PERCEPTIONS OF INFLUENCE: Understanding Attitudes to Polio Vaccination and Immunisation in Northern Nigeria
This report is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under the terms of the Cooperative Agreement AID-OAA-A-14-00028. The contents are the responsibility of the Maternal and Child Survival Program and do not necessarily reflect the views of USAID or the United States Government.

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Perceptions of Influence: Understanding Attitudes to Polio Vaccination and Immunisation in Northern Nigeria

Main Research Report
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Foreword

There is no gain saying that remarkable achievements have been recorded in the last three years in the Nigerian polio eradication initiative (PEI) and routine immunisation. By the end of 2014, only 6 polio cases were recorded in Nigeria and the county has remained polio free for the last 9 months. This places Nigeria on the verge of interruption and firmly on the pathway to eradicating the wild polio virus.

At this crucial stage, it is critical to entrench mechanisms to safeguard the gains of the polio programme and sustain high levels of routine immunisation coverage as part of the polio legacy. In order to achieve this, intensive operational research is required to clearly understand and document the propelling factors behind the current successes and identify mitigating barriers that continue to deter the polio and routine immunisation programmes from achieving 100% coverage. Reports from field activities over time indicated that the greatest challenges to the programme are due to pockets of “resistance” within various “high risk” communities particularly in some Northern Nigeria States and access in security challenged environments.

The purpose of the research therefore was to develop in-depth understanding of the underlying family and community based issues that influence their attitude towards immunisation and continue to hinder the programme. Emphasis was placed on unravelling factors that account for the serial episodes of “missed children”, “chronic non-compliance” and other acts of rejection of the polio vaccine and routine immunisation within the same communities over time.

The findings and recommendations in the report would be of extreme value in restructuring aspects of the PEI strategy at the micro-level, particularly in the areas of behavioral change communication and shoring up demand for vaccination in communities with low uptake. In addition, the application of the pertinent recommendations in this report would contribute to further improving coverage, population immunity and sustaining the more global gains in immunisation across Nigeria.

Like with the polio programme, this research and report has been made possible through the active collaboration of key stakeholders: NPHCDA, USAID, The Communication Initiative and other technical Partners who have been duly acknowledged in the report. Their insight, skill and experience were invaluable in negotiating the complex social-economic and cultural terrain in the research communities and the development of useful inferences from their findings. It is my expectation that all partners’ organizations and officers working within the framework of the national immunisation programmes would study this report and put the wealth of knowledge to optimum use.

Definitely, when the eradication of the wild polio virus is being celebrated this research work amongst others, would be cited to have served as another stepping stone in completing the last mile.

Dr. Ado J. G. Muhammad (OON)
Executive Director/CEO
National Primary Health Care Development Agency (NPHCDA)
Federal Ministry of Health – Nigeria
Acknowledgements

This research was designed and conducted under the aegis of the Nigerian National Primary Health Care Development Agency (NPHCDA), in consultation with the Nigerian Polio Eradication Programme partners, including the Federal Emergency Operating Centre (EOC) and relevant state EOCs, WHO, UNICEF, CDC, and CORE (see annex a¹). If it were not for the early involvement and input from NPHCDA and their ongoing strong support, this research would not have been possible.

We owe a particular debt of gratitude to Dr. Ado Muhammad, NPHCDA Executive Director, to Professor Okey Akpala, NPHCDA Special Advisor and focal point for this research, Dr. MJ Abdullahi and Dr. Amina Ahmad-Shehu, NPHCDA Director and PMO/Head of Operations Research. Their support and guidance have been invaluable. It is the NPHCDA that will, as it determines best, put our research to work in informing mass vaccination and routine immunisation strategies going forward.

We owe special thanks to Dr. Andrew Etsano, Incident Manager at the Federal Emergency Operations Centre (EOC), and to his colleagues in relevant State EOCs, Dr. Pascal Mkanda (WHO), Ms Melissa Corkum (UNICEF), Dr. Frank Mahoney, Dr. John Vertefeuille and CDC in Nigeria for their support in the research design phase and providing extensive and thoughtful comment during preliminary presentations in Abuja in December 2014.

USAID (Washington DC and Abuja) supported the research financially and through extensive field-based expertise. Our thanks go to Ms Ellyn Ogden, Dr. Nancy Lowenthal, Ms Marit van Strien, Mr Endale Beyene, Ms Celeste Carr, Dr. Gertrude Odezugo and Ms Mary Ndu. Chris Morry at The Communication Initiative was key to managing the research process internationally, and we thank him for his tireless commitment.

We thank Barbara Rawlins, Principal Investigator (PI), of Johns Hopkins University for her contributions to research oversight, in particular with respect to the research ethics and ethical approval process (see annex e), and we thank Mike Favin and Hassan Jibiya of John Snow Inc. for their valuable inputs to survey questionnaire design, and Hausa translation. We thank Pat Taylor and Khatidja Naithani of MCSP/Jhpiego for their continuous support in managing the research process. Field research was managed by Public Health Solution Services (PHSS). We thank its director, Dr. Mizan Siddiqi, and his staff at state and LGA levels.

We thank polio programme staff at all levels for their generous support through a period of intensive campaign operations. We thank the survey enumerator teams for their unstinting efforts, often under challenging conditions. And we thank the household heads and caregivers who took time to listen to our questions and furnish us with their answers.

We thank Professor Mahmud Khan, Chair of the Department of Health Services and Policy Management in the Arnold School of Public Health, University of South Carolina. His rigorous analysis, insights and enthusiasm helped us navigate the interpretation of many complex findings.

¹ All annexes can be found online at
http://www.comminit.com/health_research_nigeria/content/annexes-understanding-attitudes-polio-vaccination-and-immunisation-northern-nigeria
# Glossary

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AEFI</td>
<td>Adverse events following immunisation</td>
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<td>BCG</td>
<td>Bacillus Calmette-Guérin</td>
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<td>CDC</td>
<td>Centres for Disease Control and Prevention</td>
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<td>cVDPV</td>
<td>Circulating vaccine-derived poliovirus</td>
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<tr>
<td>cVDPV2</td>
<td>Type 2 circulating vaccine-derived poliovirus</td>
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<tr>
<td>DHS/NDHS</td>
<td>Demographic &amp; Health Survey/Nigerian DHS</td>
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<tr>
<td>DPT</td>
<td>Diphtheria, pertussis and tetanus</td>
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<td>EMOD</td>
<td>Epidemiological Modelling Group, Global Good</td>
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<td>EOC</td>
<td>Emergency Operating Centre</td>
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<td>EPI</td>
<td>Expanded Programme on Immunisation</td>
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<td>ERC</td>
<td>Expert Review Committee (GPEI)</td>
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<td>IMB</td>
<td>Independent Monitoring Board (GPEI)</td>
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<td>JHU</td>
<td>Johns Hopkins University</td>
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<td>JSI</td>
<td>John Snow Inc.</td>
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<tr>
<td>KI</td>
<td>Key informant</td>
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<td>LGA</td>
<td>Local Government Authority</td>
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<td>LQAS</td>
<td>Lot Quality Assurance Sampling</td>
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<td>MCSP</td>
<td>Mother and Child Survival Program</td>
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<td>NEEP</td>
<td>Nigeria Polio Eradication Emergency Plan (2014)</td>
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<td>NPEC</td>
<td>National Polio Expert Committee</td>
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<td>NPHCDA</td>
<td>National Primary Health Care Development Agency</td>
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<td>OPV</td>
<td>Oral polio vaccine</td>
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<td>PEI</td>
<td>Polio Eradication Initiative</td>
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<td>QCA</td>
<td>Qualitative Comparative Analysis</td>
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<td>RI</td>
<td>Routine Immunisation</td>
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<td>SAGE</td>
<td>Strategic Advisory Group of Experts on Immunization</td>
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<td>SIA</td>
<td>Supplemental Immunisation Activity</td>
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<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
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<td>USAID</td>
<td>United States Agency for International Development</td>
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<td>VHR</td>
<td>Very high-risk (settlement)</td>
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<td>VLR</td>
<td>Very low-risk (settlement)</td>
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<td>WPV</td>
<td>Wild poliovirus</td>
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<td>WHO</td>
<td>World Health Organization</td>
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Perceptions of Influence: Understanding Attitudes to Polio Vaccination and Immunisation in Northern Nigeria

Main Research Report

Research report
Dr. Sebastian Taylor,
August 2015
Executive Summary

The Nigerian polio eradication programme has made extraordinary advances in recent years. Transmission of wild poliovirus (WPV) is at its lowest level in the history of the programme (6 cases for 2014 (map 1) with no recorded infections to-date in 2015 (as of May 30). The rise in cVDPV2 in 2014, though, is notable and concerning (as is the scale of polio-compatible cases across the country in 2014, map 2). Programme quality has improved dramatically, with LQAS coverage for SIAs in high-risk areas above 80% rising steadily in 2013-14. Yet seroprevalence surveys suggest coverage may in reality be lower in some areas.¹

Within the picture of aggregate improvement, there are small but significant areas of sub-optimal OPV coverage. In order to maximise chances of interrupting transmission – and sustaining population immunity – these areas need to be addressed. This study was designed to investigate issues on the demand-side leading to poor SIA coverage, selecting high- and low-performing areas (according to the national programme’s risk classification) and conducting a comparative analysis to look for systematic differences in household (or settlement) characteristics that may explain localised deficits in OPV acceptance.

