An Evaluation of Community Perspectives and Contributing Factors to Missed Children During an Oral Polio Vaccination Campaign – Katsina State, Nigeria

Charles A. Michael,1 Samra Ashena,2 Ikechukwu U. Oghuanu,1 Adamu Sule,1 Melissa Corkum,2 Susan Mackay,2 Aaron D. Storms,2 Panchanan Achari,3 Oladayo Biya,1 Patrick Nguku,1 David Newberry,2 Ado Bwaka, Frank Mahoney,2 and the OPV Campaign Missed Children Study Team

1African Field Epidemiology Network (AFENET), and 2US Centers for Disease Control and Prevention, Atlanta, Georgia; 3United Nations Children Fund (UNICEF), Nigeria Country Office, and 4World Health Organization (WHO), Katsina State Office, Nigeria

Background. Unvaccinated children contribute to accumulation of susceptible persons and the continued transmission of wild poliovirus in Nigeria. In September 2012, the Expert Review Committee (ERC) on Polio Eradication and Routine Immunization in Nigeria recommended that social research be conducted to better understand why children are missed during supplementary immunization activities (SIAs), also known as “immunization plus days (IPDs)” in Nigeria.

Methods. Immediately following the SIA in October 2012, polio eradication partners and the government of Nigeria conducted a study to assess why children are missed. We used semistructured questionnaires and focus group discussions in 1 rural and 1 urban local government area (LGA) of Katsina State.

Results. Participants reported that 61% of the children were not vaccinated because of poor vaccination team performance: either the teams did not visit the homes (25%) or the children were reported absent and not revisited (36%). This lack of access to vaccine was more frequently reported by respondents from scattered/nomadic communities (85%). In 1 out of 4 respondents (25%), refusal was the main reason their child was not vaccinated. The majority of respondents reported they would have consented to their children being vaccinated if the vaccine had been offered.

Conclusions. Poor vaccination team performance is a major contributor to missed children during IPD campaigns. Addressing such operational deficiencies will help close the polio immunity gap and eradicate polio from Nigeria.

Keywords. OPV; oral polio vaccine; missed children; vaccine coverage; non-compliance.

Nigeria is 1 of only 3 countries globally and the only country in Africa that has never interrupted endemic transmission of wild poliovirus (WPV). Despite progress during 2012–2013 in reducing the number of missed children during SIAs (ie, decrease in the proportion of local government areas [LGAs] that failed to meet the <20% missed children threshold by lot quality-assurance sampling [1]), many children remain unreached. According to the July 2012 United Nations Children’s Fund (UNICEF) Social Data Analysis, the proportion of missed children during SIAs remained high in some high-risk states [2]. Sokoto state had the highest proportion (8.6%), followed by Kano (7.8%), Jigawa (7.7%), and Katsina states (7.6%). In addition, during August 2012–April 2013, field outreach activities enumerated large numbers of chronically missed settlements that had never been visited by vaccination teams during previous SIAs [3]. Unvaccinated children contribute to accumulation of polio-susceptible persons and the continued transmission of WPV in Nigeria.

The most commonly reported reason for missing children in Nigeria and other priority countries is that children are not at home when the vaccination teams
visit [2]. However, vaccination refusals are also an important issue. A recent assessment of the reasons children are missed during supplementary immunization activities (SIAs) in the Democratic Republic of the Congo (DR Congo) showed that 46% of children were missed because of vaccine refusal by caregivers [3]. Similarly, in an analysis of the 2012 polio case investigation forms, overt refusals accounted for 24% of missed children in high-risk areas of Nigeria, and more than 1/3 of the polio cases were from families that actively refused OPV [4]. Nonetheless, no previous empirical studies have clearly documented why children are continually missed during OPV campaigns in Nigeria. As reported in the DR Congo study, if not adequately addressed, a rise in polio cases in states with a high proportion of missed children has the potential to put surrounding polio-free states and other African countries at risk of reinfecion.

In recognition of the negative impact of continually missing children during SIAs, the 24th Expert Review Committee on polio eradication and routine immunization (ERC), in its September 2012 meeting, recommended that social research should be conducted to better understand the reasons, from a community perspective, that children are missed during SIAs. In response to the ERC recommendation, we conducted a study in Katsina State to assess the extent of, and reasons for, missed children during SIAs. Katsina recorded the highest number of WPV cases in 2012 and during independent monitoring in August 2012, had one of the highest proportions of missed children. Katsina is one of the 7 states in the North Western Zone of Nigeria where WPV was endemic as of the time of the study. Of the 34 LGAs in Katsina state, 19 (56%) were designated as very high risk for polio and 13 (38%) as high risk. Katsina shares borders with Niger Republic in the north, and the States of Kaduna in the south, Zamfara in the West, and Jigawa and Kano in the east. The number of polio cases in Katsina rose from 1 and 2 cases in 2010 and 2011, respectively, to 22 cases as of the time of the study (August 2012). In addition, there was a reported increase in the proportion of missed children between the February and July 2012 SIAs.

