ORIE Nutrition Research in Northern Nigeria

Quantitative Impact Evaluation of the WINNN Programme

Volume I: Main Findings

Operations Research and Impact Evaluation

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Executive summary

Introduction

This report presents the results of the quantitative impact evaluation of the Working to Improve Nutrition in Northern Nigeria (WINNN) programme. Its purpose is to provide a quantitative evaluation of the impact of the WINNN programme in the three years since the baseline study.

Separate reports provide the results of the qualitative impact evaluation and the cost-effectiveness evaluation. These reports, together with the quantitative impact evaluation, are integrated into a final integrated evaluation report, which is also presented separately.

The WINNN programme

The WINNN Programme is an ambitious £52 million, six-year, UK Department for International Development (DFID) - funded programme (2011–2017) to improve maternal, new-born and child nutrition in five states in northern Nigeria. WINNN is implemented by three partners: Save the Children (SC), Action Against Hunger (ACF) and the United Nations Children's Fund (UNICEF). WINNN is designed to deliver effective and cost -effective nutrition -specific interventions (micronutrient supplementation, a community-based management of acute malnutrition (CMAM) programme and infant and young child feeding (IYCF) counselling) whilst improving government commitment to solving malnutrition. The delivery of these interventions through government is expected to build government systems and capacity for implementation, and ultimately to institutionalise them within routine health care systems. This is expected to raise the political profile of undernutrition in Nigeria and to leverage government to coordinate and fund nutrition programmes.

The broad outputs of the WINNN programme are as follows:

Output 1: Integration of micronutrient intervention into routine primary health services.

Output 2: Delivery of effective IYCF interventions in selected states and LGAs in northern Nigeria.

Output 3: Delivery of effective treatment for SAM through local health systems in selected states and LGAs in northern Nigeria.

Output 4: Strengthening of nutrition coordination and planning mechanisms at national and state level.

Output 5: Operations Research and Impact Evaluation (ORIE) (independent impact evaluation)

ORIE is responsible for undertaking operations research and assessing the impact of the WINNN programme. The ORIE project is composed of five workstreams, as follows: (1) operations research; (2) impact evaluation; (3) economic evaluation; (4) evidence dissemination and uptake; and (5) supporting national researchers in nutrition.

The impact evaluation of the WINNN programme

The impact evaluation aims to answer the following question: what is the impact of the WINNN programme as whole on population-based, LGA-wide indicators of nutritional behaviours and nutritional status and provision of nutrition services? The overall approach chosen to answer this question is to utilise a mix of quantitative and qualitative methods to arrive at a complete

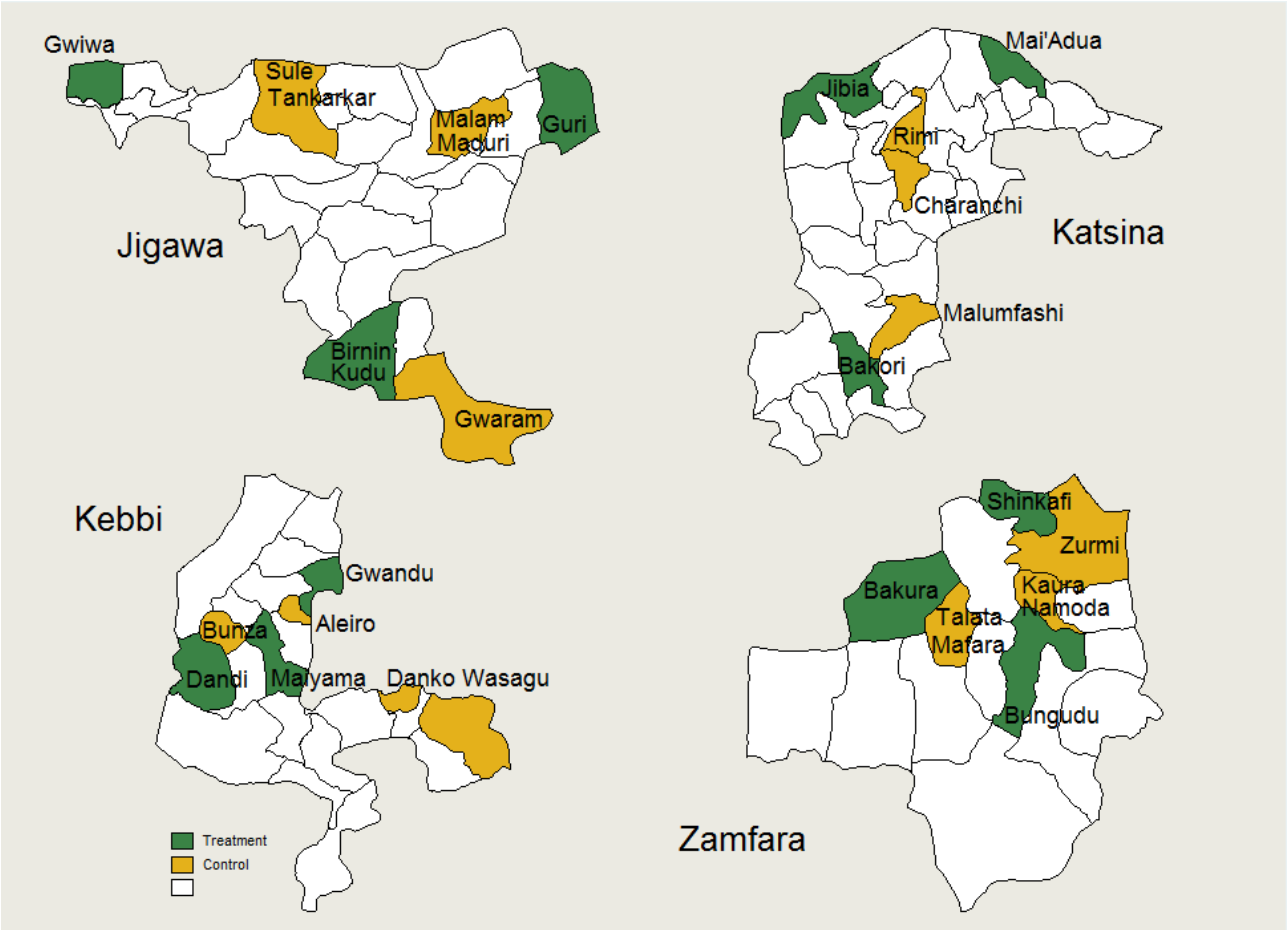
assessment of the impact of the WINNN programme as a whole. The impact of individual interventions or WINNN outputs – as technologies – was not assessed as there already exists an extensive evidence base for these interventions (Bhutta *et al*., 2008 and 2013; Longhurst *et al*, 2013).

For the sake of simplicity, the WINNN outputs can be divided into two broad categories: interventions that are focused at the level of the LGA (Outputs 2 and 3) and interventions that are focused at the level of the state and federal governments (Outputs 1 and 4). For interventions implemented at the level of the LGA (IYCF counselling and the CMAM programme), the impact assessment uses a quasi-experimental design relying on data from population-based quantitative surveys, combined with community-level qualitative research in communities. For interventions implemented at the state and federal levels, a qualitative approach is used and is presented in a separate report.

The impact evaluation methodology

This quantitative impact evaluation uses a quasi-experimental design to identify and quantify the changes in key indicators that can be attributed to two key components of WINNN: the IYCF counselling and CMAM programme interventions. To do so, it uses data collected from a panel of 3,229 households, with the same households surveyed at baseline (June 2013) and endline (June 2016). Data were collected from both LGAs where WINNN has operated (treatment LGAs) and LGAs where WINNN has not operated (control LGAs). In total, there were three treatment and three control LGAs per state (see Figure 3 below).

Figure 1 Treatment and control LGAs in Jigawa, Katsina, Kebbi, and Zamfara



The quantitative survey is complemented with community-level qualitative research to explore quantitative trends in more detail. The community-level qualitative research at endline was designed to provide more insights on key topics identified in the ORIE quantitative analysis. The qualitative community research explores caregivers' IYCF knowledge, household relations that affect infant feeding, and the work and influence of community volunteers (CVs) and health workers. The research utilises participatory methods, including a visual tool to analyse the influence of different household members over infant feeding decisions, and stories of change.

How to identify the impact of WINNN

Since WINNN-supported interventions were not allocated randomly to treatment and control LGAs, and various components of the programme began at different stages, a simple comparison of treatment and control areas at endline is not sufficient to robustly estimate the effect of the WINNN programme. We therefore use a 'difference-in-difference' (DID) approach, which measures the differential outcome between estimates in treatment and control areas over time (double-difference). The underlying assumption that must hold for this approach to work is that the difference in outcome between treatment and control areas would have been constant over time had it not been for the WINNN-supported interventions. This approach effectively factors out all pre-existing differences between the two groups so as to be able to assess the impact of the WINNN programme.

Contextualising the findings

Context of northern Nigeria

One of the most important contextual factors that must be considered when interpreting findings is the severe scale of the burden of undernutrition in Nigeria. The NNHS 2015 estimates 33% of children under five are stunted, and together with Nigeria's large population, this translates to the second largest number of stunted children globally (NNHS 2015, UNICEF 2013)[1]. Within Nigeria, the women and children of the northern states have the worst health outcomes and the lowest access to health services, with high rates of infant and child mortality and less than 50% of women receiving any antenatal care.[2]

The challenge of operating in this context is compounded by WINNN's implementation model to deliver interventions through the government health system and indeed strengthen the system in so doing. The health system in northern Nigeria is fragmented and weak, and often under-staffed and under-resourced (Qualitative Evaluation of the WINNN Programme, 2017). The inadequacy of human resources for health (in terms of both skills and numbers), particularly in rural and remote areas, is an important constraint to the provision of health services.