Adapting a methodology from QCA, this research randomly sampled 30 households per settlement in 60 settlements selected purposively from within high- and low-performing Wards and LGAs in Sokoto, Kano and Bauchi states of northern Nigeria. Logistical and security considerations allowed for inclusion of rural and urban settlements in Sokoto, rural and semiurban settlements in Kano, and rural settlements in Bauchi.

We calculated for a representative sample of 480 households per state. Allowing for attrition and substitutions, we surveyed a total of 3,306 respondents (male and female) in 1,653 households using a questionnaire eliciting information on quantitative and qualitative dimensions of family life, from general developmental conditions, through household perceptions of (and trust in) external actors, to health and healthcare experiences, and knowledge of/attitudes to routine immunisation and polio eradication. Survey values were uploaded to STATA and bivariate and multivariate logistic regressions were run. Analysis was disaggregated by state, gender and sector of residence.²

The purposive sample used for this research limits, to a degree, the generalisability of its findings. At this stage in the eradication programme, however, the helpfulness of generalisations is increasingly marginal. Moreover, if we assume that key explanatory variables are relevant in other, non-sampled areas of the northern states, correlations with risk of OPV refusal should hold true.

We focused on two primary outcome variables; households reporting missed children in past polio SIAs, and households reporting the possibility of refusing OPV in the future (‘propensity to refuse’).³ A significant minority of sampled households reported having missed children (16-17%); a similar proportion reported considering OPV refusal in future (14-17%). These figures are consistent with recent independent analysis of SIA coverage and missed children in the 11 high-risk northern states.

Households reporting missed children in the past were significantly more likely to consider refusing OPV in the future. This suggests that a sizeable proportion of missed children in our sample

¹ Kano, 2014.
² Urban, semiurban & rural; disaggregation of findings by state was a key recommendation from the preliminary findings presentation meeting hosted by NPHCDA, with the participation of the EOC and polio partners in Abuja in December 2014.
³ With two secondary outcome variables: approval/disapproval of PEI; approval/disapproval of routine immunisation.
reflect intentional caregiver behaviour – in other words, refusal. The fact that 0-dose children have a substantially higher chance of being missed in northern Nigeria suggests, further, that a substantial part of household refusal is continuous over multiple SIAs, and hence ‘chronic’. This also suggests that behaviour change communication interventions are not having the required effect for all risk groups, in particular, entrenched refusal.

Propensity to refuse OPV is clustered in specific settlements. Around 20% of our sample communities accounted for almost three-quarters of refusal risk (and over half of all reported missed children). This clustering suggests that refusal may be at least partially a collective, community-level effect, requiring a collective, community-level response.

Among sampled states, Sokoto showed highest risk of OPV refusal, followed by Kano. Urban households showed highest levels of refusal risk, while being in a semiurban area actually reduced risk. Although programme strategy recognises both urban and rural centres of risk, demand-side interventions have for long focused on ‘remote, underserved, mobile and rural’ populations. Our findings suggest that urban households (who do not fit the conventional risk profile of poor, poorly educated, illiterate and susceptible to anti-vaccine rumours) require strategic attention.\(^4\) Equally, while current regional strategy is justifiably concerned with the Kano and Yobe/Borno transmission zones (as well as associated insecurity undermining SIAs in the north-east), operational attention and capacity should be maintained in the north-west.\(^5\)

Our analysis highlights a number of (potentially inter-connected) factors associated with households’ likelihood of refusing OPV:

Knowledge of immunisation practices and vaccines, and a positive view of immunisation effects, are strongly associated with reduced risk of OPV refusal in urban, semiurban and rural households across all states. A predominantly negative view of the effects of immunisation raises the risk. This is not surprising. But it is notable that the effect operates at a broader level of vaccine knowledge than polio alone. In this sense, expansion of routine immunisation (awareness, understanding and service provision) may be a primary, rather than ancillary, strategy for enhancing OPV uptake.

Gender relations within the household appear to indicate differences in the dynamics of decision-making with regard to missed children and OPV acceptance. Men and women were more likely to agree that children were missed, and on future likelihood of OPV refusal, in urban Sokoto and rural Bauchi. Lack of agreement (or active disagreement) between male and female caregivers was highest in rural Kano. We are not in a position at this stage to do more than point to this as potentially important – the inference being that interventions that can build alignment between male and female caregivers (e.g. on vaccination) may be helpful in improving acceptance.

More broadly, PEI (and initiatives for wider health system strengthening) need a clearer gender strategy – building communication and engagement between men and women within households, but also through their mutual participation in the planning and management of community health activities, and integrating female health workers more closely in institutional processes of service planning and delivery. This could strengthen the role of women within public health at multiple levels of decision-making but also improve the coherence and commitment of male and female household heads to health as a priority issue for positive action.

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\(^4\) Urban refusal was found in other eradication programmes, notably Greater Cairo, where urban families, at higher levels of wealth and education, viewed private health practitioners as preferable to mass-delivered public health services.

\(^5\) This is supported by observations from the May 2015 SIAs in Sokoto, noting poorer demand (e.g. turn out for health camps) in urban rather than rural or semiurban LGAs [personal communication].
Wealth and educational status showed a weak or ambiguous association with risk of OPV refusal. This is likely, at least in part, to be the statistical effect of urban Sokoto, where we see a concentration of refusal in the context of better-than-average material conditions and access to resources. Higher household wealth (lower level of poverty) and education (in particular, female literacy) correlate with lower refusal risk among rural households, but not in our urban sample. This discontinuity of effect at the level of ‘intermediate determinants’ points to more structural factors shaping attitudes to polio, OPV and routine immunisation across urban and rural areas. We explored three possible determinant fields: religious orientation of households; household perceptions of and attitudes to government; and household engagement in community-level activity.

Intensity of household religiosity does not appear to correlate with OPV refusal. Households reported negligible reliance on ‘religious and traditional leaders’ for support and advice outside of ‘religious matters’. Households most strongly reliant on religious leaders for guidance on doctrinal matters were found in settlements least likely to refuse OPV. Two geographical areas with the highest levels of combined male- and female-reported OPV refusal risk (urban Sokoto and rural Bauchi) have the lowest mean scores on our ‘index of religious observation’. Whilst there are many reasons to engage with religious and traditional leaders for public health, a predominant emphasis on religious and traditional leaders as principal interlocutors for polio vaccination (and their interlocution as the primary mechanism for addressing OPV refusal) does not appear justified.

We hypothesised that lower ‘trust in government’ would correlate with higher risk of OPV refusal. The reverse appears to be the case. Higher-risk settlements have consistently higher expectations of government (for example, in terms of service provision). But they also have systematically lesser confidence in their ability to influence government performance. It may be disappointment in government that shapes negative attitudes to a programme like polio eradication.

Households across all states and sectors appear to distinguish between areas in which government advice is seen as legitimate (primarily matters of asset protection such as issues over land, inheritance, money and livestock), and others where it is largely disregarded (matters which might be defined as ‘domestic’). Health is in the latter category. If trust in government is working against the polio programme, this dynamic needs to be reversed. It is clear that high-risk settlements trust government in some areas – a key objective (both for PEI and longer-term expansion of RI) may be to extend that trust into the field of public health, but to do so in ways that are consistent with public perceptions of legitimate state intervention.

Finally, settlements at higher risk of refusing OPV have systematically lower levels of community-level activity (households reporting participation in community meetings). It is unclear whether higher-risk settlements are ones in which households dislike such meetings, or in which opportunity for such meetings has been undersupplied.

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6 We also see a notably lower perception of polio threat, though this is found in both urban and rural Sokoto households.
7 Measured using an ‘index of religious observation’ composed by bundling a range of relevant explanatory variables.
8 Although we use the terms ‘trust’, ‘expectation’, ‘reliability’ and ‘legitimacy’ with regard to household and community perceptions of government (in particular in public health provision), we do not use them interchangeably. Rather, we view them as sequential. When community expectations regarding desired services are reliably met with service provided under visible government leadership, we believe that popular perceptions of government legitimacy strengthen, and in so doing, strengthen public willingness to trust government as an interlocutor in their lives, including in the field of health.
Implications of Research for Programme Strategy

Our study shows localised and concentrated groups of households, and settlements, where children are missed during polio SIAs. Analysis suggests that many of these missed children are the result of chronic, repeating refusal. Refusal risk is strongest in urban Sokoto and rural Kano (Main Research Report (MRR), pp. 19-20).

**State-level implications**

- Operational focus should be maintained (or restored) in the north-west, alongside the focus on the Kano and Yobe-Borno transmission zones.
- State programmes should strengthen capacity (including developing qualitative and quantitative data-gathering methods) to analyse programme performance at settlement level, to identify persistent localised gaps in SIA performance.