The objective of this study was to provide empirical evidence to assist polio eradication partners to develop new communication approaches and programmatic strategies to address the chronic issue of missed children in Nigeria.

**METHODS**

**Study Site and Design**

Two LGAs in Katsina State, 1 urban (Katsina) and 1 rural (Batsari), were selected for the study. Katsina and Batsari LGAs with 8 and 3 confirmed WPV cases, respectively, had the highest number of WPV cases as of August 2012. In addition, Katsina LGA consistently recorded >10% missed children in the 3 preceding SIAs, with a peak of 33% in July 2012. The 2 selected LGAs are inhabited by predominantly Hausa/Fulani-speakers, with Islam as the major religion (Table 1). There were 2 phases of the study: a cross-sectional study using interviewer-administered semistructured questionnaires and focus group discussions (FGDs).

**Cross-sectional Study Using Interviewer-administered Questionnaires**

Within 7 days of the end of the October 2012 SIA, we conducted interviews in public places (eg, markets, bus stations or motor parks, hospitals, and social events) using semistructured questionnaires. To increase participation and ensure a random mixing of residents, we selected the participants from the largest public places in the respective LGAs; usually these were located in the capital ward/subdistrict of the LGA or the adjacent wards. With the assistance of female community volunteers, interviewers (stationed at different points in the public places) approached caregivers/women with young (<5 year old) children to request their participation. Following a caregiver’s verbal consent, the child’s little finger was checked for remnants of the indelible ink mark as proof of recent polio vaccination. Those without visible finger marking were classified as “missed,” and their consenting caregivers were interviewed using a standardized questionnaire. Interviewers approached as many caregivers as possible and consecutively interviewed all those who consented and had “missed” children. The majority of people accepted to be interviewed, but the exact proportion was not recorded.

---

**Table 1. Demographic Characteristics of Questionnaire Respondents of OPV Missed Children Study in Northern Nigeria—October 2012**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Variables</th>
<th>Frequency (N = 96)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Median age (y)</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Range (y)</td>
<td>17–55</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>95 (99%)</td>
</tr>
<tr>
<td>Tribe</td>
<td>Hausa</td>
<td>71 (74%)</td>
</tr>
<tr>
<td></td>
<td>Fulani</td>
<td>21 (22%)</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>4 (4%)</td>
</tr>
<tr>
<td>Religion</td>
<td>Islam</td>
<td>92 (97%)</td>
</tr>
<tr>
<td>Educational level</td>
<td>No education</td>
<td>16 (17%)</td>
</tr>
<tr>
<td></td>
<td>Qur’anic education</td>
<td>48 (50%)</td>
</tr>
<tr>
<td></td>
<td>Primary/higher education</td>
<td>32 (33%)</td>
</tr>
<tr>
<td>Settlement</td>
<td>Rural</td>
<td>47 (49%)</td>
</tr>
<tr>
<td></td>
<td>Rural nomadic</td>
<td>20 (21%)</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>29 (30%)</td>
</tr>
<tr>
<td>Occupation</td>
<td>Civil servant</td>
<td>5 (5%)</td>
</tr>
<tr>
<td></td>
<td>Housewife</td>
<td>59 (62%)</td>
</tr>
<tr>
<td></td>
<td>Schooling</td>
<td>1 (1%)</td>
</tr>
<tr>
<td></td>
<td>Trading</td>
<td>31 (32%)</td>
</tr>
</tbody>
</table>

Abbreviation: OPV, oral polio vaccine.
Interviews were conducted in quiet places within the public venue (e.g., hospital waiting rooms, in front of market shops, fixed posts in bus stations or motor parks). Post-interview economic compensation of N500 (500 Naira = approximately US $3) was offered to each respondent in return for their time. Most interviews were conducted in Hausa language since the interviewers were native Hausa speakers. The duration of the interviews ranged between 20 and 45 minutes (median = 30 minutes).

Focus Group Discussions (FGDs)
We conducted FGDs in the same 2 LGAs in Katsina State as the semistructured interviews. Interviewers met with LGA immunization staff and reviewed campaign tally sheets to identify wards and settlements with the highest number of missed children. The interviewers then liaised with community volunteers to identify households with missed children (as determined by house markings) in the selected wards and settlements. Community volunteers approached households and invited them to participate in the FGDs and also coordinated the logistics of the meetings (i.e., identified the time and venue for the FGD and informed all participants).