Adding to these complexities was the fiscal crisis starting in 2015, due to the large drop in the price of oil, reflected in the non-payment of health worker's salaries for much of 2015-16, in most of the WINNN states. This understandably reduced health worker's motivation, and their absence from work has compounded the inadequacy of human resources for health. The adverse fiscal situation

[1] United Nations Children's Fund, *Improving Child Nutrition: The Achievable Imperative for Global Progress* (New York: UNICEF, 2013)
[2] DFID Business case for the MNCH2 programme (2014), citing the National Population Commission, Nigeria and UNICEF; 2011 MICS survey (preliminary unpublished data) –

has also affected the release of public funds for nutrition (Qualitative Evaluation of the WINNN Programme, 2017

A further constraint is the intensely conservative gendered social norms and practices in northern Nigeria (see ORIE Gender Synthesis Report, 2015). These act as a constraint on women's uptake of health and nutrition services and on changing ingrained traditional infant feeding practices. Women marry at an early age (at 15 years on average), often to older men (average age gap of 13.5 years), and bear children early (at 17 years on average) (ORIE baseline study, 2013). Their mobility is often limited upon marriage, as are their opportunities to earn an income. Many women have limited decision-making power relative to their husbands and older women in the home over issues like use of household income, child healthcare and feeding. Levels of formal education are low across the population, and especially among women. Husbands may refuse to allow their wives to attend services at health facilities or withhold the cash needed to travel to health facilities, and many older women have been resistant to the adoption of recommended IYCF practices that are contrary to the way they fed their own children. These factors hinder mothers' ability to care for their children, to access health and nutrition services for themselves and their children, and to adopt recommended IYCF practices, and have been shown to underpin poor child nutritional outcomes in Nigeria (Omilola, 2010, Ibrahim et al., 2015, Ajieroh, 2009).

Staggered implementation of the WINNN Programme

Another important consideration is the staggered roll-out of the WINNN supported interventions. This is illustrated graphically in Figure 7 (see section 3 for programme roll-out figure). While Output 1 (micronutrient supplementation) commenced in all four states by early 2013, Outputs 2 and 3 (IYCF interventions and the CMAM programme) commenced in late 2013 and 2014 respectively.

The staggered roll-out reflected the complexities of implementing interventions through a fragmented health system, and the need to ensure government ownership, commitment and capacity building. Due to the staggered roll-out of the WINNN supported interventions, the treatment areas were not exposed to the full package of WINNN interventions until early 2014 (8-10 months after the baseline survey), giving less time for the programme to show an effect on outcome and impact indicators.

To implement their interventions across selected LGAs, WINNN's primary approach was to work through selected health facilities, combined with community outreach activities. At the start of the programme, WINNN focused its community IYCF (c-IYCF) component around selected health facilities, about 15 per LGA and with 3 support groups attached to each. Only in late 2015 was the c-IYCF component expanded, to cover additional wards and communities. While the business case intended WINNN's interventions to reach 3 LGAs per state, in practice, the community-IYCF (c-IYCF) model was implemented in ten communities per ward (WINNN Behavioural Change Communication Strategy, 2015). In effect, the c-IYCF component only covered a portion of the communities in the target LGAs[3] thus clustering implementation.

As the impact evaluation was designed to measure impact at the level of the LGA, the evolution of the WINNN's implementation model to a more focussed and clustered approach may have led to the dilution of programme impact at the LGA level.

[3] Due to a lack of data on the number of communities in each ward, WINNN has not estimated the overall proportion covered.

Timeframe for evaluation

Due to the later contracting of ORIE, the quantitative evaluation only covers the three years (2013-2016) of the six-year WINNN Programme (2011-2017). ORIE was contracted late in 2012 and implemented the baseline survey in June 2013. To enable the dissemination of findings and their use for decision making before the WINNN project close in August 2017, the endline was conducted in June 2016. As many nutritional indicators are sensitive to seasonal effects, it was necessary to conduct the endline in the same month as the baseline to control for any seasonal effects.

Key conclusions

In light of the contextual considerations outlined above, this section brings together key conclusions that emerge from this evaluation, considering the entire results chain of the WINNN programme presented in section 3.2.

IYCF counselling, knowledge, and practices

Overall, WINNN monitoring data indicates that over half a million women were reached by the IYCF interventions across the five focal states in treatment areas during the four years of implementation. The WINNN-supported IYCF interventions focussed on community-based IYCF counselling (provided by community volunteers) (c-IYCF) and facility-based IYCF (f-IYCF) counselling delivered during postnatal care (PNC) and antenatal care (ANC) sessions and on CMAM days at WINNN supported health facilities.

These numbers are reflected in the significant increases in the proportion of mothers of children under age three who received IYCF counselling in the community across WINNN treatment LGAs which are attributable to the programme. On average, mothers in treatment areas at endline were significantly more likely to have received any type of IYCF counselling, both c-IYCF and f-IYCF counselling, compared to control areas by more than 20 percentage points.

WINNN also significantly improved knowledge on some IYCF practices in mothers in treatment LGAs. Key knowledge indicators were assessed at baseline and endline and the evaluation finds a significant impact of WINNN on the proportion of mothers who recognised that water should not be given to infants under six months (20% at endline in treatment areas compared to 7% in controls). In addition, knowledge about non-standard feeding times, exclusive breastfeeding and about early initiation breastfeeding was significantly higher in treatment areas than in control areas at endline.

Despite these gains, there remains a large population still to be reached as only 19% of mothers in treatment areas agree with the message that water should not be given to infants under six months who are being breastfed. Similarly, less than half (45%) report that breastfeeding should start immediately after birth, i.e. without delay.

The evaluation finds robust evidence that WINNN significantly increased early initiation of breastfeeding (within 24 hours) among children in WINNN LGAs by about nine percentage points. Analysis at endline shows that early initiation to breastfeeding (within the 24 hours) was higher in treatment areas (83%) than in control areas (73%). There was also some improvement in terms of exclusive breastfeeding (children 0-5 months) in WINNN LGAs that could be a consequence of IYCF counselling. WINNN did not have an impact on other complementary feeding

indicators such as minimum dietary diversity which is likely due to the late start of food demonstrations and emphasis on messages relating to early initiation, exclusive breastfeeding and personal hygiene and sanitation. Improvement of complementary feeding indicators also requires mothers to overcome financial barriers thus making them particularly difficult to change.

Despite WINNN's achievements in improved IYCF knowledge and practice, less than half of all mothers in treatment areas at endline (42%) had ever received IYCF counselling at ANC sessions, only a third (32%) had attended IYCF counselling in the community, and only one fifth (20%) had received IYCF counselling at PNC sessions. Additionally, only 20% of mothers had attended a counselling session at both the community and the health facility. This shows that there is a significant challenge ahead as a large portion of the population remain to be reached.

The ORIE qualitative research also revealed that even when mothers were exposed to IYCF counselling directly, and had improved knowledge about good IYCF practices, there were challenges with regard to translating knowledge into practice. For example, even though many mothers who were interviewed did know the benefits of exclusive breastfeeding for six months, many also reported that they felt that not giving any water to infants on hot days was too much of a risk to take. The power dynamics within households, in particular the relatively weak position of young, often poorly educated, adolescent mothers vis-à-vis their mother in law, prevented the uptake of some of the IYCF practices, given that the qualitative evaluation found that many mothers-in-law are resistant to change. Autonomous decision making by mothers is often restricted by conservative community norms, which may contribute to a failure to implement favourable nutritional practice. Generally, messages around early breastfeeding were more accepted than the ones around exclusive breastfeeding, which is also reflected in the quantitative data.

Access to treatment at CMAM facilities

The WINNN-supported CMAM intervention treated more than 200,000 SAM patients over five years across the five WINNN supported states. WINNN's CMAM programme implementation model focussed on CMAM days for outpatient therapeutic feeding with RUTF in Primary Health Care (PHC) facilities, and treatment at stabilisation care facilities for severe cases of undernutrition. The role of CVs was to support CMAM-related activities at PHC, track defaulters and community sensitisation on CMAM-related services, (i.e. community outreach).

In treatment areas, the endline survey indicates that 18% of children 6-35 months with SAM had ever accessed treatment at CMAM facilities and compares to only 11% in control areas. While this is not an estimate of CMAM programme coverage, it is indicative of the low proportion of children with SAM who actually reached treatment.

Awareness of and attendance at maternal, newborn and child health week events

WINNN supported the implementation of maternal, newborn and child health week (MNCHW) events via a variety of channels, which included assistance with the procurement of commodities, coordination and planning support at state and LGA level, and social mobilisation for MNCHW events. MNCHW events are state-wide interventions that are also implemented in control areas, although WINNN undertook additional mobilisation efforts in treatment areas. The evaluation therefore assessed mother's awareness of and attendance at the MNCHW event in the areas surveyed, as well as the outcomes of increased social mobilisation efforts in the WINNN focal

LGAs. Because at baseline MNCHW events had not yet started in Kebbi, impact estimates for these indicators were based on data from Katsina, Jigawa, and Zamfara only.

The evaluation findings indicate there has been a significant increase in the awareness among mothers of MNCHW events in both treatment and control areas. As MNCHW events are state-wide interventions, an increase in awareness in both treatment and control areas is interpreted to be a positive result of WINNN's effort.

A similar trend is found for attendance at MNCHW events with a general increase in mothers attending MNCHW events between baseline and endline in both treatment and control areas.

In this context of improved awareness and increased attendance in all evaluation areas, **the endline survey finds significantly higher attendance at MNCHW events in treatment areas (15%) compared to controls (8%) which is largely due to WINNN's social mobilisation efforts in focal LGAs.**

Despite these positive trends, the endline survey reveals that only 10% of mothers in treatment areas reported attending the most recent MNCHW event. However, we acknowledge that this indicator is notoriously difficult to capture, especially given MNCHW events were not strongly branded. As such, these findings are likely under-estimated and should therefore be interpreted with caution. As MNCHW events are the only source of Vitamin A in WINNN States, it may be the case that the Vitamin A coverage indicator may be a good proxy for MNCHW event attendance. Even if we considered Vitamin A coverage to be a suitable proxy and upper bound for MNCHW event attendance, the conclusions we would draw remain the same indicating that there is a large portion of the target population that remains to be served.

Vitamin A intake

WINNN monitoring data suggests that it has reached a 9,232,400 children with Vitamin A by the end of the fifth year of implementation. WINNN supported the distribution of Vitamin A primarily at MNCHW events.

WINNN positively and significantly affected the proportion of children who received Vitamin A in treatment areas. In treatment LGAs, WINNN positively affected the proportion of children (6-35 months) who received Vitamin A drops in the six months preceding the survey at endline by over 15 percentage points. At endline, nearly 30% of children 6-35 months had received Vitamin A in the last six months compared to 18% in control areas.