**Household-level implications**

OPV refusal risk is found in both urban and rural areas, at very different levels of household wealth, education/literacy and access to services (MMR, pp.23-24, 28).

- State programmes should investigate PEI performance and RI uptake in urban and semiurban settlements to assess the extent of a new/emerging urban set of OPV/RI risks.
- Programmes should re-balance the current focus on poor/poorly-educated, rural households, to develop capability to respond to urban dynamics of OPV, RI and wider health demand.
- Programmes in Sokoto and Kano should conduct targeted investigations in VHR settlements (for example using ‘social network analysis’) to analyse how households develop and share information/attitudes to PEI/RI.

The evidence from this research suggests that household- and community-level understanding of immunisation at a general level – not limited to polio/OPV – can soften negative attitudes to OPV whilst strengthening propensity to access routine immunisation services (MRR, pp.21-22).

- State programmes should strengthen information and communication on the benefits of routine immunisation as a general practice, focusing on mitigating negative perceptions (e.g. AEFI).

Agreement between male and female caregivers within the household appears to have an impact on whether children are missed during SIAs and the risk of refusing OPV in the future (MRR, p.22-23).

- State programmes should focus on building health communication between men and women within communities, strengthening shared commitment by male and female caregivers to health and education as community development priorities.
- A gender strategy should build male-female engagement at household, but also at community participation and service-provision levels.
**Settlement-level implications**

The evidence in this study does not support the idea of a strong religious orientation to refusal in high-risk settlements (MRR, pp.24-26).

- State programmes should maintain networks and relations with religious and traditional leaders to create a supportive ‘background’ environment of cultural norms for PEI and RI.

- But strategic focus and resources should be rebalanced in favour of promoting local government leadership on public health provision and community-level engagement. (See following.)

Settlements with high levels of OPV refusal risk are characterised by high expectation of government, but low experience of government responsiveness. Government is highly trusted for some issues, but not for public health. High-risk settlements also have low levels of collective, community-level activity (especially with regard to women’s participation) (MRR, pp.26-31).

- State programmes should re-balance current emphasis on individual behaviour change, to build a stronger community context of public health within which PEI (and RI) happens.

- Taken as a whole, our research suggests that the ‘health camp’ concept may have considerable potential as a strategic intervention – primarily for PEI in the short term, but with positive cross-over effects for RI. Health camps constitute a practical way forward to build ‘public health under one roof’. They are an opportunity to build a community-level sense of public health as a collective activity – ‘public health in public spaces’.

- But the health camp concept needs to be developed, and the quality of implementation strengthened (with a potential pilot in Sokoto)
  - Health camps should be run alongside SIAs. They should offer a way of accessing OPV (and other antigens/health services), which complements house-to-house campaign vaccination.
  - Health camps should be regular and more substantial in scale, offering a consistent, publicly desired suite of public health and nutritional interventions within which OPV/IPV are delivered. They should be situated in well-known public spaces and where possible attached to publicly-valued and trusted institutions/activities (such as education or therapeutic feeding centres).
  - Health camps require adequate finance. They should be designed, supervised and assessed for impact – both in terms of services uptake through them and potential impact on SIA rates of missed children and refusal in areas where they are held. Metrics can be developed to assess, regularly over time, to create a picture of trend, whether and how health camps modify male/female, household and community attitudes to OPV, RI, public health and service provision/providers, including local government.
  - Organisation of health camps strategy should be led by LGA Chair and Ward Heads (with oversight from state-level traditional leadership and/or State LGA
Commissioner), and enhanced by technical support from partners. We recognise that capacity is heavily stretched in many operating contexts in northern Nigeria. WHO and UNICEF should consider strengthening their presence in areas like urban Sokoto to support larger-scale health camp interventions.

- The health camp model is intended as an interim strategy – bridging between the immediate requirements of the polio eradication end-game (where residual high-refusal households and settlements may respond to an alternate mode of OPV delivery) and the long-run aim of strengthening routine immunisation through the health system. Health camps are not, in themselves, a strategy for RI (or wider public health delivery). But while small gaps in SIA household coverage remain, and RI remains weak, the health camp offers a medium-term response (with an estimated timeframe for support of 3-5 years) to contribute simultaneously to the aims of both polio eradication and EPI.

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9 Visible leadership by local government on delivery of health camps may strengthen households’ perception of government as a legitimate and trustworthy actor in public health delivery. LGA commitment to health – and PEI – has been variable to-date. Advocacy with partners and through the State Ministry for Local Government and Chieftaincy Affairs may be required to leverage better leadership. The period following the 2015 election may offer an opportunity to gain traction on health and LGA commitment, both for PEI and RI.
Main Research Report
Research Background

In the first half of 2015, the Nigerian eradication programme shows significant progress towards interrupting transmission of wild poliovirus (WPV). The total number of cases for 2014 stands at 6 (last confirmed case, July 24th), with no new cases reported to-date in 2015.10

Graph 1: LQAS assessment of SIA performance, high-risk states, 2013-14.11

Longer-term, total caseload (WPV) has fallen year-on-year from 2012 (122), through 2013 (49) to 2014 (6), including a reduction in 2014 high-season transmission of 96%. The quality of programme operations has shown similar improvement.12 LQAS data for 2013-2014 show adequacy above 80% rising strongly across the 11 high-risk northern states (graph 1) (though seroprevalence data may suggest treating LQAS reports with a degree of caution).

The Independent Monitoring Board (IMB) of the Global Polio Eradication Initiative notes that ‘Nigeria...has greatly strengthened its programme over the last two years’, but that the country programme should not start thinking of itself as ‘nearly there’.13 Nigeria has shown the capacity to lose as well as gain ground on the virus in the last ten years.14

Rising coverage data in the aggregate can camouflage significant variation in vaccination performance at sub-state levels (Global Good/EMOD, 2013). Seroprevalence for 2013-14 shows lower levels of performance than are suggested by LQAS at 80%+ coverage, in particular for children <9 months.15 The continuing detection of polio-compatible cases, including in the north-east, suggests persistent underlying vulnerabilities in the population.16 The 2013 Global Good study identifies ‘time-invariant latent causes [of missed children] and spatial clustering of risk’ distributed heterogeneously in sub-LGA areas (maps 3 & 4). Understanding these ‘latent causes’ is critical to achieving levels of OPV coverage that interrupt transmission, to maintaining coverage towards certification, and to building routine immunisation in areas of limited access or uptake.

10 WPV1, at date of publication. No cases or environmental isolates for WPV3 have been reported since November 2012. However, we note that there were 30 reported cases of type-2 circulating vaccine-derived polio virus (cVDPV2) for 2014 [30 May 2015], compared with 4 for 2013 (WHO, 2015).
12 Between Jan. 2013 and Sept. 2014, 24 SIAs were conducted with a focus on the Kano and Borno/Yobe Zones.
13 IMB 10th Report, October 2014.
14 Polio infections fell by 95% between 2009 and 2010, followed by subsequent relapse in programme quality and resurgence of virus (IMB, 2011).
16 Kano seroprevalence study 2013-14, NPEC.
The Expert Review Committee on Polio Eradication and Routine Immunisation in Nigeria (ERC, 2015) notes the continuing critical challenge of reaching every child with vaccine, and the
need to maintain programmatic, public and political momentum in relation to this challenge. Routine immunisation remains very weak in some areas, in spite of improvements in overall coverage. Ensuring quality campaign delivery of OPV over the coming 3+ years, while simultaneously scaling up routine immunisation service delivery, will require maximum vigilance – actively seeking out and fixing gaps in both supply and demand. As those gaps become smaller, they will become increasingly difficult to detect, and require more sensitive methods of data-gathering and analysis.

This research was conceived and designed to do two things: to pilot a modified research method, combining quantitative and qualitative elements, to capture micro-level variation in household and settlement-level attitudes to polio vaccination; and, by comparing poorer with better performing areas, to try to identify household and settlement factors associated with weaker OPV demand.

\[\text{Map 3: State-level rates of ‘missed children’ in the 11 northern high-risk states (source: Global Good/EMOD, 2013)}\]

\[\text{Map 4: LGA-level rates of ‘missed children’ in the 11 high-risk northern states (ibid.)}\]

\[\text{Especially looking ahead to opportunities presented by President-Elect Buhari’s first term (Expert Review Committee on Polio Eradication and Routine Immunisation in Nigeria, 21-22 January, 2015).}\]

\[\text{For example, for OPV3 ranging from 43.7% in Kaduna to 2.6% in Sokoto (see NDHS, 2008 and 2013).}\]

\[\text{This research focuses on the demand-side. We recognise, however, the critical importance of supply-side performance for missed children, and the interanimation of supply and demand (see e.g. Ado, Etsano, Shuaib, Damisa et al., 2014).}\]

\[\text{Given the vital role of routine immunisation as a goal in its own right and the infrastructure on which long-run viability of eradication depends (as well as the likely influence of intensive house-to-house polio campaigns over many years on households’ thinking about immunisation), we incorporated a number of survey questions directly related to RI attitudes.}\]
Support for micro-level research on ‘missed children’ in polio vaccination and routine immunisation