The FGDs were conducted in diverse types of locations, including mosques, schools, viewing centers, primary healthcare centers, and the homes of traditional leaders. Interviewing teams were composed of 3 staff: 1 trained Field Epidemiology and Laboratory Training Program (FELTP) resident or National Stop Transmission of Polio (NSTOP) staff who served as the moderator, a second FELTP-NSTOP resident who served as the recorder, and 1 observer who was usually a community volunteer. Interviewers conducted 36 FGDs (18 per LGA) over a 3-day period. There were 8–12 participants in each focus group. Katsina LGA had separate FGDs for mothers, fathers, and grandparents, whereas most FGD participants in Batsari LGA were fathers.

An economic compensation of N500 (500 Naira = approximately US$3) was offered to each participant for their time and to cover transportation costs. All interviews were conducted in Hausa because most of the interviewers were fluent Hausa speakers. Each FGD lasted between 45 and 60 minutes.

Data Management
Questionnaire data were entered into Epi-Info database version 3.4.5 (US Centers for Disease Control and Prevention, Atlanta, GA), whereas qualitative data from FGDs were summarized by theme and content in a Microsoft Excel spreadsheet (Microsoft Corporation, Seattle, Washington).

Data Analysis
Both qualitative and quantitative data analyses were conducted on the responses from the questionnaires and FGDs. Qualitative analysis was conducted on the responses to open-ended questions, whereas frequencies were calculated from responses that were categorical (e.g., “yes/no” answers, education level, race). In addition, after completing the qualitative analysis of responses to open-ended questions, the frequency of themes was quantified for most questions (e.g., perceived polio threat, reasons for children being missed, perception of campaigns and vaccination teams). The data from the FGDs were sparse, because we did not obtain full transcripts of the discussions; instead, FGD facilitators captured only short answers and consensus statements from the group. For this reason, the data from the questionnaires and FGDs were analyzed similarly.

Prior to the commencement of data analysis, a coding list and structure were developed using the framework of themes and topics that were central to the objective of the study as described in the study protocol. The analysis used open coding (developed by Strauss & Corbin, 1990 [5]) and was conducted separately by 2 investigators on the analysis team. Results were compared between the 2 investigators to ensure consistency. The codes were then applied to responses from the questionnaires and FGDs. Subsequently, the coding list and structure were modified in an iterative process during analysis of the data to reflect the nuances of the data. Changes to the coding list and structure were made after consensus discussion by the entire analysis team. Excel 2010 was used to tabulate and calculate frequencies for each response and to create graphs from selected questionnaire data.

Ethical Considerations
Prior to conducting the in-depth interviews and FGDs, all participants provided verbal consent. Participants received information about the project, procedures, benefits, and confidentiality and were reminded that their participation was voluntary. The interviewers resolved any concerns about the study prior to the commencement of interviews and FGDs.

RESULTS
Demographics
We obtained data from 96 questionnaires and 28 FGDs. Demographic data were only available from the questionnaire respondents. In sum, 99% of respondents were female with a median age of 27 years (range 17 to 55); 97% were Muslim, and most were from the Hausa (74%) or Fulani (22%) tribes. Most respondents described their settlement as rural (70%); of the 70%, 21% further described their settlement as scattered or nomadic (Table 1). The educational level was low, with 17% having had no education, 50% with only a Qur’anic education, and 33% with a primary or higher education. More than half of FGD groups were composed exclusively of male participants (15 of 28), with 7 composed only of females and 7 of mixed gender.

Polio Risk Perception and Understanding of Polio
Polio risk perception was low to moderate: 59% of questionnaire respondents believed that polio was a significant problem in their community and 41% believed that their child was at risk.
for polio. However, the large majority (82%) would have agreed to vaccinate their children if the vaccine had been available to them. The most common concerns mentioned by people who believed that polio was a significant problem in their community were that it causes paralysis, unproductiveness/disability, deformity, and that it was a permanent condition. The most common themes mentioned by people who did not believe that polio was a significant problem in the community were that it was not a common condition, and that other health problems were more important. The responses were similar when participants commented on the risks specifically to their children; however, other themes mentioned in the questionnaire were that lack of vaccination was related to polio risk and that the risk was out of their hands (“God’s will” or “destiny”).

