td>268 (84)</td>
<td>(72)</td>
</tr>
<tr>
<td>Total</td>
<td>228</td>
<td>348</td>
<td>319</td>
<td></td>
</tr>
</tbody>
</table>

a Weighted data.
b Figures in parentheses are the percentages of the total missed opportunities for each geographical area.
c Analysis for DPT3 is restricted to children who had received DPT2 (whether valid or not).

Vaccination, the mean potential reduction was 31 days; for the subset of children who had a valid measles vaccination but who could have been vaccinated earlier (i.e., excluding those without an opportunity for earlier vaccination), it was 70 days. For children lacking a valid measles vaccination, the mean reduction was 151 days; for those who had at least one missed opportunity for valid measles vaccination, it was 220 days.

Measles vaccination coverage versus age

The improvement in timeliness of measles vaccination is shown in Fig. 2. Maximum vaccination levels were higher for Bangui than for urban areas, and much higher than for rural areas; in addition, the vaccinations were more timely, with more of the vaccines being given closer to the ideal age of 9 months. This is illustrated by the steep rise in the curve and by the early plateau for Bangui and, to a lesser extent, for urban areas. In rural areas, coverage increased much more slowly below 1 year of age, but continued to increase steadily over subsequent months.

Valid coverage was lowest and rose the slowest. While potential coverage using all vaccination visits was much higher than valid coverage, potential coverage using all health centre visits was higher still. The elimination of missed opportunities at non-vaccination health centre visits provided the greatest additional gain in coverage in urban areas, but relatively little additional gain in rural areas.

Discussion

The analysis presented here quantifies the frequency of missed opportunities and the potential for vaccination at every health facility visit to increase vaccination coverage and to reduce days-at-risk for disease. The proportion of opportunities for measles vaccination that were missed (70%) indicates that many children had many missed opportunities, even if they received other vaccinations and had no recorded evi-

Table 4: Frequency of missed opportunities for measles vaccination, by vaccination history, among the study sample of 12–23-month-olds, Central African Republic, 1990

<table>
<thead>
<tr>
<th>No. in area:</th>
<th>Rural</th>
<th>Urban</th>
<th>Bangui</th>
<th>Nationala</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dose not received previously</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earlier dose invalid</td>
<td>155 (68)b</td>
<td>235 (68)</td>
<td>255 (80)</td>
<td>(70)</td>
</tr>
<tr>
<td>Total</td>
<td>73 (32)</td>
<td>113 (32)</td>
<td>64 (20)</td>
<td>(30)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>228</td>
<td>348</td>
<td>319</td>
<td></td>
</tr>
</tbody>
</table>

a Weighted data.
b Figures in parentheses are the percentages of the total missed opportunities for each geographical area.
### Table 5: Valid vaccination coverage and potential increase in such coverage by avoiding missed opportunities for simultaneous vaccination and all missed opportunities for vaccination, among the study sample of 12-23-month-olds, Central African Republic, 1990

<table>
<thead>
<tr>
<th>% in area:</th>
<th>Rural</th>
<th>Urban</th>
<th>Bangui</th>
<th>National</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full DPT series</strong>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid doses noted on card</td>
<td>44</td>
<td>60</td>
<td>75</td>
<td>53</td>
</tr>
<tr>
<td>Potential coverage using:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— vaccination visits only</td>
<td>57</td>
<td>75</td>
<td>93</td>
<td>67</td>
</tr>
<tr>
<td>— all health centre visits</td>
<td>59</td>
<td>78</td>
<td>95</td>
<td>70</td>
</tr>
<tr>
<td><strong>Measles</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid dose noted on card</td>
<td>48</td>
<td>57</td>
<td>73</td>
<td>54</td>
</tr>
<tr>
<td>Potential coverage using:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— vaccination visits only</td>
<td>68</td>
<td>67</td>
<td>82</td>
<td>70</td>
</tr>
<tr>
<td>— all health centre visits</td>
<td>70</td>
<td>79</td>
<td>90</td>
<td>76</td>
</tr>
<tr>
<td>Potential increase:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— maximum</td>
<td>22</td>
<td>22</td>
<td>17</td>
<td>22</td>
</tr>
<tr>
<td>— administering only absent doses***</td>
<td>10</td>
<td>14</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Maximum potential increase</td>
<td>15</td>
<td>18</td>
<td>20</td>
<td>17</td>
</tr>
<tr>
<td><strong>Full coverage</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid doses noted on card</td>
<td>27</td>
<td>38</td>
<td>54</td>
<td>34</td>
</tr>
<tr>
<td>Potential coverage using:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>— vaccination visits only</td>
<td>51</td>
<td>63</td>
<td>81</td>
<td>59</td>
</tr>
<tr>
<td>— all health centre visits</td>
<td>55</td>
<td>75</td>
<td>89</td>
<td>65</td>
</tr>
<tr>
<td>Maximum potential increase</td>
<td>28</td>
<td>37</td>
<td>35</td>
<td>31</td>
</tr>
</tbody>
</table>

* Potential coverage for DPT series based on taking advantage of missed opportunities for DPT1, DPT2, and DPT3.