WINNN counteracted a general negative trend in the proportion of children receiving Vitamin A since the baseline. ORIE survey data show that there was an overall decrease in the proportion of children who received Vitamin A drops in the areas surveyed. The overall decrease is consistent with estimates published in other regional surveys such as the NDHS, the NNHS and the MICS surveys. While the reason for this decline between 2011 and 2016 cannot be inferred from the data collected in this evaluation, it has been suggested that this could be due to a decrease in the intensity of the door-to-door polio campaign in this period. WINNN helped counteract this effect in its focal LGAs, probably by increasing attendance at MNCHW events.

Child undernutrition

Various surveys, including ORIE but also national surveys like the NDHS and NNHS, show that child undernutrition continues to be a severe public health issue in northern Nigeria. The prevalence of child undernutrition, as measured by the proportion of children who are stunted, wasted (acutely malnourished), severely wasted (severely acutely malnourished), or underweight, across northern Nigeria remains very high. Recent publications, such as e.g. the National Nutrition and Health Survey 2015 (NNHS 2015), have shown that across North West Nigeria about one in ten children (6-59 months) is acutely malnourished, about 3% are severely acutely malnourished, about a third (0-59 months) is underweight, and over half (0-59 months) is stunted. Efforts to reduce child undernutrition therefore remain very important.

In areas surveyed for this evaluation, at endline, child undernutrition in treatment and control LGAs remained at high levels. Among children aged 6-35 months, (i.e. a different population than the figures presented above) at baseline about half (50%) were stunted, over a third (38%) were underweight, about 17% were acutely malnourished and about 6% were severely malnourished. Indeed, the results of this quantitative impact evaluation reveal no significant improvement in anthropometric indicators as a result of the WINNN Programme.

The determinants of undernutrition are complex and multi-determinant and it is not surprising that the WINNN interventions alone did not improve anthropometric indicators. Achieving a significant improvement in population-level anthropometric indicators is difficult and requires a complementary set of interventions that are delivered with sufficient intensity and coverage. The nutrition specific interventions in the WINNN programme were not accompanied by a suitable range of nutrition sensitive interventions. It is also questionable as to whether we would have been expected to see a significant change in anthropometric indicators during the three-year duration of the evaluation.

Adolescent mothers

Adolescent mothers (15-19 years) in treatment areas were at a considerable disadvantage in regard to accessing and benefiting from WINNN services compared to older mothers. We found that this was the case across a range of services. For example, adolescent mothers in treatment areas were significantly less likely to attend IYCF counselling at the community at endline (22% compared to 39% among mothers aged 35 years or more) and their children were significantly less likely to ever have been screened for undernutrition using Mid-upper arm circumference (MUAC) (5% compared to 21% among children whose mothers were 35 years old or more).

Children of adolescent mothers (15-19 years) in treatment areas were also less likely to benefit from improved breastfeeding practices and less likely to have received Vitamin A drops in the six months preceding the survey. For example, about 18% of children (6-35 months) with adolescent mothers in treatment areas at endline received vitamin A in in the six months preceding the survey, compared to 33% with mothers age 35 years old or more. Similarly, about 6% of children (0-5 months) with adolescent mothers were exclusively breastfed, compared to 23% of children with mothers aged 20-24 years. Results from qualitative research indicate that internal power dynamics within households that are skewed against young and adolescent mothers were partly responsible for this, an issue recognised by WINNN. The contribution of low levels of education and conservative social norms towards young mothers appear to be crucial constraints on achieving nutritional change.

Differences across states

Differences in implementation timelines and modalities across WINNN states have led to significant differences in terms of key indicators assessed in this evaluation. Together with evidence from qualitative research implemented within the context of ORIE, the following key findings can be highlighted.

In **Katsina and Jigawa,** this survey found comparatively high levels of community IYCF counselling attendance, higher levels of MNCHW event attendance, and higher levels of IYCF knowledge among mothers (15-49 years) in treatment areas, compared to similar treatment areas in Zamfara and Kebbi. The qualitative research confirmed that community IYCF counselling was strong in Katsina and Jigawa, in particular because of strong supervision and highly motivated CVs.

In **Kebbi**, this survey found comparatively low levels of IYCF counselling attendance among mothers (15-49 years), significantly lower levels of MUAC screening among children (0-35 months), and a significantly lower proportion of mothers who had attended the last MNCHW event than in Jigawa and Katsina. This translated into significantly lower levels of knowledge of appropriate breastfeeding practices among mothers and in lower programme effects on Vitamin A intake among children (6-35 months) than in other states. Partly, this could be explained by the later implementation of some components of WINNN in Kebbi compared to other states and late commencement of MNCHW events.

In **Zamfara**, we found lower levels of IYCF counselling attendance and MNCHW event attendance among mothers (15-49) in treatment areas compared to Jigawa and Katsina, but similar levels of MUAC screening among children (0-35 months). Breastfeeding knowledge among mothers (15-49 years) in treatment LGAs and programme effects on Vitamin A uptake and IYCF knowledge were similar to Jigawa and Katsina.

Key lessons and recommendations

The key conclusions presented above provide an overview of the findings that emerge from this evaluation along the results chain of the WINNN Programme. While the impact evaluation showed no impact on anthropometric indicators, there is positive evidence of impact on a limited number of intermediate outcomes such as IYCF knowledge and practice, awareness of and attendance at MNCHW events as well as coverage of Vitamin A supplementation.

The principle objective of this quantitative impact evaluation was to assess impact, not to develop detailed operational recommendations. ORIE has produced a separate document, the ORIE Nigeria Integrated Report which draws on evidence from across ORIE workstreams to fully draw out lessons learned and recommendations targeted towards specific stakeholder groups such as the Nigerian Government, donors and programme implementers. The Integrated Report also draws on evidence from across ORIE workstreams to report on WINNN's logframe indicators.

However, a number of important lessons and recommendations emerge from the quantitative impact evaluation and are outlined below.

Lessons

1) The WINNN programme has tested and applied models of implementing nutrition-specific interventions within a weak and fractured health system and demonstrated that

it is possible to make significant improvements in service delivery and in some intermediate outcome indicators through focussed and coordinated efforts.

2) However, the scale of resources allocated, though large, was not sufficient to provide comprehensive coverage in the focal LGAs. It is understood that WINNN was meant to be a demonstration project, therefore the anticipated scale of change in key impact and outcome indicators may have been ambitious given the resources available, the complexity of the context of implementation and the challenges of securing scale-up by government.

3) Given the challenges of high quality data in northern Nigeria, it is important to go beyond using absolute population targets in the design and monitoring of programmes. Monitoring programmes using population coverage indicators are essential to tracking the progress of implementation, identifying bottlenecks and setting expectations of achievement.

4) Given the various determinants of undernutrition and challenging context of northern Nigeria, it is important that the package of nutrition-specific WINNN interventions are complimented with nutrition-sensitive interventions to address the wider set of determinants of undernutrition.

5) The quantitative impact evaluation of the WINNN programme was constrained to assessing impact at the level of the LGA which imposed limitations on its ability to flexibly assess the adapting operational models in selected communities within these LGAs. A further constraint was the mismatch between the implementation timeline and that of the evaluation. Coordinating timelines between implementation and evaluation is critical to ensuring the evaluation is not unduly limited in the evidence it is able to collect.

Recommendations

1) Improving the access of young, adolescent and less educated mothers to nutrition interventions needs focused interventions towards those mothers who have low levels of autonomous decision making regarding the nutrition of their child. This will require novel community based action and supported change.

2) There are significant cultural barriers in turning increased knowledge into improved practice – particularly for exclusive breastfeeding and mother's fears of not giving water to the infant. Additional research to further develop approaches to addressing these barriers will be required to see significant improvements in these IYCF practices.

3) WINNN's approach to intensive social mobilisation in focal LGAs has led to significant improvements in awareness and attendance at MNCHW events. This social mobilisation has also led to WINNN counteracting a general decline in the coverage of Vitamin A supplementation. However, the extent to which this intensive social mobilisation can achieve results at scale should be considered carefully in light of health system and human resource constraints in northern Nigeria.

4) If state governments judge that universal treatment at CMAM facilities for SAM is a priority and affordable, they will need to strengthen active case finding for CMAM-related cases to improve coverage of the CMAM programme among the at-risk population of children. Additionally, the feasibility of such an intensive 'vertical' CMAM

model must be considered carefully given the limited human resources available and cost of this intervention. Alternative models must be explored that more closely integrate treatment into everyday routine primary health care services and make less of a time demand on health workers. This could also include adding complementary approaches to managing moderate acute malnutrition (MAM).

5) The decline in Vitamin A supplementation coverage across northern Nigeria is worrying and warrants further investigation. While the quantitative data does not allow us to determine the reason for this negative trend, it is clear new strategies to increase Vitamin A supplementation to their former levels is an important priority. Alternatively, if this trend is an artefact of the Vitamin A monitoring methodology, new measurement strategies must be developed as this trend is appears in other population-based surveys.

6) The effectiveness of community-based strategies to mobilise and distribute essential interventions such as Vitamin A must not be underestimated. This is particularly important if the decline in coverage of Vitamin A is driven by a shift in distribution from door-to-door via the polio campaign to health facility-based at MNCHW events. Community-based strategies, through paid community health workers for example, can be remarkably effective at reaching remote and under-served communities particularly in a society in which conservative and gendered social norms and practices prevail.

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List of abbreviations

ACF	Action Against Hunger
ANC	Antenatal care
ATT	Average treatment effects on the treated
CAPI	Computer-assisted personal interview
c-IYCF	Community-based IYCF
CMAM	Community-based management of acute malnutrition
C	Control
CSO	Civil society organisation
CV	Community volunteer
DFID	UK Department for International Development
DID	Difference-in-difference
ENA	Emergency Nutrition Assessment
FANTA	Food and Nutrition Technical Assistance
f-IYCF	Facility-based IYCF
GPS	Global positioning system
IYCF	Infant and young child feeding practices
ITT	Intention to treat
LGA	Local Government Area
MICS	Multiple Indicator Cluster Survey
MNCHW	Maternal, Newborn and Child Health week
MUAC	Mid-upper arm circumference
NDHS	Nigeria Demographic and Health Survey
NNHS	National Nutrition and Health Survey
OECD/DAC	The Organisation for Economic Co-operation and Development's (OECD) Development Assistance Committee (DAC)
OPM	Oxford Policy Management
ORIE	Operations Research and Impact Evaluation
ORS	Oral rehydration solution

OTP	Outpatient Therapeutic Programme
PHC	Primary health care
PNC	Postnatal care
PSM	Propensity score matching
RUTF	Ready-to-use therapeutic food
SAM	Severe acute undernutrition
SE	Standard errors
T	Treatment
SHAWN	Sanitation, Hygiene and Water in Nigeria Programme
SMART	Standardized Monitoring and Assessment of Relief and Transitions
UNICEF	United Nations Children's Fund
WASHCOM	Water Sanitation and Hygiene Committee
WHO	World Health Organization
WINNN	Working to Improve Nutrition in Northern Nigeria

1 Introduction

This report presents the findings of the ORIE quantitative impact evaluation of the WINNN programme.