‘Immunisation programs need to regularly determine if and where pockets of under-immunized subgroups occur in the country as part of good program management practice. Then, the factors underlying this lower than expected uptake, given the vaccination services, need to be assessed (SAGE, 2014).\footnote{Report of the SAGE Working Group on Vaccine Hesitancy, November 12th 2014}

‘Refusal data is collected on a large scale, usually in a quantitative format... and it is not possible to drill down to the level of detail that is required to understand... public perceptions about PEI, and what is driving these perceptions’ (WHO, 2013; IMB, 2014, 2013, 2011).\footnote{World Health Organisation (2013). \textit{Public Perceptions of the Pakistan Polio Eradication Program}, April 2013.}

There is a clear need to ‘...[i]nvestigate [population] clusters with very low [immunisation] coverage... It may be helpful to scrutinise what is happening in specific portions of LGAs [where performance is considered to be problematic and risk to be relatively high]’ (KANRICS, 2014).\footnote{Kano State Primary Health Care Management Board (2014). \textit{Kano Routine Immunisation Coverage Survey (KANRICS)}, Executive Summary, Kano State PHCMB 2014.}

There is a need to focus on at-risk communities, to develop more ‘effective ways to identify geographic communities at increased risk...[and to assess whether there are] common features among these communities’ (American Academy of Arts and Sciences, 2014).\footnote{American Academy of Arts & Sciences (2014). \textit{Public Trust in Vaccines: defining a research agenda}, Cambridge Mass: AAAS 2014.}

The purpose of the research was to better understand the attitudes of male and female heads of household towards polio vaccination (and routine immunisation) by exploring with between quantitative and qualitative factors (including demographic characteristics, socioeconomic conditions, and trust in or reliance on external actors for health and development needs).

The choice of a mixed research method was designed to ‘thicken’ our understanding of what drives family, household and community-level attitudes relating to polio vaccination and wider immunisation, rather than to refine or restate ‘thin’ but familiar and widely validated observations.

Although rates of children missed during polio SIAs in Nigeria have fallen to an historical low, they remain a significant vulnerability. Data-gathering on reasons for missed children has improved, but categories of causation (e.g. ‘child absent’) remain broad and hard to interpret and there is, in practice, a continuing reliance on cultural assumptions to explain demand-side problems.

Household Survey

The research is based on a household survey. The survey instrument was designed to run through a series of question ‘fields’, from broad demographic and socioeconomic conditions to more detailed health, immunisation and polio experience and attitude. This was a deliberate strategy. After two decades of eradication and associated public engagement, it is likely that households know what to say when asked directly about polio – and to be able, therefore, to game surveys that concentrate solely or mainly on the disease, the vaccine and the programme.

The survey was designed to amalgamate what we may call ‘objective’ and ‘subjective’ dimensions of household life – incorporating quantitative information on the demographic and socioeconomic profile of respondents and other family members, quantitative and qualitative information on their experiences of household and community health and development, and qualitative information on their view of ‘external actors’ mandated in one way or another to support those conditions of health and development. We hypothesised that household perceptions of, and consequent differential trust in, external actors may mediate the effect of material conditions on attitudes to immunisation and polio vaccination.

Selection of explanatory variables for inclusion in the household survey was driven both by literature on determinants of vaccine attitude and uptake, and by our hypotheses regarding the role of trust between households and external actors, derived from extensive field observation in the polio programme in Nigeria and other endemic countries.

Four outcome variables were included: Incidence of missed children in past SIAs (OV1); Reported possibility of refusing OPV in future SIAs (OV2); Approval/disapproval of polio vaccination (OV3); Approval/ disapproval of child immunisation (OV4).

Understanding whether missed children are the result of unintentional or intentional household behaviour – and understanding whether intentional refusal is the result of intrinsic ideological/ religious opposition to vaccination or of households instrumentalising OPV refusal as a

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28 Reasons for missed children will likely have evolved with the programme over time. This research may pick up on factors specific to the programme’s end-game. In this context, households may now assume that the polio programme is ‘almost over’, and be less assiduous in ensuring children are covered. This should ring alarm bells. Refusal may be shaped by religious beliefs, but evidence is needed to substantiate this. Household attitudes may, equally, be shaped by quite rational strategic behaviour designed to limit consumption of OPV, or to counter perceived over-extension of external agencies in the autonomy of the household, or to trade compliance for other higher-valued public goods and services.

29 We did not include ‘full immunisation status’ as an outcome variable, since its inclusion would have extended the duration of interviews considerably (e.g. where evidence such as immunisation card can take time to produce or where a caregiver is unable to produce verification). We recognise that this is an important variable to include in future research.
way of expressing dissatisfaction with other aspects of life – are vital insights if we are to produce effective programme strategies to address demand-side issues. In the current Nigeria programme (as in other endemic country programmes), a combination of fluid, contingent and entrenched, ‘chronic’ refusal behaviour makes this intelligence hard to secure. By combining and analysing overlap in household responses to OV 1 and 2 (reported past behaviour and reported future intention), we aimed to explore more systematically the proportion of households where there is continuity between past missed children and future intention to refuse, indicating chronic, intentional behaviour.

**Sampling**

The research was conducted in selected areas of three high-risk northern states (Sokoto, Kano, Bauchi). Selection was purposive rather than randomised. Using the national programme’s own risk classification system, we selected a pair of LGAs in each state (one ‘high-performing’, one ‘low-performing’), a pair of high- and low-performing Wards in each LGA, and two pairs of high- and low-performing settlements in each Ward (see chart 1). We calculated a total sample size of 480 households per state (including 10% for non-response/attrition).

We hypothesised that purposive selection of settlements defined as ‘high-’ and ‘low-performing’ would allow us to look for and analyse systematic differences in the characteristics of households within high- and low-performing communities (and where possible between communities themselves).

**Chart 1: Selection of high-/low-performing areas (Kano State)**

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39 All selections were based on extensive consultation with NPHCDA and programme partners. Below Ward level, reliable continuous data on settlement performance was partial at best, and had to be complemented by expert guidance. High- and low-performance at Settlement level was defined primarily by rate of missed children in the most recent three SIA rounds.
We recognise that purposive sampling can limit the generalisability of research with respect to the wider statistical significance of our primary outcome variables (rates of missed children and rates of refusal). However, to the extent that we may assume continuity in key explanatory variables between sampled and non-sampled areas in the northern states, we may infer a reasonable degree of external validity in discovered correlations.\textsuperscript{31}

Sampling included rural, semi-urban and urban settlements.\textsuperscript{32} Security and logistical constraints meant that we were able to survey urban and rural settlements in Sokoto, semiurban and rural settlements in Kano, and rural settlements in Bauchi (chart 2). Although this limits cross-state comparison by sector, it allows for 3-state rural analysis as well as state-specific analysis of rural-urban and rural-semi-urban households and settlements.

*Chart 2: Selection of sites by rural, semiurban and urban*

Within each settlement, 30 households were randomly selected using a sampling interval calculated for the size of the settlement population. In each household, we conducted separate interviews with the (self-identifying) male head of household, and with the senior female (as requested by enumerator teams). With substitutions and additions for households excluded as non-eligible, we surveyed 1,653 households completing 3,306 interviews.\textsuperscript{33}

Fieldwork was conducted between February and July 2014. A presentation of preliminary analyses was presented to NPHCDA, EOC and polio partners in December 2014. Contributions and suggestions from this meeting helped shape this report.

Data were recorded directly onto hand-held tablets and uploaded daily to a central data depository for monitoring. The completed dataset was uploaded to STATA for bivariate and multivariate logistic regression analysis. In the first round of analysis, we combined selected variables to create a number of indices (e.g. wealth index, index of gender agreement, vaccine knowledge index, health experience index, index of religious observation, trust in government index) to test for composite effect of variables on outcomes (see annex f).

\textsuperscript{31} See e.g. Olsen et al., 2012.


\textsuperscript{33} The household survey was complemented by structured Key Informant (KI) interviews with government and religious/traditional/cultural leaders at settlement, Ward and LGA levels. The KI survey questions mirrored those of the household survey (as relevant) to allow cross-comparison. These have not been included in the current report, but may be incorporated in future analysis.
These research findings are based on bivariate and multivariate logistic regression analysis of the household survey dataset. One male and one female caregiver was interviewed from each selected household. Male and female responses were matched together to create household observations. Analysis was disaggregated by state, urban, semiurban and rural as standard.

Relevant groups of variables were bundled together to compose indices including: wealth (household asset) index; vaccine knowledge index; health experience index; gender agreement index; ‘intensity of religious observation’ (religiosity) index; ‘trust in government index’; and ‘community participation’ index (see annex e). The principal unit of observation was the individual respondent; gender agreement was assessed by comparing household (paired male/female) responses; settlement-level analysis used mean values for 30 randomly selected households per settlement in 60 settlements.