When asked about what causes polio, the most commonly mentioned themes were lack of cleanliness (ie, environmental, water, food, and personal hygiene) followed by fever, God’s will/destiny, evil spirits, and lack of vaccination. The most frequently mentioned ways to protect against polio were vaccination and cleanliness (ie, environmental, water, food, and personal hygiene). Other less common answers were God/prayers and medical care (ie, visiting healthcare facilities and taking medications).

**Reasons for Missed Children During the Recent OPV Campaign**

The most common reason that children were missed during the October 2012 campaign (mentioned by 60% of questionnaire respondents) was lack of access to the vaccine. Specifically, respondents mentioned “child not at home” (36%) and “vaccination teams not visiting the home” (25%; Figure 1). Of the 27 respondents who mentioned where their children were at the time vaccination teams visited their homes, the most common answers were “trips out of the village” (18%); “social events” (eg, naming ceremonies; 18%); “the hospital” (18%); “farm” (17%); and “at the market” (17%). The lack of access to the vaccine due to homes not being visited or children not being at home (and not being revisited later) was reported more often by residents of rural locations (44 of 67 respondents, or 65%) than by residents of urban locations (14 of 29 respondents, or 48%); as well as by residents of scattered or nomadic communities (17 of 20 respondents, or 85%) than residents of other communities (41 of 75 respondents, or 55%). People of the Fulani tribe also reported less vaccine access (18 of 21 respondents, or 86%) than non-Fulani (40 of 74 respondents, or 53%).

Other common reasons reported by questionnaire respondents for why their children were missed included “parent/caretaker not allowing vaccination” (25%); “the concern that the vaccine is harmful” (21%); “the belief that vaccination is unnecessary” (13%); and the belief that “other more important community needs should be addressed” (13%).

**DISCUSSION**

Our study showed that lack of access to polio vaccine (either because teams did not visit the homes, or child was absent) were
the most frequently reported reasons for children being missed during the October 2012 campaign. This lack of access was reported more frequently in respondents from scattered/nomadic communities. Although polio risk perception is moderate in participants of the missed children study, the value and usefulness of vaccination was generally accepted. Most respondents also had positive impressions of polio campaigns and the polio eradication effort.

Though it was frequently reported that the government should address other social and health priorities in addition to polio, most respondents would have accepted polio vaccination if it was available to them. Respondents who reported “child absent” as one of the main reasons their children were missed, seemed to have similar attitudes and responses as compared to overall questionnaire respondents. Nonetheless, 25% of all respondents mentioned that refusal was the main reason their child was not vaccinated. Generally, overt and covert refusals play significant roles in children being missed during OPV SIAs. Therefore, approaches to reduce the proportion of missed children should include strategies to address noncompliance, such as engaging religious leaders or other community-influence groups (eg, doctors, journalists, polio-survivors); distributing pro-OPV public enlightenment/educational materials; and providing other health services along with OPV. Beginning in January 2013, the polio eradication program in Nigeria adopted these and other evidence-based social mobilization strategies with varying degrees of success.

The lack of access to the vaccine is an indicator of poor team performance and is consistent with the finding that “revisiting, if child is absent” was the strategy most frequently mentioned by FGD respondents as the best way to ensure that missed children would get vaccinated. The Nigeria polio program will benefit from strategies to improve team performance, including better training, accountability, and supervision.

To address the challenges of missing children during campaigns, we recommend that intra-campaign operational deficiencies should be addressed to ensure that all children are reached. For instance, improved social mobilization should provide communities with the exact dates when their community would be visited. Some of the ways preferred by respondents included announcements by town criers, as well as engaging traditional leaders (village and ward heads). Mosque announcements could be considered, where feasible. Secondly, all homes where a child was absent should be revisited by vaccination teams, ideally at a time when the child is expected to be at home. Alternatively, vaccinators should give a date when they will revisit homes so that parents can arrange for their kids to be present. The plan for revisiting households with missed children should be clearly outlined in microplans, and there should be enough vaccination teams to accomplish this goal. Third, in addition to visiting all homes, we advocate that more vaccination should occur in public places using special teams. Hopefully, this will capture children in playgrounds, farms, mosques, motor parks, and other public places. Intensification of the evidence-based strategies to improve vaccination team performance and community acceptance of OPV would be most helpful in reaching eligible children during OPV campaigns.

Notes

Financial support. This work was wholly funded by the US CDC.
Supplement sponsorship. This article is part of a supplement entitled “The Final Phase of Polio Eradication and Endgame Strategies for the Post-Eradication Era,” which was sponsored by the Centers for Disease Control and Prevention.
Potential conflicts of interest. All authors: No reported conflicts.
All authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

References