1.1 What is the WINNN programme?

The WINNN programme is an ambitious £52 million, six-year, DFID-funded programme (2011–2017) to improve maternal, new-born and child nutrition in five states in northern Nigeria. WINNN is implemented by three partners: SC, ACF and UNICEF. WINNN is designed to deliver effective and cost-effective nutrition-specific interventions (micronutrient supplementation, a CMAM programme and IYCF interventions), while improving government commitment. The delivery of these interventions through government is expected to build government systems and capacity for implementation, and ultimately to institutionalise them within routine health care systems. This is expected to raise the political profile of undernutrition in Nigeria and to leverage government to coordinate and fund nutrition programmes.

The broad outputs of the WINNN programme are as follows:

Output 1: Integration of micronutrient intervention into routine primary health services.

Output 2: Delivery of effective IYCF interventions in selected states and LGAs in northern Nigeria.

Output 3: Delivery of effective treatment for SAM through local health systems in selected states and LGAs in northern Nigeria.

Output 4: Strengthening of nutrition coordination and planning mechanisms at national and state level.

Output 5: ORIE (independent impact evaluation).

More details on the ORIE project are presented in Section 1.2 and on the WINNN programme in Section 3.1. Note that throughout the rest of this report we refer to Output 1 as ‘micronutrient supplementation’, Output 2 as ‘IYCF counselling’, and Output 3 as ‘the CMAM programme’, in the interests of simplicity.

1.2 What is ORIE?

The acronym ‘ORIE’ stands for Operations Research and Impact Evaluation. ORIE is responsible for undertaking operations research and assessing the impact of the WINNN programme. It is managed by Oxford Policy Management (OPM) and consists of two other UK-based institutions – the London School of Hygiene and Tropical Medicine and the Institute of Development Studies– in conjunction with four Nigerian partners: the University of Ibadan, Kaduna Polytechnic, Ahmadu Bello University at Zaria, and Food Basket Foundation International.

The ORIE project is composed of five workstreams, as follows:

1. operations research;
2. impact evaluation;
3. economic evaluation;

4. evidence dissemination and uptake; and

5. supporting national researchers in nutrition.

1.3 How will ORIE integrate its findings?

While the ORIE project has been set up to be comprised of multiple workstreams, each producing a series of research and evaluation outputs, it is the intention of the ORIE project to integrate key findings and recommendations that emerge from each individual workstream into a single integrated evaluation report.

The integrated evaluation report will be produced towards the end of the project (June 2017) and will be based on the five Organisation for Economic Co-operation and Development (OECD)/Development Assistance Committee (DAC) evaluation criteria of relevance, effectiveness, efficiency, impact and sustainability. An integrated evaluation framework has been prepared and identifies a number of 'high-level' evaluation questions and 'sub-questions' within each OECD/DAC criterion. Evidence from individual ORIE workstream outputs will then be drawn on to answer each of these questions in a single, accessible integrated evaluation report.

1.4 What is the quantitative impact evaluation?

The impact evaluation aims at answering the following question: what is the impact of the WINNN programme as whole on population-based, LGA-wide indicators of nutritional behaviours, nutritional status and provision of nutrition services? The overall approach chosen to answer this question is to utilise a mix of quantitative and qualitative methods to arrive at a complete assessment of the impact of the WINNN programme as a whole. The impact of individual interventions or WINNN outputs – as technologies – was not assessed as there already exists an extensive evidence base for these interventions (Bhutta *et al*., 2008 and 2013; Longhurst *et al*., 2013).

The evaluation has both an accountability and learning purpose. First, the evaluation aims to assess the impact of WINNN to understand how good the programme was at achieving its objectives within a given timeframe and budget. Second, the evaluation also aims to provide insights about the current undernutrition situation in northern Nigeria, to identify successes and barriers to efficient programming, and to provide recommendations to improve future nutrition programmes in this area.

For the sake of simplicity, the WINNN outputs can be divided into two broad categories: interventions that are focused at the level of the LGA (Outputs 2 and 3) and interventions that are focused at the level of the state and federal governments (Outputs 1 and 4). The level at which the intervention is focused determines the precise combination of methods used in the assessment of impact.

For interventions implemented at the level of the LGA (IYCF counselling and the CMAM programme), the impact assessment used a quasi-experimental design relying on data from population-based quantitative surveys, combined with qualitative research in communities. The table below summarises the overall structure of the impact evaluation and corresponding key reference documents.

Table 1 Structure of the ORIE evaluation

	Qualitative methods	Quasi-experimental methods
Interventions focused at the level of the LGA		
Output 2 – IYCF counselling	•	•
Output 3 – CMAM programme	•	•
Interventions focused at the level of the state and federal governments		
Output 1 – micronutrients	•	
Output 4 – government planning and coordination	•	
Key documents	Inception report Qualitative baseline report Qualitative midline report Qualitative endline report	Inception report Quantitative baseline report Quantitative endline report* (the present report)

1.4.1 Timing of the evaluation

Due to the later contracting of ORIE, the quantitative evaluation only covers three years (2013–2016) of the six-year WINNN programme (2011–2017). ORIE was contracted at the end of 2012 and implemented the baseline survey in June 2013. To enable the dissemination of findings and their use for decision-making before the WINNN project closes in August 2017, the endline was conducted in June 2016. As many nutritional indicators are sensitive to seasonal effects, it was necessary to conduct the endline in the same month as the baseline, to control for any seasonal effects.

1.4.2 Volumes I and II of the final impact evaluation report

The endline findings of the ORIE quantitative impact evaluation workstream are presented in two volumes. **The present report constitutes Volume I, which presents the main findings of the quantitative impact evaluation, answering the impact evaluation research question. Volume 1 is intended to be accessible to a wide audience.**

Volume II is the technical companion to Volume I. It contains detailed technical discussions of the methods used in this evaluation, presents additional contextual information, discusses additional information that supports our main findings, presents additional indicators not directly relevant to answering the evaluation questions, and also contains all key annexes. The two volumes complement each other and represent a single analytical product. Scope and structure of this report

This report is structured as follows: **Section 2** presents an overview of the impact evaluation design, sampling strategy, sample size calculations, data collection processes and impact identification strategy. The limitations of the design and its risks are also discussed in this section.

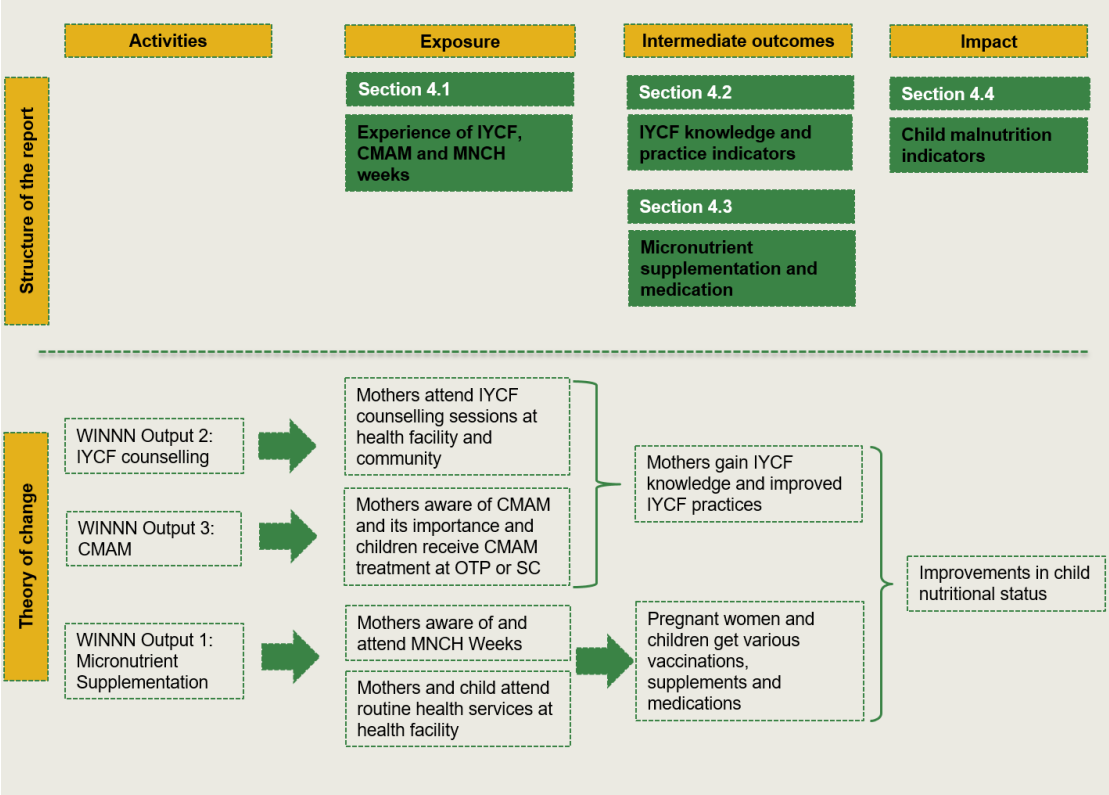
Section 3 provides an overview of the WINNN programme and its intervention logic, and of the status of implementation at the point at which the impact was assessed.

Section 4 presents our main findings. We have aligned the presentation of our findings with the WINNN theory of change, as depicted in Figure 2. Thus, we start with the analysis of exposure to

the WINNN-supported interventions, followed by the assessment of intermediate outcomes of the WINNN-supported interventions (such as micronutrient supplementation, and IYCF knowledge and practices), and finally concluding with an assessment of the impact on child undernutrition. This structure aims to facilitate understanding of the WINNN-supported interventions and their relationship with the evaluation impact results.

Finally, **Section 5** contains an overall discussion of our findings and conclusion.

Figure 2 Structure of ORIE quantitative impact evaluation findings



1.4.3 Who are the intended users of this report?

This report is primarily intended for DFID, WINNN, the Nigerian Government and various professionals working in nutrition or nutrition-sensitive areas in northern Nigeria.