Settlement-level analysis was conducted by selecting the third of settlements with lowest household average propensity to refuse as ‘very low-risk’ (VLR) and the third of settlements with highest propensity to refuse average as ‘very high-risk’ (VHR). Insofar as household-level explanatory variables and outcomes were dichotomous (yes or no type), the effect of explanatory variables on outcomes is expressed as odds ratios (the larger the OR, the greater the size of the effect), with statistical significance accepted at ≤0.05 (p-value).

Settlement-level analysis compared the mean value for a given variable between VLR and VHR settlements (e.g. ‘VLR: 0.917; VHR: 0.544’ – here the variable is more strongly present in the VLR group). The statistical significance of the difference in VLR/VHR values (the contribution of the difference to the level of OPV refusal risk) is expressed using a t-statistic (t-stat) score. Where the t-stat is ≥2 (ignoring the negative sign), the estimated coefficient is significantly different from zero implying that the variables show statistically significant relationship. The size of the t-stat indicates the statistical significance level.

Multi-choice perception variables are represented using a cumulative step graph (below). These graphs show the range of response options (e.g. ‘radio’, ‘TV’, ‘mobile phone’, ‘family’, ‘neighbour’, ‘religious leader’, ‘Ward/LGA government’ etc.) on the y-axis, and the proportion of respondents selecting each option from left to right along the x-axis. In this example, we can see that most male respondents select ‘radio’ as principal source of information in all optional areas; a significant group, though, identify ‘religious leader’ as preferred source for information on ‘religious matters’. Multi-choice variables were also converted into simple dichotomous variables for statistical analysis.

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Statistical note

See also annex g.
Findings & Analysis

Missed children in past SIAs predicts OPV refusal in future

A significant minority of households (16.14% of male and 17.24% of female respondents) reported having had missed children in past SIA campaigns (graph 2).

Graph 2: Male/female respondents reporting missed children in past SIAs

A similarly significant sub-set of male and female respondents reported the possibility of refusing OPV in future (‘propensity to refuse’) – 17.66% and 14.8% respectively (graph 3).

Graph 3: Male/female respondents reporting ‘propensity to refuse’ OPV in the future (P2R)

Although these findings are reflective only of our sample, they are consistent with recent independent analysis of average SIA coverage across the high-risk northern states. Households which reported missed children in past SIAs were considerably more likely to consider refusing OPV in the future (chart 3). The effect is stronger in urban and rural areas, and lesser but still significant in semiurban settlements.

35 A detailed profile of sample demographic and socioeconomic characteristics is included in annex c.
This, too, is consistent with analysis which suggests that, in the Nigerian programme, 0-dose children have a considerably higher chance of being missed in subsequent SIA campaigns than children with 1-5 doses. Graph 4 shows how (aside from infants under 1) children who report as 0-dose (black markers) are substantially, and persistently, at higher risk of being missed during SIAs than children with one or more historical doses (blue markers).

This suggests that a significant proportion of missed children in our sample are the result of intentional household behaviour – that refusal is a significant component of the problem of missed children, and that this refusal is likely to be continuous and hence ‘chronic’. We need to understand much more about what characterises the households (and settlements) where this kind of refusal is happening.

Gathering data on both past and prospective household behaviour (‘revealed preference’ and ‘expressed intention’) can strengthen operational research. Combined analysis of these metrics helps us to discriminate better between low uptake which is the result of intentional avoidance and ostensibly weak demand which is unintentional and driven by circumstance. That intelligence, in turn, helps in designing interventions, both for polio and for routine immunisation, which can discriminate and target genuinely attitudinal barriers.

In order to design such interventions, we need to know where households with negative attitudes are located, and what factors are shaping those attitudes. The analysis that follows aims to provide detail on these two questions.

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37 Confidence Interval
Risk of OPV refusal is clustered

Households reporting propensity to refuse OPV in our sample show distinct clustering within a subset of settlements (in particular in urban Sokoto\(^{38}\)). Around a fifth of sampled settlements (13/60) account for \(73.7\%\) of households reporting risk of OPV refusal and \(53\%\) of households reporting missed children (graph 5).

Graph 5: 'Propensity to refuse' score by settlement\(^{39}\)

Settlements identified in our survey as ‘at-risk’ of OPV refusal do not tally with the original selection of ‘low-performing’ settlements identified by the national programme.\(^{40}\) Operationally, this points to the need for better data-gathering at settlement level, to monitor and track risk at an appropriately granular level as risk becomes increasingly localised. And it supports a number of operational responses:

First, although there is a need to focus programme resources on key areas (e.g. Kano, Yobe/Borno),\(^{41}\) it is important to maintain capacity for wider ‘watchfulness’, to avoid leaving vulnerable programmatic flanks across the north – such as urban Sokoto – under-attended.

Second, the survey points to a group of settlements, in particular in urban Sokoto but also in rural Kano, where collective (settlement-level) opposition to OPV and/or the polio programme is very high. These could be selected for intensive intervention targeting factors identified in this research, to assess whether such targeted action leads to improved OPV uptake.

Third, the implication of this finding is that negative attitudes to OPV/PEI operate at settlement as well as household level. We need to understand better community-level networks of information, communication and ‘shared knowledge’ that underpin positive and negative beliefs and attitudes with regard to health, immunisation and polio. Interventions aimed at reducing refusal should include strategies explicitly aimed at changing the collective, community-level dynamic – not just for polio, but for public health more broadly.

\(^{38}\) Rijiya A and Gagi C Wards of Sokoto South LGA.

\(^{39}\) ‘Propensity score’ indicates proportion of households in a settlement reporting possible OPV refusal (ranging from 0 (no households) to 1 (all households); marker colours: urban=red; semiurban=yellow; rural=green.

\(^{40}\) ‘At-risk’ defined as \(>20\%\) ‘propensity to refuse’ OPV. We acknowledge that the range of criteria used by the Nigerian polio programme to assess risk incorporates a considerably wider set of metrics.

\(^{41}\) See e.g. ERC, 2015; National Polio Eradication Emergency Plan, 2014.
In our sample, propensity to refuse OPV was highest in Sokoto (OR 1.84, p=0.000, CI 1.39-2.49), followed by Kano (OR 1.42, p=0.017, CI 1.06-1.9).\textsuperscript{42} Propensity to refuse OPV was significantly higher in urban settlements (OR 3.17, p=0.000, CI 2.37-4.24), and lower in semiurban areas (OR 0.43, p=0.000, CI 0.29-0.64).

This may appear to run counter to conventional programme wisdom – that the weight of risk for missed children and OPV refusal is located in poor rural and remote areas. Our sample’s sub-set of ‘very high-risk’ (VHR) settlements is evenly split between urban (6) and rural (6) communities, with one semiurban (chart 4).\textsuperscript{43} This finding suggests that a continuing emphasis in programme strategy on underserved and remote/hard-to-reach populations (implicitly in the rural sector\textsuperscript{44}) risks leaving urban refusal (which is neither underserved nor hard-to-reach) exposed.\textsuperscript{45}

*Chart 4: Distribution of VHR settlements by state and residential sector*\textsuperscript{46}

<table>
<thead>
<tr>
<th></th>
<th>Urban</th>
<th>Semiurban</th>
<th>Rural</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sokoto</td>
<td>Adarawa (0.917)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Majema (0.741)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Village Head Office (0.666)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Old Post Office (0.633)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blue Crescent (0.629)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kwasare House (0.555)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kano</td>
<td>Daurawa Lokon Danmalanta (0.526)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tsalle (1.000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Yautar Arewa (1.000)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Garin Gambo (0.900)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bauchi</td>
<td></td>
<td>Unguwan Alh. Musa (0.766)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kufai S (0.500)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Magasa East (1.000)</td>
<td></td>
</tr>
</tbody>
</table>

Having looked at the distribution and clustering of OPV refusal risk, we then turn to an analysis of factors associated with that risk. The following sections work through from proximal and intermediate determinants such as health knowledge, wealth and education, to distal factors including religious orientation and trust in government.

\textsuperscript{42} This is consistent with risk-modelling which found that, compared with an aggregate rate of 17% missed children, rates in the worst LGAs of Sokoto states were the highest for the 11 high-risk states at 63%, and that the rate of 0-dose children in Sokoto was estimated to be 9.7%, compared with a range of 1-2% for other northern states (Global Good/EMOD, 2013).

\textsuperscript{43} Settlements in the top 33% of propensity scores: ‘very high-risk’ (VHR); those in the bottom 33%: ‘very low-risk’ (VLR).

\textsuperscript{44} See, e.g. Nigeria Polio Eradication Emergency Plan, 2014.

\textsuperscript{45} NB: Case investigations for 2012 show that of seven confirmed polio infections in Sokoto in that year, the majority were in households identified as ‘small town’ or ‘urban’, programme documentation, source: UNICEF Nigeria.

\textsuperscript{46} Numerical parentheses indicate settlement ‘propensity score’ – see graph 5.
**Vaccine knowledge is strongly associated with lower risk of OPV refusal**

We hypothesised that households with a poorer experience of health and healthcare would be more inclined to express frustration through refusing OPV. This does not appear to be the case. A lower score on our ‘health experience index’ did not predict higher propensity to refuse OPV.47 Knowledge of vaccines and a positive perception of immunisation in general, by contrast, were strongly associated with lower OPV refusal risk. This was not unexpected. But the effect appears to operate at a broader level of household knowledge than OPV, polio and PEI alone.

