Vaccine xxx (2018) xxx–xxx

Contents lists available at ScienceDirect

Vaccine

journal homepage: www.elsevier.com/locate/vaccine

Parents' preferences for interventions to improve childhood immunization uptake in northern Nigeria

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ARTICLE INFO

Article history:
Received 11 December 2017
Received in revised form 26 March 2018
Accepted 27 March 2018
Available online xxxx

Keywords:
Nigeria
Vaccine
Immunization
Preferences
Best-worst scaling
Latent class analysis

ABSTRACT

Background: Routine childhood immunization coverage has been low in northern Nigeria. While local authorities and international partners have been working hard to improve coverage, population preferences for interventions have not been documented. This study aimed to understand parents' preferences and identify possible interventions to improve uptake of childhood immunization.
Methods: Preferences for immunization interventions were elicited using a best-worst scaling (BWS) instrument among parents with children under five. We explored the value of six program attributes (each varying across three levels) identified through a literature review and engagement with local stakeholders. In each of 18 hypothetical programs identified through a main effect orthogonal design, respondents selected the best and worst attributes that may facilitate vaccination of children. Assuming sequential best-worst responses, we used conditional logit to estimate preferences. We employed latent class analysis (LCA) to categorize and examine respondents' preferences across interventions.
Results: 97 men and 101 women in 198 households were surveyed. The most preferred level for each attribute included door-to-door vaccinations, free food supplements, bundling with nutritional support programs, involvement of religious leaders, information dissemination through media campaigns, and strengthening of health services by the government. Three types of preferences were recognized in the LCA. The value-driven group (14%) characterized by youngest age, predominantly female, and lower education perceived bundled services with food and nutritional programs as the most important feature of an intervention. Convenience and information seekers (28%) characterized by oldest age and the lowest employment preferred door-to-door vaccinations and media campaigns. The remaining complacent group (58%), characterized by highest education and highest employment, did not show strong preferences to any intervention compared to the other two groups.
Conclusions: Routine immunization programs should consider joining forces with food and nutritional programs to improve vaccination uptake. Incorporating door-to-door visits and media campaigns to target older and unemployed populations may increase childhood immunization uptake in northern Nigeria.

1. Introduction

Increasing routine immunization coverage has been challenging in Nigeria. Coverage has been particularly low in the northern states, where insecurity has challenged the immunization supply chain and demand for vaccines has been low partly due to people's mistrust in the polio vaccine [1,2]. The World Health Organization (WHO) and UNICEF report estimated 2017 coverages of 3 doses of pentavalent (diphtheria, tetanus, pertussis, hepatitis b and Haemophilus influenzae type b), polio, and measles vaccines in Nigeria at 49%, 49%, and 51%, respectively [3]. Although numerous groups including the Nigerian government, local and international organizations have been working hard to make vaccines available and improve the uptake of the polio vaccine [4–6], little efforts have been documented on the spillover effect of any mistrust of polio on routine childhood immunizations.

In order to reach every child in Nigeria with childhood vaccines, it is essential not only to ensure the supply of vaccines, but also to understand what affects parents' demand for routine childhood immunizations, and their preferences among possible interven-

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https://doi.org/10.1016/j.vaccine.2018.03.073
0264-410X/

tions [7]. Demand for vaccination is complex and goes beyond acceptance, defined by individuals and communities seeking, supporting and/or advocating for vaccines and immunization services [8]. Since demand is dynamic, it can vary by context, time, place, vaccine, and immunization services provided, making it important to understand local preferences to ensure demand.

Previous studies suggest that determinants affecting immunization uptake include maternal knowledge and educational status, communication activities, and beliefs in the efficacy and safety of vaccines [9–16]. The perception that vaccinating a child makes one a good parent was found to be an important component of the demand for immunizations in northern Nigeria [17]. To address low vaccine uptake, a variety of programs have been proposed, including reminder systems, patient outreach/home visits/in-home vaccinations, various formats to deliver vaccine information, financial incentives or food vouchers, and health system and community partnerships [18–21]. While many interventions have been tested, there is no strong evidence on which to recommend specific interventions to address vaccine hesitancy, and evidence is limited in low- and middle-income countries [22,23].

Stated-preference methods such as conjoint analysis and discrete choice experiments are increasingly used to understand the preferences of patients and other stakeholders in medicine [24–26]. These methods focus on estimating preferences across a range of attributes that are each defined across two or more levels [27,28]. Attributes are characteristics that describe the contents of a policy or service. Each attribute contains different levels that are evaluated for their relative importance by a respondent. This method allows one to estimate tradeoffs across attributes with multiple levels. Object scaling relates broadly to a class of stated-preference methods that are also known as best-worst scaling (BWS) or maximum difference scaling [29–31]. While these methods are well established in marketing, psychology, and economics, they have only recently been applied in healthcare and few in Sub-Saharan Africa [25]. Moreover, few studies have utilized latent class analysis (LCA) to explore healthcare preference heterogeneity in low- and middle-income country settings [32]. In this study, we examine how parents with children under five years of age in the Zamfara state in northern Nigeria rank potential vaccine interventions to increase vaccine uptake using BWS. We then conduct LCA to examine preference groups within the population.