The executive summary of this report will be published as a stand-alone document to facilitate digestion of key information and recommendations, particularly for policy practitioners, and to ensure broad dissemination of findings.

Both Volume I and Volume II have been written so as to train readers on how to interpret the quantitative information presented. Volume I includes a 'how to read this report' section, which outlines the types of tables and graphs presented in the reports.

Finally, ORIE is composed of multiple workstreams and thematic briefs will be produced in collaboration with WINNN which synthesise evidence across workstreams and experience of implementation, focusing on achievements and lessons learned.

2 Methods

2.1 Data sources and data collection

This report presents the key findings of ORIE's quantitative impact evaluation workstream. This quantitative impact evaluation uses a quasi-experimental design to identify and quantify the changes in key indicators that can be attributed to two key components of WINNN: the IYCF counselling and CMAM interventions. (See Section 3 below for more information on WINNN). To do so, it uses data collected from a panel of households, with the same households surveyed at baseline (June 2013) and endline (June 2016).

The quantitative survey is complemented with community-level qualitative research to explore quantitative trends in more detail. A description of the qualitative methodology is outlined in Section 2.1.3 below.

2.1.1 Sample size and population of interest

The definition of 'household' used in the current survey is 'a person or group of related or un-related persons that live together in the same compound and acknowledge one adult male or female as the head of the household'. This differs from definitions used in other surveys, such as the NNHS or Nigeria Living Standards Measurement Study, and generally allows for large households with polygamous marriage arrangements to be included under the term, and suggests that households could include several dwellings. Households were considered to be eligible for our analysis if at least one member was a child aged 0–35 months. Tracking at endline was implemented by tracking down the same compounds that were visited at baseline and interviewing individuals living in those dwellings. Again, households were considered eligible for this analysis if they had one household member who was a child aged 0–35 months (see Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017, Section 3.1, for a more detailed discussion of sample size).

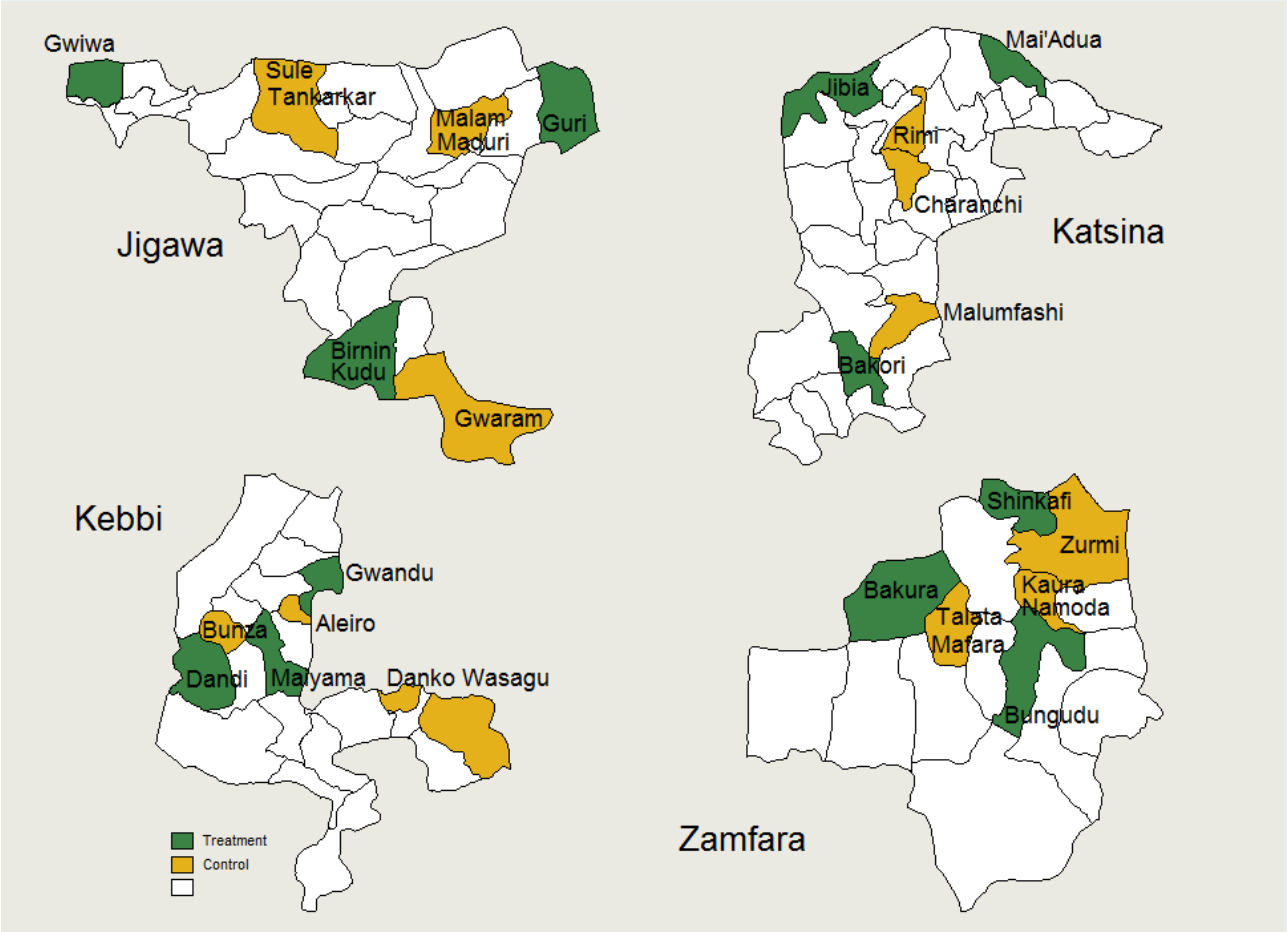
It is important to point out that the population of interest for child-level indicators in this evaluation is children aged 0–35 months. This is narrower than the usual age of 0–59 months that is typically used for child-level indicators in the Nigeria Demographic and Health Survey (NDHS), Multiple Indicator Cluster Survey (MICS) and Standardized Monitoring and Assessment of Relief and Transitions (SMART) surveys. There are two reasons why a narrower age range is used in this impact evaluation. The first is 'operational', in that there were only three years (or 36 months) between the baseline and endline surveys. Thus, if we included children from a wider age range at endline, they would not have been fully 'exposed' to the WINNN interventions throughout their lives. We explicitly sample children aged 0–35 months – or less than three years old – at endline so as to ensure that the sample of children at endline have been 'exposed' to WINNN interventions for their entire lives. The second reason for the narrower age range relates to the fact that we expect to see the largest effect on key outcome and impact indicators in the first 1,000 days of life – that is, from the start of a woman's pregnancy until the child's second birthday (or when the child is 24 months) (Black *et al*., 2013). Because the age of young children is notoriously difficult to assess accurately, the ORIE sample of children has been optimised to include a sufficiently large sample of children within the slightly larger window of 0–35 months, in order to be better able to detect the impact of the programme.

Data were collected from both LGAs where WINNN has operated (treatment LGAs) and LGAs where WINNN has not operated (control LGAs). In total, there were three treatment and three control LGAs per state (Figure 3). Sample size and power calculations were computed during the

inception phase in which the evaluation was designed. A random sample of 3,450 households was drawn from 840 communities across treatment and control areas to provide results that are representative for both WINNN treatment areas and control areas. With an intra-cluster correlation of 0.09 for stunting, 0.13 for underweight and 0.02 for wasting, this sample size was deemed to be sufficient to detect a decrease in stunting by five percentage points (from 58% to 53%), in underweight by five percentage points (from 41% to 36%), and in wasting by three percentage points (from 16% to 13%). More detail on the sampling strategy and power calculations can be found in Volume II, Section 3.1 and Annex C1 (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017).

It is important to emphasise again that this sampling ensured that our estimates are representative of treatment and control LGAs overall – i.e. across the geographical area that these LGAs cover – irrespective of the exact location of WINNN-supported activities within treatment LGAs. This means that, within LGAs, certain indicator estimates presented below might vary geographically and could be higher in catchment areas around facilities or locations where WINNN has focused its efforts within treatment LGAs. Our estimates, in contrast, are averages that hold across treatment LGAs overall.

Figure 3 Treatment and control LGAs in Jigawa, Katsina, Kebbi, and Zamfara



While survey teams tried to track all communities and households from baseline, only 829 out of 840 communities visited at baseline were visited at endline. Similarly, some households could not be found due to security issues (mostly cattle rustling in Katsina and Jigawa), physical difficulties in relation to accessing communities (due to flooded roads), and migration of Fulani settlements in Zamfara.

The key units of analysis for this report are defined as households (see above for definition) with children aged 0–35 months, all children aged 0–35 months in those households (as explained above), and mothers of those children aged 15–49 years. An overview of the sample size breakdown that the analysis for this report is based on is presented in Table 2.

The results presented in this table show that at endline about 2,722 households with eligible children were visited and individuals interviewed there, which represents a decrease of about 19% compared to the baseline figure of 3,355. This translated into decreases in sample sizes for children and mothers of over 15% in each case. Section 2.3.2 presents a complete analysis of this attrition and its implications for the survey.

Table 2 Sample sizes in the ORIE quantitative survey

Level of analysis	Baseline	Endline	Baseline		Endline	
			Treatment	Control	Treatment	Control
Households ***(with eligible children 0–35 months)***	3,355	2,722	1,677	1,678	1,347	1,375
Children 0–35 months	6,833	5,567	3,463	3,370	2,777	2,790
Mothers of children 0–35 months (*mothers of reproductive age 15–49 years*)	5,708	4,784	2,855	2,853	2,406	2,378
Communities	840	829	420	420	411	418

2.1.2 Data collection – quantitative

Baseline data collection took place in June and July 2013, while endline data collection took place in July and August 2016. OPM developed the overall impact evaluation design, survey instruments, and protocols, and oversaw the complete data collection process for this evaluation. Importantly, data collection at both baseline and endline was completed during the rainy season. Some changes were made in the questionnaire from baseline to endline as the understanding of the programme and context improved. This is outlined in more detail in Section 2.3.4.

In addition, several steps were taken to improve data quality at endline compared to baseline. Most importantly, data collection was conducted at endline through computer-assisted personal interview (CAPI) software, which also made possible very extensive automated and on-the-go quality assurance mechanisms. A data quality assessment was implemented to assess how this affected data, in particular child undernutrition indicators (see Section 2.2 for details on the data quality assessment). More detail on data collection and quality assurance processes can be found in Section 3.1.4 of Volume II of this report (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017).