Across urban and rural households, the absence of positive perceptions of vaccination48 raises the risk of OPV refusal significantly (respectively, OR 4.00, p=0.002, 95% CI 1.67-9.6; OR 3.76, p=0.000, 95% CI 1.87-7.54). Very high-risk settlements are characterised by a stronger perception of negative vaccine effects (VLR: 0.34, VHR 1.19, t-stat 9.95), while very low-risk communities show a consistently higher level of practical vaccine knowledge. For each value in chart 5 (mean values for sampled households in high- and low-risk settlements), women’s and men’s knowledge of vaccines and vaccination is higher in settlements with low risk of OPV refusal, and the differences are statistically significant (t-stat >2, negative value = inverse relation to risk).

**Chart 5: Vaccine knowledge/practice and risk of OPV refusal**

<table>
<thead>
<tr>
<th>Vaccines and immunisation knowledge, VHR/VLR settlements</th>
<th>VLR</th>
<th>VHR</th>
<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approve of child vaccinations (women)</td>
<td>0.9874101</td>
<td>0.9277979</td>
<td>-4.8</td>
</tr>
<tr>
<td>Approve of child vaccinations (men)</td>
<td>0.9748201</td>
<td>0.9079422</td>
<td>-5.03</td>
</tr>
<tr>
<td>Believes vaccination protects against disease (women)</td>
<td>0.9064748</td>
<td>0.8610108</td>
<td>-2.17</td>
</tr>
<tr>
<td>Believes vaccination protects against disease (men)</td>
<td>0.9082734</td>
<td>0.8068592</td>
<td>-4.83</td>
</tr>
<tr>
<td>Women reported knowing about BCG</td>
<td>0.7392086</td>
<td>0.5920577</td>
<td>-5.14</td>
</tr>
<tr>
<td>Women reported knowing about DPT</td>
<td>0.7014388</td>
<td>0.5451263</td>
<td>-5.41</td>
</tr>
<tr>
<td>Women reported knowing about OPV</td>
<td>0.9460432</td>
<td>0.8285199</td>
<td>-6.06</td>
</tr>
<tr>
<td>Women reported knowing about HEPB</td>
<td>0.7032374</td>
<td>0.5794224</td>
<td>-4.29</td>
</tr>
<tr>
<td>Women reported knowing about measles</td>
<td>0.8579137</td>
<td>0.7833935</td>
<td>-2.99</td>
</tr>
<tr>
<td>Women reported knowing about pneumococcal</td>
<td>0.5989209</td>
<td>0.4548737</td>
<td>-4.92</td>
</tr>
</tbody>
</table>

At household level, knowledge of OPV and measles vaccine (the two commonest campaign antigens delivered in northern Nigeria) appears negligibly associated with women’s propensity to refuse OPV. Familiarity with BCG, Hepatitis B, DPT and pneumococcal vaccines, meanwhile, seems

47 Based on our ‘health experience index’ and propensity to refuse OPV.

48 Respondents citing zero positive attributes of vaccination.
considerably more strongly and systematically related to reduced risk (graph 6). Improving households' broader knowledge of vaccination practice and routine immunisation may be an important strategy for improving OPV uptake at this point, rather than pursuing a predominant emphasis on polio.

**Graph 6: Women’s vaccine-specific knowledge and propensity to refuse OPV**

We combined immunisation-related survey responses to create a ‘vaccine knowledge index’ (VKI) (annex e). Across all states and sectors, a higher VKI is associated with lower risk of OPV refusal. What determines the level of VKI, however, differs by context.

In urban and semiurban settlements, wealth is the strongest correlate of VKI (urban: OR 9.8, p=0.000, CI 7.3-12.6; semiurban: OR 4.2, p=0.004, CI 1.35-7.05). In rural settlements, VKI is most strongly associated with female literacy (OR 6.8, p=0.000, CI 4.27-9.37) and women’s participation in community activities (OR 12.21, p=0.000, CI 9.79-14.62).

It seems clear that while the effect of positive vaccine knowledge on OPV refusal is strong, that knowledge itself is mediated by more deep-rooted household- and community-level factors.

**Household dynamics of gender shape refusal ‘intentionality’**

The extent to which men and women within a household agree about whether children have been missed, or whether OPV is to be refused in future, differs dramatically across areas within our sample.

Across the sample, the proportion of households where only one (male or female) respondent reported missed children in past SIAs (24.6%) was considerably higher than those where both (male and female) so reported (8.7%). The difference is magnified when we disaggregate by state and sector of residence. In urban Sokoto and rural Kano, the proportion of households where either male or female reported missed children was high (27.2% and 25.4% respectively). The proportion of households in which both male and female reported missed children was lower in both cases, but also markedly different in scale (21.2% for urban Sokoto and 7.97% for rural Kano). In urban Sokoto, almost three-quarters of households reporting missed children are ones in which male and female caregivers both know that eligible children were neglected. In rural Kano, this falls to around a third.

We found a similar effect for ‘propensity to refuse’ OPV. Urban Sokoto and rural Kano have the highest rates of potential OPV refusal, taking either the male or female response (34.98% and 32.25% respectively). Male and female respondents jointly agree on the prospect of OPV refusal
in around a third of households in urban Sokoto, but in rural Kano that figure falls to one in 13 households.

High levels of agreement between male and female caregivers on the intention to refuse OPV (such as we find in urban Sokoto) may indicate a more conscious, hence arguably more entrenched, form of resistance to vaccination. Conversely, low levels of agreement (as in rural Kano) may indicate households in which there is either poor communication or genuine difference of opinion on the matter. In both cases, understanding more about gender dynamics and refusal risk (both for OPV and for wider immunisation services) may be helpful in shaping programme strategies that build stronger intra-household alignment on health as a priority issue.

But a gender alignment strategy should go further. Strengthening engagement between men and women on the value and practice of public health should incorporate male/female participation in planning and managing community activities, and consultation between community-based and institutional male and female health workers.

The influence of wealth and education on OPV refusal is ambiguous

Neither wealth nor education appears strongly correlated with propensity to refuse OPV in our sample. Higher wealth appears to reduce the risk of OPV refusal in rural areas (OR 0.67, p=0.022, CI 0.47-0.94). But households in very high-risk settlements have greater asset holdings (e.g. fridge/freezer (t-stat 10.8), TV (t-stat 10.2), better water and sanitation, and are closer to market centres (<15mins, t-stat 6.03) and health facilities (<15 mins, t-stat 7.8).

Formal educational status does not appear strongly to influence OPV refusal risk (or rate of missed children). The educational profile of households with missed children mirrors that of the general sample in the same area (graph 7). Female literacy reduces the risk of OPV refusal among rural households (OR 0.59, p=0.015, CI 0.39-0.9), but appears to increase risk at settlement level (t-stat 2.9), and is strongly correlated with urban VHR settlements (t-stat 12.17).

Although at lower absolute levels, the proportion of households where both male and female both reported possible OPV refusal in Bauchi was in the same range as urban Sokoto.

We found that risk of OPV refusal was marginally lower in households where male and female respondents both identified health and education as priorities for settlement development (OR 0.98, p=0.002, CI 95% 0.98-0.995). 

49 Although at lower absolute levels, the proportion of households where both male and female both reported possible OPV refusal in Bauchi was in the same range as urban Sokoto.

50 We found that risk of OPV refusal was marginally lower in households where male and female respondents both identified health and education as priorities for settlement development (OR 0.98, p=0.002, CI 95% 0.98-0.995).
The ambiguous impact of wealth and education in our sample is likely to be driven by the cluster of refusal risk in urban Sokoto where average levels of household wealth and education (as well as access to services) will be comparatively high. There is no reason to doubt that increasing household wealth and education (especially female literacy) are important positive factors for vaccine uptake and mitigating OPV refusal, in particular in rural areas. We can, though, conclude that comparatively comfortable material conditions and higher levels of education characteristic of urban areas do not appear reliably to reduce risk of refusing polio vaccination. We may hypothesise further, therefore, that other factors, perhaps operating at a deeper level than material conditions, are at play.\(^5^1\)

Households in very high-risk settlements are characterised by a more conservative normative outlook relating to education\(^5^2\) – men and women reporting own education as ‘madrassa’ (t-stats 9.49 and 4.83 respectively); men reporting madrassa education for eldest child (t-stat 6.7); women reporting preference for education of boys over girls (t-stat 2.23). More conservative household values might explain the persistence of OPV refusal bridging the different material conditions of rural and urban settlements. But ‘conservative’ draws on different meanings, including religious belief and preferences for societal organisation. If we are to understand the provenance of household antipathy towards OPV, we need to investigate these more structural characteristics.

**Religious orientation does not appear to correlate with OPV refusal risk**

We found no significant correlation between household religious or ethnic identity and propensity to refuse OPV. Households consistently scored ‘traditional and religious leaders’ significantly lower than all other options (e.g. ‘family’, ‘local leadership’, ‘government’, ‘NGO’) when asked to whom they turn for advice and support (graph 8).