** Excludes replacement of invalid doses.

*** BCG, DPT1–2–3, poliovirus vaccine 1–2–3, and measles (eight doses in total).

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**Fig. 1.** a) "Valid" vaccination coverage, b) potential increase in such coverage by avoiding missed opportunities for simultaneous vaccination, and c) all opportunities for vaccination. National vaccination coverage survey of 12-23-month-olds, Central African Republic, 1990. (R = rural; U = urban; B = Bangui; N = national).

The finding that most of the potential increase in vaccination coverage would be achieved using simultaneous vaccination is a reflection of our method of analysis. Since we assumed that it requires less behavioural change on the part of health care staff to avoid missed opportunities at vaccination visits than at other health facility visits, we initially calculated the simultaneous coverage. Thus, for a child with four missed opportunities for measles vaccination at non-vaccination visits and one missed opportunity at a vaccination visit, the gain in coverage was attributed to simultaneous vaccination. Since few children had missed opportunities only at non-vaccination
visits, such visits would have yielded relatively little additional benefit after all missed opportunities at vaccination visits were avoided. Had we initially calculated the potential increases in coverage due to avoiding missed opportunities at non-vaccination visits, there would have been less gain associated with doing so at vaccination visits. Using this approach, the potential gain in measles vaccination coverage due to avoiding missed opportunities at vaccination visits would have been 8%, rather than the 16% shown in Table 5. For the full DPT series, the potential gain in coverage associated with vaccination visits would have been 2% rather than 14%.

Although WHO recommends avoiding missed immunization opportunities and many ministries of health have adopted such a policy, exit interviews at health facilities show that missed opportunities continue to occur frequently; up to 60% of children in some countries have at least one missed opportunity (3). One explanation for the continued missed opportunities is that exit interviews fail to demonstrate how much coverage could be increased by avoiding missed opportunities. As a result, ministries of health may have been uncertain about what priority to attach to the policy. The results of our study have reduced this uncertainty by demonstrating major potential increases in vaccination coverage. One previous study reported that in Mozambique (based on growth monitoring dates) and in Guinea (relying mostly on mothers’ histories of visits), 8% and 19%, respectively, of incompletely vaccinated children had sufficient health centre contacts for them to have been fully and correctly vaccinated (4). Thus, the impact of avoiding missed opportunities is potentially greater in the Central African Republic than in these two countries.

An analysis based on the records of all health facility visits may not be feasible in most settings, since it requires access to data often not recorded on documents kept at home. In the Central African Republic, however, the use of a single health document to record both vaccinations and other health care enabled us to consider all types of health facility visits. The practice of using different health cards for vaccination, preventive care, and curative care, which is common in other countries, might pose logistical barriers to collecting data on all health centre visits; also, in some countries, there are no home-based records of curative visits. Furthermore, because of the high availability of health cards in the Central African Republic (85% nationally), the missed opportunity analysis could be applied to the majority of children in the survey sample. Even in the absence of information on all health centre visits, much of the potential increase in vaccination coverage can be documented with data limited to vaccination visits. The potential benefit from simultaneous vaccination can be assessed using COSAS 4.3 software for vaccination survey analysis, which permits an analysis similar to the method we used.6

Our analysis did not attempt to determine the reasons why immunization opportunities were

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Avoiding missed opportunities for immunization: impact on vaccination coverage

<table>
<thead>
<tr>
<th>Table 6: Potential decrease in days-at-risk for measles by avoiding all missed opportunities for vaccination among the study sample of 12–23-month-olds, Central African Republic, 1990</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Decrease in days-at-risk in area:</strong></td>
</tr>
<tr>
<td>Rural</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>All subjects with cards</td>
</tr>
<tr>
<td>Children with valid measles vaccination noted on card</td>
</tr>
<tr>
<td>Children with opportunity for earlier vaccination</td>
</tr>
<tr>
<td>Mean for all children with valid vaccination</td>
</tr>
<tr>
<td>Children without valid measles vaccination noted on card</td>
</tr>
<tr>
<td>Children with opportunity for valid vaccinationb</td>
</tr>
<tr>
<td>Mean for all children without valid vaccination</td>
</tr>
</tbody>
</table>

a Figures in parentheses are the total number for the particular subgroup.
b Includes those never vaccinated (n=79) and those vaccinated before age 270 days (n=51); results for the two groups were very similar.