Data were collected using four instruments: first, one household questionnaire was administered per household. Also, separate questionnaires were administered for each child aged 0–35 months. The respondents to child questionnaires were the main caregivers to those children (i.e. their mothers in the majority of cases[4]). Hence throughout the report we refer to these respondents as 'caregivers'. The child questionnaires included an anthropometric module which was completed by trained anthropometric specialists. In addition, a separate questionnaire was also administered for each mother of reproductive age (15–49 years) of the children aged 0–35 months in our sample. In this report we refer to these respondents as 'mothers'. (Note that caregivers who were not the child's mother were not administered this questionnaire.) Finally, one community questionnaire was administered for every community. Table 3 below lays out the main areas covered by the

[4] At endline, 97% of caregivers who responded to the child questionnaire were the children's mothers.

questionnaires and their corresponding respondents. The full questionnaire can be found in Annex D2 of Volume II of this report (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017).

Global positioning system (GPS) data of all communities and health facilities that WINNN was supporting in treatment areas were also collected in order to calculate the distance between each community and these health facilities. Distance was defined as geodetic distance, i.e. 'the length of the shortest curve between two points along the surface of a mathematical model of the earth' (Vincenty, 1975).

Note, additionally, that the IYCF practices and dietary recall sections in the child questionnaire were used to build the key practice indicators in this report, while the anthropometric measurement section was used to build the undernutrition impact indicators. The mother questionnaire and the child questionnaire were also used to build the WINNN exposure indicators. The wealth indicators were built using the wealth assessment section of the household questionnaire. Precise definitions and sources for all key indicators used in this report can be found in Annex E of Volume II of this report (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017). Note that other indicators not directly relevant to answering the evaluation questions but for which information was collected through the various questionnaires are presented in Volume II of this report (Section 3.1.2 on sample background characteristics).

Table 3 Structure of endline survey questionnaire

Questionnaire	Main areas	Respondent
Child questionnaire 1/	IYCF practices and dietary recall	Child's caregiver
	Child health	
	CMAM programme	
	Anthropometrics	
Mother questionnaire	Mother characteristics	Child's mother (15–49 years) 2/
	Intra-household decision-making	
	IYCF counselling participation	
	MNCHW event participation	
	Knowledge of, and attitudes towards, IYCF practices	
	CMAM programme	
	Anthropometric measurement	
Household questionnaire	Household characteristics	Head of the household 3/
	Food security	
	Direct observation of the household dwelling	
Community questionnaire	Community characteristics and awareness of WINNN	Emir, village head or community leader

1/ All children under three years old in the household.
2/ Mothers of reproductive age (15–49) of the children under three years old in our sample. If the caregiver of the child is not his/her biological mother then no mother questionnaire was administered.
3/ Or person acting as head of the household in the absence of.

2.1.3 Data collection – qualitative

In this report we use the findings of the qualitatibe evaluation of the WINNN programme to provide context relating to our quantitative evaluation findings. The full methodology of the qualitative research is provided in the Qualitative Evaluation of the WINNN Programme – summary report: Operations Research and Impact Evaluation, 2017.

The qualitative evaluation of the WINNN programme assesses WINNN's contribution to change in the governance context for nutrition interventions, including civil society and community engagement. The baseline research was carried out from July to October 2013, while the endline research was carried out from July to August 2016. The research was conducted at federal level, in the four focal states (Jigawa, Katsina, Kebbi and Zamfara), and in two LGAs in each state. Two health facilities were also purposely sampled in each LGA: one WINNN-supported CMAM programme Outpatient Therapeutic Programme (OTP) site, and one health facility in which WINNN supports IYCF interventions and MNCHW events. The data were collected from government officials, health workers, CVs, community leaders, civil society organisations (CSOs), WINNN partners, other development partners, and a small sample of IYCF mothers support groups.

ORIE has also conducted various community-level qualitative studies, which are also drawn upon in this report. This includes ORIE operations research on IYCF interventions (conducted in Katsina in late 2015), and ORIE community-level research at endline (conducted in Zamfara and Kebbi in January 2017). In this report, all references to the findings from the qualitative research (including the community-level studies) are cited as 'Qualitative Evaluation of the WINNN Programme – summary report: Operations Research and Impact Evaluation, 2017'.[5]

ORIE community-level research

The ORIE community-level research at endline was designed to provide more insights into key topics identified in the ORIE quantitative analysis: (i) a disconnect between mothers' knowledge of, and practice based on, IYCF interventions recommendations, and (ii) mothers' relatively low awareness of, and attendance at, MNCHW events. The research focused on one LGA in Zamfara, and one in Kebbi. Zamfara and Kebbi were selected because the quantitative data found lower attendance at c-IYCF counselling and MNCHW events in these two states. Since ORIE had already conducted operations research on IYCF interventions in Katsina, the findings were also used for comparative analysis. The same research tools and sampling strategy were utilised in all three states.

The qualitative community research on IYCF interventions explored caregivers' IYCF knowledge, household relations that affect infant feeding, and the work and influence of CVs and health workers. The research utilised participatory methods, including a visual tool to analyse the influence of different household members over infant feeding decisions, and stories of change. The research focused on 28 purposively sampled communities, one in which WINNN had supported the c-IYCF component of the IYCF interventions for around three years. The communities were identified by WINNN state teams, based on the following criteria:

- four to six communities where they perceived relatively good uptake of exclusive breastfeeding;

[5] Data collected for the various studies of the ORIE qualitative research has been analysed using NVIVO qualitative analysis software. For each study, the data were coded in regard to respondent category, and thematic content. Analytical NVIVO queries were then conducted in order to analyse themes by respondent type, so as to disaggregate the data. Data were triangulated by analysing data on the same questions from different stakeholder categories, and from different focus group discussions with the same type of respondent at community level.

- four to six communities where they perceived relatively low uptake of exclusive breastfeeding; and
- two Fulani communities, and at least two communities with no health facility.

This sampling was designed to enable analysis of 'what works', as well as challenges. The caregivers[6] were randomly sampled, and included fathers, adolescent mothers, older mothers and grandmothers. In each community, focus group discussions were also conducted with all available CVs, the community leader, and the IYCF activities supervisor for that ward.

The qualitative community research on MNCHW event social mobilisation complemented the ORIE evaluation research, which was conducted in WINNN's focal communities for the IYCF interventions and the CMAM programme. The follow-up research focused on 22 communities in which WINNN does not implement the CMAM programme or any IYCF intervention, but that are within the WINNN focal LGAs. The sample focused mainly on communities that are at least 10 minutes' walking distance to the closest health facility, and included two Fulani settlements in each LGA. The respondents[7] were community leaders, town announcers, and fathers (who were randomly sampled in different sections of the communities).

2.2 Data quality assessment of ORIE anthropometric data

We conducted a quality assessment of ORIE baseline and endline anthropometric data based on Emergency Nutrition Assessment (ENA) and WHO guidelines to review the quality and comparability of our data. Section 3.2 of Volume II of this report (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017) presents a full analysis of various quality criteria, which includes a review of age and sex ratios, standard deviation of anthropometric z-scores, digit preferences for weight, height and age variables, and distribution of z-scores (including the presence of outliers). This section presents summarised results for quality indicators on age, sex ratios, and standard deviation of z-scores on our data and the NNHS (2015) for comparability purposes.[8]

We found that the ORIE anthropometric data are within the recommended guidelines on almost all quality assessment criteria. The endline data are of relatively superior quality compared to the baseline, given the use of CAPI, but this difference is not problematic for our impact estimations.

Compared to paper-based surveys, CAPI provided automated consistency and performance checks, which allowed timely feedback and the implementation of course-correction processes. This in turn improved the quality of the ORIE data collected at endline. The difference in quality identified between baseline and endline is not problematic for our analysis for two reasons. First, the DID approach (see Section 2.3 for an explanation of the DID methodology) is used to estimate impact controls for changes over time, such as the difference in quality between baseline and endline data. Second, we implement different regression specifications controlling for the anthropometric specialist as a proxy for anthropometric data quality, and our results are robust to those checks (see Section 3.2 of Quantitative Impact Evaluation of the WINNN Programme -

[6] Overall, the community-level IYCF component research (in Katsina, Zamfara and Kebbi) was conducted with 823 mothers, 413 fathers, 46 grandmothers, 89 community volunteers, 45 traditional birth assistants, and 29 community leaders.
[7] The research on MNCHW events' social mobilisation was conducted with 213 fathers, 22 community leaders, and 22 town announcers. This complemented the interviews on MNCHW event social mobilisation with an additional 23 community leaders, 12 Ward Development Committee and over 80 CVs in the WINNN CMAM programme and IYCF interventions focal communities (undertaken within the broader institutional-level research in all four evaluation states).
[8] The last NNHS was carried out in 2015 by the National Bureau of Statistics: it includes a sample of 20,060 children from 37 states in Nigeria.

Volume 2, 2017). We also do not find any significant difference in data quality at baseline between treatment and control areas.

2.2.1 Balancing of key demographic indicators

Table 4 presents the estimated age and sex ratios for children aged 0–35 months in our data and NNHS (2015), along with the proposed ENA guidelines.

The age ratio is defined as the number of children aged 0–17 months over the number of children aged 18–35 months. It gives an indication of whether our age distribution is skewed towards older or younger children. The sex ratio is defined as the number of male children over the number of female children.

Sex and age ratios for both ORIE (baseline and endline) and NNHS data lie within the ENA recommended intervals. The sex ratio for ORIE stood at 1.02 and 1.04 for baseline and endline, respectively. As for NNHS data, the overall sex ratio for children below five years of age was 1.01, indicating a balanced distribution. The sex ratio ranged between 0.8 and 1.3 across 37 states surveyed (NNHS, 2015). The age ratio for ORIE stood at 1.04 and 1.14 for baseline and endline respectively. Overall, the age ratio for NNHS data is not reported, however, data quality assessment of NNHS suggests that it lies in an acceptable age distribution (NNHS, 2015).

This analysis suggests that the ORIE anthropometric data present a balanced distribution in terms of sex of children and proportion of younger versus older children.