![Graph 8: Preferred source of advice/support (men and women)](image)

Indeed, households in which men and women expressed greater reliance on their religious leaders for information about religious matters are found in settlements at lower risk of OPV refusal (OR 0.4, p=0.000, CI 0.26-0.6) (graph 9).


\(^{5^2}\) ‘Conservative’ defined as preference for traditional as opposed to ‘modern’ institutions for e.g. education.
We asked households whom they relied on for information in four areas: religious matters, health, security and political issues. The pattern of male responses for VLR and VHR settlements is almost identical (graphs 10 & 11). Religious leaders are viewed as the best source of information on religious matters (blue line) by a substantial proportion of respondents. But they are considered negligible in all other issue areas, including health.

We combined survey responses relating to households’ degree of preference for, reliance on or engagement with religious institutions to form an ‘index of religious observation’. A higher index score indicates a greater level or intensity of household religiosity. Mean values for this index were lowest in urban Sokoto and rural Bauchi – the two areas with the highest rates of male and female OPV refusal risk.\(^{53}\)

\footnote{\(^{53}\) Sokoto urban (3.573); Bauchi rural (4.510); Sokoto rural (12.097); Kano rural (13.043); Kano semiurban (16.045)
\(^{54}\) Y-axis values for graphs 10 & 11 are: 1 (radio); 2 (TV); 3 (mobile phone); 4 (internet); 5 (town crier); 6 (newspaper); 7 (family members); 9 (neighbours); 10 (settlement leader); 11 (religious leader); 12 (Ward Head); 13 (LGA); 14 (State Govt); 15 (Federal Govt); 16 (int. organisations); 8 (other)
Maintaining positive engagement with religious and traditional leaders is clearly crucial both for PEI and routine immunisation, for a range of reasons. However, following this analysis, a continuing concentration on traditional and religious leaders as primary interlocutors for PEI – and an expectation of this as the primary route to reducing negative attitudes to PEI/OPV – is hard to justify.

**Household perceptions of government appear to correlate with OPV attitude**

We hypothesised that household and community perceptions of external actors, in particular government, would influence attitudes to the polio programme and to OPV. We hypothesised that where government is viewed as a significant actor in PEI (either alone or in alliance with Western institutions), lower levels of ‘trust’ in government would be associated with higher propensity to refuse OPV. Our study suggests that the reverse is the case – though in a complex fashion.

We asked households which actor they viewed as ‘most effective’ in providing basic services (using three examples: water and sanitation, security, and healthcare).\(^{55}\) Households in VHR settlements expressed a systematically stronger expectation of (or reliance on) government (graph 12).\(^{56}\)

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\(^{55}\) Options ranging from ‘family itself’, through settlement and traditional/religious leaders, to Ward, LGA and higher levels of government.

\(^{56}\) We do not know whether positive responses on the role of government in service provision indicate actual experience of good performance, or expectation of performance (which may be fulfilled or disappointed). This is a critical distinction and one that would require further, more in-depth investigation.
Households in very high-risk communities reported consistently more positive perception of government as ‘effective provider’ of water and sanitation, health and security services (chart 6).

**Chart 6: Perception of government service provision and propensity to refuse OPV**

<table>
<thead>
<tr>
<th>Positive view of government in service provision in VLR/VHR settlements</th>
<th>VLR settlements</th>
<th>VHR settlements</th>
<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water/sanitation (government)</td>
<td>0.21</td>
<td>0.377</td>
<td>6.24</td>
</tr>
<tr>
<td>Security (government)</td>
<td>0.377</td>
<td>0.559</td>
<td>6.17</td>
</tr>
<tr>
<td>Health (government)</td>
<td>0.322</td>
<td>0.514</td>
<td>6.6</td>
</tr>
</tbody>
</table>

VLR settlements, by contrast, are characterised by an almost mirror perception of ‘family’ as the primary actor in securing basic services (graph 13).

**Graph 13: Reliance on government vs family self-reliance, VHR/VLR settlements**
Higher expectation of government as effective service provider might to an extent be explained by the preponderance of urban risk in our study. But the correlation between positive perception of government for provision of services and heightened risk of OPV refusal was particularly strong in rural settlements (OR: 4.47, p=0.000, CI 2.87-6.98).

Comparing VHR and VLR settlements, there was also a systematic difference in households’ belief in their ability to influence external, government policy and practice regarding the development of their communities. Perception of influence is consistently lower in VHR settlements (chart 7).

*Chart 7: Perception of household capacity to influence government, VLR/VHR settlements*

<table>
<thead>
<tr>
<th>Perception of household-government relations in VHR/VLR settlements</th>
<th>VLR</th>
<th>VHR</th>
<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opinion can influence government at local level (women)</td>
<td>0.571942</td>
<td>0.198556</td>
<td>-13.52</td>
</tr>
<tr>
<td>Opinion can influence government at state level (women)</td>
<td>0.519784</td>
<td>0.203971</td>
<td>-11.42</td>
</tr>
<tr>
<td>Opinion can influence government at local level (men)</td>
<td>0.663669</td>
<td>0.566787</td>
<td>-3.47</td>
</tr>
<tr>
<td>Opinion can influence government at state level (men)</td>
<td>0.584532</td>
<td>0.447654</td>
<td>-4.69</td>
</tr>
<tr>
<td>Opinion sought about community development (women)</td>
<td>0.339928</td>
<td>0.202166</td>
<td>-5.04</td>
</tr>
<tr>
<td>Opinion sought about community development (men)</td>
<td>0.649281</td>
<td>0.458484</td>
<td>-6.58</td>
</tr>
<tr>
<td>Local government cares about well-being of community (women)</td>
<td>0.465827</td>
<td>0.375451</td>
<td>-3.04</td>
</tr>
<tr>
<td>Local government cares about well-being of community (men)</td>
<td>0.442446</td>
<td>0.393502</td>
<td>-1.65</td>
</tr>
<tr>
<td>Family most responsible to improve family’s living conditions (women)</td>
<td>0.947842</td>
<td>0.895307</td>
<td>-3.63</td>
</tr>
<tr>
<td>Family most responsible to improve family’s living conditions (men)</td>
<td>0.920863</td>
<td>0.801444</td>
<td>-5.46</td>
</tr>
<tr>
<td>Government most responsible to improve family’s living conditions (women)</td>
<td>0.02518</td>
<td>0.046932</td>
<td>2.16</td>
</tr>
<tr>
<td>Government most responsible to improve family’s living conditions (men)</td>
<td>0.057554</td>
<td>0.099278</td>
<td>2.46</td>
</tr>
<tr>
<td>Women reporting “nothing” can they do to improve household conditions</td>
<td>0.039568</td>
<td>0.249097</td>
<td>10.77</td>
</tr>
<tr>
<td>Men reporting “nothing” can they do to improve household conditions</td>
<td>0.041367</td>
<td>0.084838</td>
<td>3</td>
</tr>
</tbody>
</table>

It is possible that our study is picking up a dissonance, strongly present in households with a higher propensity to refuse OPV, between expectation of government and perception of government responsiveness. A higher expectation associated with a perception of poor performance could create resentment that is subsequently expressed through negative attitude to the relatively visible and heavy government investment in polio eradication.

We asked households whom they would turn to (and, implicitly, trust) for advice to solve a range of day-to-day problems. As in the case of service provision, respondents in high-risk settlements had a considerably higher preference for government (at Ward level or above) (graph 14).

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57 The problem scenarios were designed to test relative preference for different external actors in each case. Scenarios were: a problem of crime in the community; a marital dispute; a dispute over inheritance; a dispute over money; a dispute over land; a problem of livestock disease; a problem of household food insecurity; and ill health in the household.
Looking at respondents’ preference by individual scenario, we found a consistent pattern (modulating proportions but largely unchanging in order of preferences). Households in general appeared to distinguish between a group of issues (between the dotted lines) in which government interlocution is viewed as desirable (or legitimate), and others (between the dashed lines) in which it is not (graph 15). We may class these issue groups as, respectively, ‘asset-related’ and ‘domestic’.

Differences between VHR and other settlements on preference for government in problem-solving do not have a statistically significant bearing on risk of OPV refusal. But the more extreme pattern, in higher risk households, may point back to the question of conservative norms. It is possible that VHR settlements are ones in which households demarcate relatively emphatically between matters in which the role of government as interlocutor is viewed as legitimate and to-be-sought, and other matters – including health – in which government is almost entirely excluded. In this interpretation, relatively conservative households may be less comfortable accepting delivery of health interventions in the private space of domestic management.
When we look at results for VHR settlements, we find that the pattern is amplified (graph 16).\textsuperscript{58}

**Graph 16: Preferred source of external ‘problem-solving’ advice (men, VHR settlements)**

Although we use the terms ‘trust’, ‘expectation’, ‘reliability’ and ‘legitimacy’ with regard to household and community perceptions of government (in particular in public health provision), we do not use them interchangeably. Rather, we view them as sequential. When community expectations regarding desired services are reliably met with service provided under visible government leadership, we believe popular perceptions of government legitimacy strengthen, and in so doing, strengthen public willingness to trust government as an interlocutor in their lives, including in the field of health.\textsuperscript{59}

This analysis offers a couple of distinct opportunities for engaging resistant households both for PEI and wider routine immunisation.