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describe the reasons for missed vaccination opportunities (8).  

In countries where combined vaccination/health cards are used, the method described in this study can provide a well-documented, population-based assessment of the frequency of missed opportunities and the potential gains in coverage achievable by avoiding them. Efforts to reduce missed opportunities should be monitored using this and other methods to demonstrate the extent to which potential increases in coverage can be practically achieved, and to identify the best training, supervisory, and record-keeping techniques for achieving these increases.


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### Résumé

**Éviter les occasions manquées de vaccination en République centrafricaine: impact potentiel sur la couverture vaccinale**

Cette étude réalisée en République centrafricaine évalue l’ampleur des occasions manquées de vaccination, ainsi que l’amélioration potentielle de la couverture vaccinale et du respect du calen-
drier vaccinal qui pourrait être obtenue si l'on profi- 
tait de chaque visite à un centre de santé pour 
effectuer les vaccinations nécessaires.

Les données ont été recueillies au cours 
d'une enquête nationale sur la couverture vacci- 
 nale, selon une version modifiée des directives de 
 l'OMS. L'échantillon se composait de 642 enfants 
âgés de 12 à 23 mois, recrutés dans des zones 
 rurales, des zones urbaines et dans la capitale, 
 Bangui. Les dates de toutes les vaccinations et 
des autres visites aux centres de santé (pour les 
 contrôles de croissance et les soins curatifs) ont 
et été obtenues d'après les carnets de santé des 
 enfants. La fréquence des occasions manquées, 
 la couverture vaccinale actuelle et la couverture 
 vaccinale qu'il devrait être possible d'atteindre ont 
et été calculées d'après les âges et les intervalles 
 requis pour les diverses doses de vaccin confor-
 mément à la politique nationale de vaccination. 
Les "jours à risque" pour la rougeole ont été défi-
nis comme le nombre de jours écoulés sans vac-
cination antirougeoleuse valable, après qu'un enfant ait atteint l'âge de 270 jours.

Au total, 84,5% (moyenne nationale pondérée) 
des enfants recrutés dans l'étude possé- 
daient un carnet de santé. A l'échelle du pays, 
70% de toutes les occasions de vaccination anti-
 rougeoleuse ont été manquées, et se répartis-
saient comme suit: 28% ont été manquées lors 
de visites comportant l'administration d'au moins 
un vaccin, et 72% lors d'autres visites au centre 
de santé. Si aucune occasion n'avait été man- 
quée pour administrer toutes les vaccinations dont 
l' enfant avait besoin lors d'une visite au cours 
de laquelle au moins un vaccin avait été administré, 
de la couverture vaccinale serait passée de 53% à 
67% pour la série diptétrie-tétanos-coqueluche, 
de 54% à 70% pour la rougeole, et de 34% à 
59% pour l'ensemble des antigènes. Si aucune 
occasion n’avait été manquée, c’est-à-dire lors de 
toutes les visites au centre de santé, les chiffres 
seraient passés, respectivement, à 70%, 76% et 
65%. Pour le vaccin antirougeoleux, 46% de 
l’augmentation potentielle supposerait que l’on 
reconnaîsse la non validité d’une dose antérieure 
et que l’on procède à une revaccination. Le 
nombre de jours à risque pour la rougeole aurait 
et été réduit en moyenne de 74 jours par sujet pos- 
sédant un carnet de santé si aucune occasion de 
vaccination n'avait été manquée.

En fournissant des estimations bien documen-
tées, obtenues en population, sur la fréquence 
des occasions manquées de vaccination et leur 
impact potentiel sur la couverture vaccinale, la 
méthode utilisée ici constitue un apport valable 
avs évaluations des occasions manquées fondées 
sur des interrogatoires à la sortie des centres de 
santé. Les résultats montrent qu’en République 
centrafricaine, environ les deux tiers de l’en-
semble des occasions de vacciner les enfants 
sont manquées, que l’on obtiendrait une améliora-
tion substantielle de la couverture vaccinale si ces 
occasions manquées étaient évitées, que la 
 majeure partie du gain potentiel résulterait des 
occasions non manquées d’administration simulta-
née de plusieurs vaccins, et qu'environ la moitié 
de certains dums vaccin potentiels de couverture vaccinale antirou- 
geoleuse pourrait être obtenue sans qu’il soit 
nécessaire de reconnaître les doses non valables. 
Il serait possible, et utile, d'incorporer ces mé-
thodes dans les enquêtes de couverture vaccinale 
 réalisées dans d'autres pays où toutes les visites 
 à un centre de santé sont enregistrées sur un car-
et de santé conservé à la maison.

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