Table 4 Age and sex ratios

	Sex ratio	Age ratio
Proposed ranges by ENA	[0.80-1.20]	[0.78-1.18]
ORIE baseline sample	1.02	1.04
ORIE endline sample	1.04	1.14
NNHS 2015	1.01	-

Notes: The sex ratio is defined as the number of male children over the number of female children. The age ratio is defined as the number of children aged 0–17 months over the number of children aged 18–35 months.

2.2.2 Analysis of anthropometric z-scores

We also analyse standard deviations of anthropometric z-scores for ORIE and NNHS data against ENA guidelines. Table 5 presents the acceptable ranges proposed by the WHO (1995) and Mei and Grummer-Strawn (2007) for the standard deviation of each z-score of interest, along with both ORIE and NNHS standard deviations. Mei and Grummer-Strawn (2007) use the more recent 2006 WHO growth standards and a variety of existing anthropometric datasets to compare with the WHO z-score standard deviation ranges that were defined in 1995.

Table 5 Standard deviation of Z-scores

	WHO (1995)	Mei and Grummer-Strawn (2007)	ORIE baseline	ORIE endline	NNHS 2015
Weight-for-age	[1.00-1.20]	[1.17-1.46]	1.56	1.41	1.11
Height-for-age	[1.10-1.30]	[1.35-1.95]	1.80	1.66	1.31
Weight-for-height	[0.85-1.10]	[1.08-1.50]	1.52	1.31	1.05

Notes: This table presents the acceptable ranges proposed by the WHO (1995) and Mei and Grummer-Strawn (2007) for the standard deviation of the z-scores weight-for-age, height-for-age, and weight-for-height.

We found standard deviations of anthropometric z-scores for both ORIE baseline and endline data to be higher than ENA recommended ranges based on WHO (1995). However, standard deviations of z-scores for ORIE data are found to be within Mei and Grummer-Strawn's (2007)

recommended ranges except for standard deviations of weight-for-age (WAZ) and weight-for-height (WHZ) scores at baseline, which are slightly outside the recommended range, by 0.1 and 0.02 standard deviation, respectively. The standard deviations of z-scores for NNHS data lie within WHO (1995) and Mei and Grummer-Strawn (2007) recommended ranges, which is expected given the larger sample size of nationally representative data compared to the sample in ORIE.

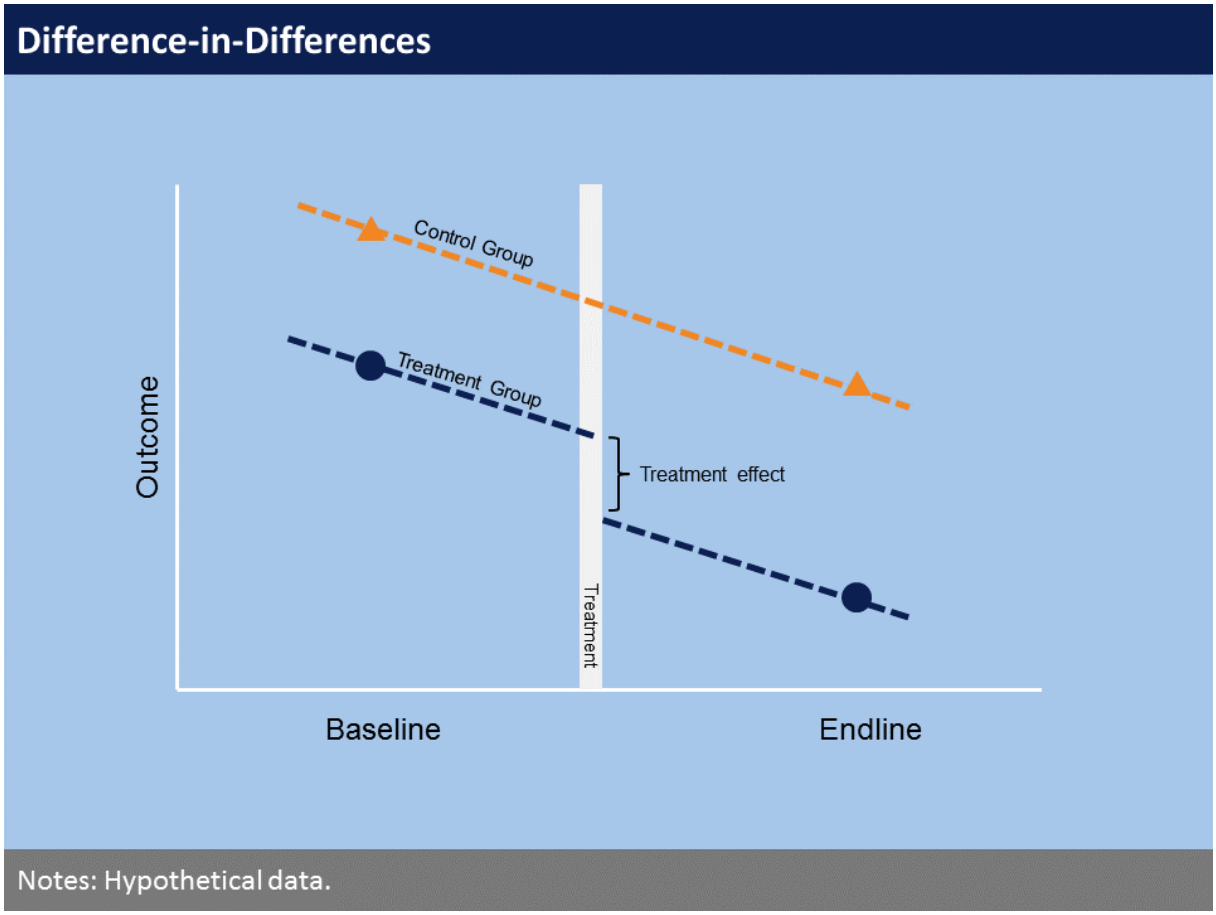
Because measurement error is positively related to the standard deviation of z-scores, i.e. higher measurement error leads to higher standard deviations, this analysis suggests that, first, data quality in ORIE improved between baseline and endline, and, second, that at baseline measurement error was relatively high compared to what can be found in the literature. Note, however, that, first, these are only recommended ranges and not strict barriers. Second, other surveys implemented in northern Nigeria exhibit similar levels of z-score standard deviations, in particular when related to height measurements. For example, in the NNHS data, the standard deviation values of z-scores for height-for-age are 2.22 in Katsina, 2.21 in Kebbi, 2.21 in Zamfara, and 2.4 in Jigawa (NNHS 2015). Finally, and as explained above (see beginning of Section 2.2), we are overall not worried about this difference because the DID approach controls for differences in quality between baseline and endline data, our results are robust to regression specifications controlling for the anthropometric specialist as a proxy for anthropometric data quality, and we do not find any significant difference at baseline between treatment and control areas.

2.3 DID approach

Since WINNN-supported interventions were not allocated randomly to treatment and control LGAs and various components of the programme began at different stages, including before the ORIE baseline was implemented (see limitations outlined in Section 2.3.4), a simple comparison of treatment and control areas at endline is not sufficient to robustly estimate the effect of the WINNN programme. There are likely to be systematic differences between treatment and control areas that would bias the impact estimates.

We therefore use a DID approach, which measures the differential outcome between estimates in treatment and control areas over time (double-difference). The underlying assumption that must hold for this approach to work is that the difference in outcomes between treatment and control areas would have been constant over time had it not been for the WINNN-supported interventions. Figure 4 below illustrates how impact is estimated through this econometric approach. This approach effectively factors out all pre-existing differences between the two groups so as to be able to assess the impact of the WINNN programme. Through this study design, the control group is an acceptable counterfactual provided that any differentials in changes over time are only due to the implementation of the WINNN-supported interventions and not due to any other factors, such as, for example, the differential scale-up or roll-out of nutrition-related programmes in or around the evaluation areas.

Figure 4 DID estimation



2.3.1 Impact estimates presented in this report

As discussed above, evaluation treatment status was assigned geographically to treatment and control LGAs. This means that anyone living in treatment areas is considered as being 'treated' regardless of whether that individual has actually had an interaction with components of the interventions supported by WINNN. Therefore, estimates presented in this report are estimates of **the intention to treat (ITT) effect**: this is the average effect on the relevant population in treatment areas, irrespective of whether individuals have been in touch with the WINNN programme. This means that low exposure to WINNN-supported interventions could dilute the effect measured by the ITT estimate. Please refer to Section 3.3 of Volume II of this report for more technical details on how this evaluation estimated the impact that WINNN had (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017).

The ITT estimation is implemented using a simple regression framework that takes into account the sampling structure of the data, weights, and household fixed effects, and includes covariates to control for confounding factors. Note that in order to assess the robustness of this analysis, several estimations were implemented using different regression specifications. The results of these tests and the rationale of the preferred model are presented in Section 3.3 of Volume II of this report (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017).

Note that because the data used here are representative of WINNN treatment and control areas only (see Section 2.1 for an explanation of the WINNN programme), treatment estimates are representative for the population in those areas as well. This means that estimated treatment effects cannot be assumed to be representative for other areas, such as, for example, states in northern Nigeria overall.

2.3.2 Attrition

One worry in relation to panel surveys is the threat posed by attrition bias, i.e. the fact that households drop out of the sample between baseline and endline in such a way that it biases estimates. For example, if poorer households move away for economic reasons and cannot be followed up in the endline survey, the remaining sample that is being used for analysis is richer than it was at baseline. When comparing the endline sample to the full sample at baseline, one could then erroneously assume that people have become richer over time. In the context of an impact evaluation, attrition is particularly challenging when it shifts the composition of the sample differentially across treatment and control areas ('differential attrition'), or if it occurs with such incidence that it affects the representativeness of the remaining sample.

In this evaluation, we address attrition in two ways. First, we run regressions to test whether attrition is associated with treatment status. We find that the treatment assignment is not significantly correlated with attrition (see attrition analysis in Section 3.1.3 in Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017). **This suggests that there is not a problem of differential attrition between treatment and control groups in our sample**. Second, we calculate sampling weights corrected for attrition and use this in the calculation of all point estimates of the indicators presented in this report, and in the robustness checks analysis of the treatment effects presented in Volume II (see robustness checks in Section 3.3.1.2 in Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017). We find that our results (point estimates of descriptive indicators and treatment effects) are robust to the use of sampling weights with attrition and without attrition correction. **This suggests that attrition in our sample does not pose a problem in regard to the representativeness of our estimates.**

2.3.3 Contamination and LGA spillover effects

As mentioned above, a DID approach provides unbiased treatment effects if outcomes in treatment areas would have followed the same trend over time as control areas in the absence of the WINNN programme. It is therefore important to analyse the potential risk posed by contamination or spillover effects that differentially affected treatment and control areas during the study period.

