**Assessing the Impact of Social Networks on Mothers' Childhood Immunization Decisions in Bungudu LGA, Zamafara State, Northern Nigeria**

## I. Introduction

Why do some mothers vaccinate their children while others don't? What role do social networks play in the inequitable uptake of childhood immunizations in northern Nigeria? An estimated one million children die annually from vaccine-preventable diseases[1] in Nigeria, making it one of the least successful countries in improving child survival in the world (2). Although vaccines are one of the most effective prevention measures to improve child survival, the success of this strategy depends on high rates of acceptance and coverage (3). Widespread disparities in immunization coverage and the unstable acceptance of vaccines for routine use have threatened the success of immunization programs in Nigeria (4).

Past studies have relied on the knowledge-attitude-practice (KAP) model of health behavior to explain the uneven uptake of childhood immunizations in Nigeria (5). These studies have shown that widespread disparities in immunization coverage persist among children whose parents are in the lowest socio-economic quintile, have low levels of education, and have fear and confusion about the safety and efficacy of vaccines (6). Other studies, which focus on the community-level determinants of immunization uptake, have found geography (rural versus urban) and access to maternal healthcare to be key predictors of this outcome (7). This research, however, has been limited to measuring wealth, education, and access to health care at the neighborhood-level (7). Only scant attention has been paid to the ways that social factors influence immunization outcomes.

This study will be the first of its kind to assess how social networks influence immunization outcomes. The social network influence model used in this study will draw on theories from the fields of political science and sociology – namely opinion leadership theory and social networks theory – in order to explain the social forces behind the widespread disparities in immunization coverage in northern Nigeria.

## II. Background and Significance

Opinion leadership theory purports that key individuals exist in every community that others turn to for advice and information (8). These individuals are known as opinion leaders because they have the power to influence the opinions – and ultimately the actions – of others. Opinion leaders are a central part of the social system (e.g. popular individuals or formal leaders) and typically exhibit greater social participation, a higher socioeconomic status, and a higher level of knowledge and competence than their followers (8-9). Given their centrality in the social system, opinion leaders have far-reaching influence, from shaping public opinion, to changing political behavior, and persuading people to adopt new innovations like contraception (9-10). This study tests the combined influence of three groups of opinion leaders – traditional medical providers, religious leaders, and political leaders – on mothers' childhood immunization decisions in northern Nigeria:

> Hypothesis 1: Mothers/caregivers with a greater number of opinion leaders in their social networks that support the use of childhood immunizations will have a higher likelihood of ever immunizing their child.

[1] The 9 vaccine-preventable diseases that continue to cause significant morbidity and mortality in Nigeria, and Africa more generally are: measles, diphtheria, tetanus, pertussis, tuberculosis, yellow fever, hepatitis B, poliomyelitis, and blindness (1).

Social networks theory purports that there is a pattern of friendship, advice, communication, and support that exists among members of a social system (11-13). The actors in this social system are believed to be interdependent, with social ties facilitating the flow of information and influence on actions (14-15). While both opinion leadership theory and social networks theory emphasize the importance of social connections between individuals over individual-level attributes, social networks theory moves beyond opinion leadership in two key ways. First, social networks theory acknowledges that individuals without a central role in the social system (e.g. peers) also have the power to influence behavior. This study will test the effect of peers on immunization outcomes in northern Nigeria.

> Hypothesis 2: Mothers/caregivers with a greater number of peers in their social networks that support the use of childhood immunizations will have a higher likelihood of ever immunizing their child.

Overall, the focus of this study is to assess the relationship between social networks and childhood immunization use in northern Nigeria. As such, this study will also test the interaction between a range of social network influencers – namely opinion leaders and peers – on mothers' childhood immunization uptake in this context.

> Hypothesis 3: The relationship between opinion leader support for immunizations and immunization use will increase when mothers' peers also support immunizations.

In order to test the study hypotheses, a social network design that uses quantitative data collected from mothers and their opinion leaders is used. The results from this study have important implications for understanding how social networks influence immunization uptake in the African context as well as generating new ideas about how to increase demand for childhood immunizations in areas with dangerously uneven rates of coverage.

## III. Study Design

This study uses a case-control design. This design was operationalized by pairing 22 villages that are similar in geographic location, compound size, and family structures, but different in their level of immunization coverage. A total of 11villages with 50 percent or higher vaccination coverage (the "cases") were paired with 11 villages with 0 percent immunization coverage (the "controls") based on these criteria. The benefit of this approach is that it permits controlling for confounders (geographic location, compound size, and family structure) by design, which saves statistical power during analyses.

Individual-level data for this study were collected using the egocentric and link-tracking approaches. The egocentric approach was operationalized by disseminating a questionnaire to all women who met the eligibility criteria (being a woman between 14 and 49 years of age, with a child between 9 to 18 months of age, and living in one of the 22 study villages); the questionnaire focused on collecting information about key actors (e.g. husbands, peers, religious leaders, political leaders, and health providers) that influenced the women's immunization behaviors. The link-tracking method was used to locate and interview the opinion leaders (the religious leaders, political leaders, and health providers) about their perceptions, behaviors, and activities around immunizations. A total of 550 mothers and 128 opinion leaders were interviewed.

This study was implemented in the Health and Demographic Surveillance System (HDSS) site of Bungudu Local Government Area (LGA), Zamfara State, Nigeria from October to November 2011. The Partnership for Reviving Routine Immunisation in Northern Nigeria, Maternal, Newborn, and Child

Health Programme (PRRINN-MNCH) – an immunization program funded by the UK Department for International Development (DFID) and the Norwegian Government, and supported by the Zamfara State Ministry of Health (SMOH) – established the HDSS in Bungudu in 2009. The HDSS was designed to be a longitudinal health and population registration system to monitor health and demographic dynamics among the 125,149 residents of Bungudu and to support studies aimed at assessing the wider progress and impact of strengthening health systems (16). Despite substantial demand and interest from other researchers, this study is the first and only study that PRRINN-MNCH has agreed to support in the HDSS.

## IV. Data Analysis

I have conducted descriptive statistics to characterize the study population and their social network properties. These analyses were conducted across the entire sample as well as disaggregated by pair (high immunization villages versus low immunization villages). The latter strategy, which makes use of the case-control design, is being used to elucidate whether high immunization villages have opinion leaders that are more favorable towards immunizations than low immunization villages, and whether higher immunization villages have denser social networks.

I then plan to test the three study hypotheses using multivariate statistics. Conditional logit models, with the pair number operating as the grouping variable, will be used. The benefit of this approach is that it incorporates the paired design implemented to collect the data. The logit models will use robust standard errors in order to account for the clustering of observations common in social networks studies (15). Individual and community-level variables will also be included in the models in order to control for exogenous factors that were not controlled for by design, but which may increase the likelihood of immunization use. Variables include husbands' attitudes towards immunizations, a vector of risk factors (e.g. previous experience accessing health services for child), knowledge about immunizations, and distance to health facilities that provide immunization services. All multivariate analyses will be completed by February 2012.

## V. References


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