In operational terms, a key aim should be to shift the issue of health leftwards along the x-axis of public perception graphs such as the one above. Evidence suggests that communities are willing to trust in (and work with) government, provided the issue is one in which government’s role is viewed as legitimate. Evidence also suggests that it may be disappointed expectation of government performance, rather than distrust of government in and of itself, which contributes to negative reactions to the polio programme.\textsuperscript{60}

A strategy to build the role of local government as a lead presence in public health discourse and delivery should be developed on the basis of this analysis as a way of strengthening PEI and building out of PEI towards a stronger public engagement around routine immunisation. This leads to our final finding.

\textsuperscript{58} By contrast, ‘family’ is viewed as the primary source of support in VLR settlements for: inheritance disputes (men/women, t-stats: -3.47, -7.28), land disputes (men/women, t-stats: -3.21, -2.71) and food shortage (men/women, t-stats: -5.94, -2.54), money disputes (men, t-stat: -3.97), marital disputes (men, t-stat: -4.12) and household illness (women, t-stat: -7.12).


\textsuperscript{60} CORE strategies in India, brokering and building a relationship around issues of public health between communities and local government are reported to have been effective in improving acceptance and uptake of OPV.
Community-level participation (in particular for women) is associated with lower OPV refusal risk

Settlements at high risk of OPV refusal show consistently lower levels of community activity. This was particularly strongly the case for female respondents (graph 17 and chart 8).

Graph 17: Community participation (women, VHR & VLR settlements)

![Bar chart showing community participation and propensity to refuse OPV](image)

Chart 8: Community participation (women) and propensity to refuse OPV

<table>
<thead>
<tr>
<th>Community participation (women) and propensity to refuse OPV, VHR/VLR settlements</th>
<th>VLR settlements</th>
<th>VHR settlements</th>
<th>t-stat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Religious meetings</td>
<td>0.699</td>
<td>0.261</td>
<td>-15.67</td>
</tr>
<tr>
<td>Village development meetings</td>
<td>0.581</td>
<td>0.157</td>
<td>-16.64</td>
</tr>
<tr>
<td>Village health committee meetings</td>
<td>0.519</td>
<td>0.142</td>
<td>-14.94</td>
</tr>
<tr>
<td>NGO meetings</td>
<td>0.332</td>
<td>0.102</td>
<td>-10.28</td>
</tr>
</tbody>
</table>

The role of women’s collective engagement in the management of community development has been promoted widely and for long. We need, though, to understand whether it is women’s higher levels of engagement in settlement-level activities that directly reduces risk of OPV refusal, or whether, more indirectly, it is the fact that households which support women’s public engagement are also likely to adopt a more progressive view of health and a more open attitude to vaccine delivery through the polio programme.

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61 Measured as households reporting having participated in the last 6 months in: community level religious, health committee, community development and/or NGO meetings.
Conclusion

This study reveals a complex picture of attitudes to OPV, PEI and immunisation. It shows how a mixed methodology of qualitative and quantitative approaches can be used to generate relatively rich and nuanced but statistically verifiable insights, going beyond more conventional social-epidemiological representations of population proportion and disembodied determinant.

The opportunity provided by quantitative/qualitative amalgamation and purposive sampling for comparative analysis is also, arguably, its weakness. At the limits of strictly statistical analysis, we are left (as we have found at key moments in this research) with a considerable space for interpretation. At the same time, purposive selection of areas for comparison can limit the wider applicability of insights.

On the whole, however, we would argue that this pilot investigation demonstrates the potential of field research to explore and explain deep-rooted and interconnected factors shaping people’s health-related behaviour and attitudes to mass vaccine programmes like PEI. The circumstances of household thinking about community, livelihood, health and vaccination are complex. To reduce this protean calculus to a short-list of population proportions and individuated causations is to undermine and underestimate the reality with which a programme like polio eradication wrestles daily.

From this prototype research, we hope that more streamlined, field-ready and cost-efficient models can be developed to support operational research for both disease-specific vaccine interventions and building of universal routine immunisation services in the future. Conducting this kind of localised research in areas known to be chronically poor-performing could enhance understanding of demand-side barriers, improve design and cost-effectiveness of interventions, close persisting immunity gaps, and shorten overall length and cost of control/elimination and eradication programmes.

Polio eradication in Nigeria has made remarkable progress in recent years. But threats remain to that progress, both in the immediate programme present and in the longer term of routine immunisation and health system strengthening. The threat posed by small groups of un- or under-vaccinated children, missed repeatedly round by round, is perhaps the most pronounced. As aggregate coverage rises, highly localised coverage gaps become increasingly hard to detect, assess, understand and address.

There appears to be a significant degree of intention in the rate of missed children in areas of northern Nigeria today. There is evidence that refusal risk may be clustered, with a degree of settlement-level effect that we need to understand better. How are households communicating with one another in these communities? What are their formal and informal networks of information and influence?

There is evidence, too, that risk is not (now) concentrated uniquely in relatively poor, remote rural and ‘underserved’ areas. Rather, risk appears to be more evenly present, in our sample, in rural and urban contexts. On one hand, this points to the need for PEI to balance strategic attention to rural and urban areas. On the other, it raises the question whether the effect of factors such as wealth and education is itself shaped by deeper, structural conditions which may have purchase in urban and rural households alike.

It seems clear that households with a better understanding of immunisation (more broadly than simply polio) are less likely to refuse OPV. This raises the possibility that strengthening routine
immunisation (awareness, understanding, even service provision) in areas at higher risk for missed children and OPV refusal may be primary (rather than ancillary) strategy for PEI at this point.

This research found little evidence that household attitudes to OPV (or wider immunisation) are shaped by a specific religious orientation. Reliance on religious leaders for information and advice appears quite limited (relative to other institutional options), and quite closely confined within the realm of uniquely religious issues. Health is excluded from this realm. There are very good reasons to maintain and strengthen the role of religious leaders and institutions in PEI, mass immunisation and wider public health programmes. But the polio programme in Nigeria could explore other ways to engage target populations, including in particular, working more strongly with and through local government.

If we combine the potentially positive effect of community-level activity, with households’ expectation of government as service provider, but exclusion of government from domestic decision-making on health matters, there may be an operational argument in favour of expanding publicly-organised health camps, with an emphasis on ramping up this strategy in areas considered at high risk for OPV refusal (and historically high rates of missed children).

The Nigeria programme has already committed to a health camps strategy – though recognition of the role of health camps in our survey was very small (1-2% of responses). Investment in high-quality camps – delivering a range of public health services (including OPV and other antigens, but not limited to immunisation) – has a number of potential benefits. It can show leadership by local government in service provision, and build public confidence in that role; it can show responsiveness to households or settlements where there is uncertainty about the legitimacy of government intervening in domestic health decision-making; and it can act as a bridge between the door-to-door familiarity of polio eradication, and the long-range goal of a fully functional infrastructure of routine immunisation delivered and accessed through the healthcare system (though we note that health camps, in and of themselves, should not be viewed as a full strategy for strengthening RI or health systems).

But building a public health presence, led by local government and operationalized in and through communities’ public spaces, may be an important strategy for building the regularity of interaction between communities and their local government in the domain of public health, building demand-side perception of local government as a reliable source of support for household health, and contributing to a virtuous upward cycle of demand-side confidence and supply-side performance, maximising reach and uptake of mass immunisation and health services equitably and universally across northern Nigeria in the future.

This kind of (‘health camp’) strategy has had conventional traction in rural areas where problems of sparse population and wide area coverage validates the intermediate infrastructural model of health camps as a staging post between house-to-house vaccine delivery and households habituated to seeking immunisation through the formal health system. Health camps may have a role in urban environments too, where they constitute, almost literally, a middle ground between formal administrative systems and households whose values, including those related to health, caregiving, risk and prevention and trust in external actors, are caught between rural traditions and urban modernity. In this context, the urban health camp is an intermediate rather than long-run strategy, designed to build relationships around public health in the public space of rapidly forming and often rapidly changing urban communities.

This research suggests that there is significant potential to build the role of government – in particular local government at LGA and Ward – in provision of public health, and more particularly
routine immunisation and polio vaccination. Settlements with higher OPV refusal risk appear to expect more of government (but also to feel they can exert less control over government performance). They have relatively high levels of trust in government, but only in certain areas (mainly oriented to protection of assets and property). Health is not one of these.

High-risk settlements are comparatively disadvantaged with regard to community-level activities and opportunities for collective participation. If high-risk households exclude government as an interlocutor on health in the private space of the family, there may be an opportunity to build a strategy for public health programmes delivered through public spaces.
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3. WHO Executive Board prepares resolution for World Health Assembly to have polio declared a programmatic emergency for global public health. GPEI February 2012.  
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