2. Material and methods

We first carried out a literature review to understand factors affecting the demand for immunizations, and interventions to increase this demand. We assessed these factors broadly across low- and middle-income countries with a focus on literature concerning Nigeria. The literature was primarily sought through PubMed, with supplemental online searches for gray literature. From this review, we identified six intervention attributes that may affect immunization demand, including location, type of incentive, bundled services, leaders' involvement, vaccine information source, and government role (Table 1) [9–14,33–47]. Each attribute was given three levels. These attributes and levels were reviewed by vaccine experts and a local study advisory group for face validity. We selected the attributes and levels based on evidence from the literature and feasibility. For example, offering cash transfers of 200 Naira (US$1.25) per vaccinated child was included in consultation with the local study advisory group where the amount was considered to be reasonable and the intervention potentially feasible. In selecting other attributes, we considered whether potential interventions had been implemented in Nigeria or in other low- and middle-income countries. Attributes and levels that were reported to benefit vaccine uptake were included in this study.

We developed a household questionnaire that included BWS questions to elicit parents' preferences among different vaccine interventions, alongside questions on respondents' background characteristics. Eighteen hypothetical programs were developed from six attributes using a main effect orthogonal design [48]. All programs were described by six attributes with three levels. In each profile, respondents selected the best and worst attributes that would promote vaccination of children in their neighborhood. Surveys were translated into Hausa and back-translated to English to ensure accuracy. We sought and obtained approval from the Johns Hopkins School of Public Health Institutional Review Board (IRB) and from the Zamfara State Health Research Ethics Committee of the Ministry of Health (No. ZSHREC/01/06/2013) to carry out this study.

A pre-test was administered to ten respondents in Sankalawa in Zamfara state, similar in demographic composition to the Nahuche site where the full survey was conducted. The interviews concurrently administered a checklist to assess people's understanding of the BWS questions. Questions and clarifications generated by the checklist were recorded, where responses were transcribed and translated. Based on the pre-test results, the BWS questions were developed into a visual questionnaire to improve respondents' understanding of the choice task (Fig. 1). One picture was chosen for each object and used throughout the survey so respondents could more easily understand choice sets. The visual questionnaire was tested and judged to be user-friendly among respondents.

This study was set in Nahuche district in Zamfara state in northwestern Nigeria. Zamfara state was selected given the second lowest immunization coverage for basic childhood vaccines nationwide and the state's relative stability [49]. Nahuche represents a rural agricultural region faced with typical challenges of low literacy rates, inadequate power supply, underdeveloped sanitation system, and poor road network [50]. Nahuche hosts the Nahuche Health and Demographic Surveillance Site (HDSS), a longitudinal population registration system that monitors the health and demographic events (births, deaths, migration) [50]. We surveyed all six districts in Nahuche. Each district contributed to the sample according to its population. The sampling frame was constructed from clusters in each district and households in the corresponding selected cluster. Clusters that were hard-to-reach due to extremely difficult terrain or security threat were excluded from the sampling frame. A systematic sampling of clusters was followed by a random route procedure to select households for the survey. For the study, a household was defined as a person or a group of related or unrelated persons, who live together and share common cooking and eating arrangements. The target population were parents with children under five years of age. The interview was conducted in the home of 198 respondents, where we interviewed one respondent from each household. Interviews took an average of one hour to complete. All local data collectors were trained in BWS methodology, including those who were involved in the pre-test.

In analyzing the BWS questions, we assumed sequential best-worst responses. This presumed that respondents first chose the object that they judged as fitting the criteria the best, and then chose the worst from the remaining factors. This approach assumes that the choice of best is independent of the choice of worst and that the choice of worst is conditional upon the choice of best. Each task was broken into two sub-tasks, and the choice of best and worst was described via a single dichotomous dependent variable. Using McFadden's conditional logit, we regressed the choice variable on all attributes and levels, where data were grouped by respondent, task, and type (i.e., best or worst) [51]. Effects coding was used to analyze the effect of each factor [52].

Please cite this article in press as: Ozawa S et al. Parents' preferences for interventions to improve childhood immunization uptake in northern Nigeria. Vaccine (2018), https://doi.org/10.1016/j.vaccine.2018.03.073