Contamination effects

Contamination occurs when another intervention that affects the main outcomes of interest is implemented in control or treatment areas. In the context of this evaluation, the ORIE team and DFID were aware of potential contamination due to the implementation of the DFID-funded Sanitation, Hygiene and Water in Nigeria Programme (SHAWN) in some WINNN treatment areas. SHAWN began its implementation after the baseline survey was carried out.

To investigate whether this could be problematic for the present evaluation, at endline we asked additional questions of community respondents to inquire about the existence of non-WINNN programmes operating in the community. Table 6 shows the results of these questions. At endline, a significantly larger proportion of communities in treatment areas reported exposure to water and sanitation programmes compared to controls. Some of the treatment LGAs with higher coverage of water and sanitation programmes are those in which the WINNN programme overlaps with SHAWN. Figure 5 suggests that, across states, the differential coverage between treatment and control groups is mainly driven by exposure to SHAWN in Jigawa and Katsina, which is consistent with the fact that SHAWN overlaps with WINNN interventions in two out of the three treatment LGAs in each of these states[9].

[9] In Jigawa, SHAWN operates in Birnin Kudu and Gwiwa WINNN treatment LGAs. In Katsina, SHAWN operates in

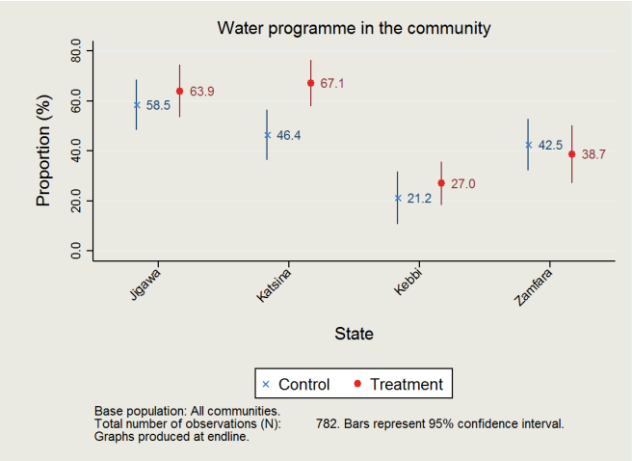
This differential coverage of water and sanitation programmes between treatment and control areas could bias our impact results upwards, in particular in Jigawa and Katsina, i.e. treatment effects could be over-estimated. **To mitigate the potential risk of bias, we include covariates that control for water and sanitation infrastructure at the household level in our estimations of treatment effects**.

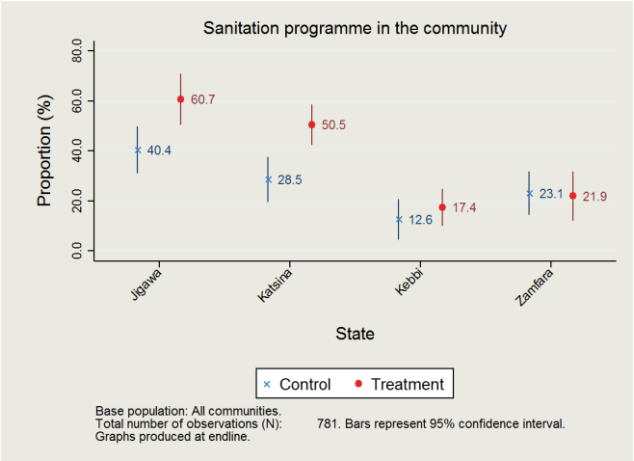
Table 6 Community awareness of non-WINNN programmes in treatment and control areas at endline

Indicator name	Endline			
	Total	T	C	Diff (T–C)
Percentage of communities reporting that…				
There has been a government or non-government cash transfer programme operating in the community	22.9	23.7	22.2	1.5
N	*765*	*386*	*379*	
There has been a government or non-government water programme operating in the community	46.0	51.3	41.6	9.6**
N	*782*	*391*	*391*	
There has been a government or non-government toilet and sanitation programme operating in the community	31.9	39.8	25.4	14.4***
N	*781*	*391*	*390*	
They have heard about the Water, Sanitation and Hygiene Committee (WASHCOM) (village-level wash committees)	38.3	45.2	32.6	12.5***
N	*758*	*380*	*378*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Data from endline survey only.
T:Treatment
C:Control

Figure 5 Community awareness of water and sanitation programmes across states at endline





LGA spillover effects

In the present analysis, spillover effects refer to situations where WINNN effects materialise in control LGAs, due to, for example, individuals in those control LGAs accessing WINNN-supported interventions in treatment areas. Spillover effects that materialise between baseline and endline

Bakori and Maiadua WINNN treatment LGAs.

could bias our DID estimates, given that non-intervention areas would no longer be true control areas across time. This bias could lead to an underestimation of treatment effects.

The results presented in the main findings section of this report (e.g. Table 10 and Table 13) indicate that there is a possibility that mothers and children in control areas also had some exposure to c-IYCF counselling and CMAM interventions at both baseline and endline. This could, in theory, be due to either spillover effects or contamination effects from other programmes that focus on IYCF services and CMAM. However, secondary evidence collected throughout the implementation of this evaluation indicates that no such programmes were implemented in control areas. In addition, a geographical analysis of our survey data indicates that individuals in control areas living close to treatment areas had an increased likelihood of being exposed to c-IYCF counselling (results presented in Section 3.3.2 of Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017). Hence, we consider this to be a potential spillover and not a contamination issue.

Table 13 shows that the exposure to the CMAM programme in control areas overall did not change significantly over time (from 7.6% at baseline to 7.8% at endline), which makes spillover into control areas not problematic for our DID estimations with respect to the CMAM programme. However, Table 10 shows that exposure to IYCF counselling in the community did increase significantly in control areas over time (from 4% at baseline to 7% at endline). This would suggest a potential risk of downward bias for estimated impact effects that are influenced by c-IYCF counselling exposure. However, the risk of bias resulting from this is low, given that the change in control areas is small in size and that a significant WINNN impact on exposure to community IYCF counselling in treatment areas is still found due to significantly larger changes over time in the treatment areas.

Thus, we conclude that the potential risk of bias due to spillover effects of treatment effects influenced by the CMAM programme and the IYCF interventions exposure is low and not problematic. We look at this in further details at the state level in section 3.3.3 of Volume II of this report (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017)

2.3.4 Limitations of the study

This section summarises important limitations of the study.

First, the quasi-experimental impact evaluation design was set up to treat the WINNN programme as a single homogenous intervention across northern Nigeria. This was a necessary assumption at the outset of the evaluation as presenting disaggregated estimates by state would have significantly increased the required sample size. As such, the sample of the impact evaluation is powered to provide statistically significant estimates that are representative of all WINNN treatment areas as outlined in Section 2.1.1. In reality, we understand that WINNN-supported interventions are ultimately implemented through the various state health systems and we address this by providing as much contextual information as possible about state differentials and by explicitly mentioning them when they are relevant to our findings.

Second, the DID approach relies on the main underlying assumption that the difference in outcomes between treatment and control areas would have remained the same over time had it not been for the WINNN intervention. This assumption could be violated if a programme were to be implemented in parallel in northern Nigeria that would differentially affect treatment and control areas during the same time period. As discussed in detail in Section 2.3.3, we consider the potential for this contamination and spillover bias in this study to be low and not problematic for our overall impact estimates.

Third, it should be noted that the baseline data used here are not a 'pure' baseline. Some components of the WINNN package of interventions were rolled out in some areas before baseline data collection took place. This could be problematic because it could lead to an underestimation of the true treatment effect of WINNN. However, given that the key outcome and impact indicators (IYCF knowledge, practice, stunting, underweight and wasting) take significant time to shift, we were not expecting to see much of an effect from the pre-baseline implementation of these interventions. In addition, our baseline results indicated that coverage for most interventions at baseline was low, and hence likely to not be an issue for our impact estimation. We explicitly discuss this issue in this report whenever pre-baseline contamination could be an issue for the validity of our findings.

Fourth, as mentioned above, survey instruments changed between baseline and endline. This means that some indicators had to be adapted in order to be comparable from baseline to endline, while others could only be used at baseline or endline. There are two main reasons why endline-only prevalences might be presented in this report. First, some indicators were not collected at baseline, either because the implementation of some interventions had not yet begun or the design specifications of those interventions were not yet finalised and so they could not be included in the baseline questionnaire. Second, some baseline survey questions changed, to make them more specific and closer to the implementation of the programme. Indicators for which there are no baseline equivalent cannot be used in a DID context and therefore do not have a DID estimate. However, there is still significant value in presenting endline-only estimates and differences between treatment and control groups, so these are still presented and explained throughout the report. For clarity, 'endline-only' estimates are presented in separately from DID estimates.

Fifth, it is important to note that the time horizon of this evaluation might also be considered a limitation. This impact evaluation collected data over a three-year time horizon (between June 2013 and June 2016), which is within the overall six-year time horizon of the WINNN programme (2012–2017). The reason why the time horizon of the impact evaluation could not be expanded to match that of the WINNN programme is due to the nature of the contracting of the ORIE project. The ORIE contract began at the end of 2012, one year after the WINNN programme had been contracted, and baseline data were collected in 2013. Endline data were collected in 2016 to allow results to be presented in dissemination events in 2017. As such, the time horizon of the ORIE impact evaluation was designed to maximise the duration between baseline and endline while accommodating the boundaries outlined in the ORIE contract.

Sixth, the WINNN interventions had a staggered roll-out, as explained in Section 1.1 above. As a result, the treatment areas were not exposed to the full package of WINNN interventions until early 2014 (8–10 months after the baseline survey), giving less time for the programme to show an effect on outcome and impact indicators. To achieve coverage of its interventions across selected LGAs, WINNN's primary implementation model was to work through selected health facilities, combined with community outreach activities. However, from the start of the programme, WINNN focused its c-IYCF component around selected health facilities and only in late 2015 was the c-IYCF component expanded, to cover additional wards and communities. As the impact evaluation was designed to measure impact at the level of the LGA, this clustering of implementation may have led to the dilution of programme impact at the LGA level. This is explained in more detail in Section 5.2.

Seventh, it is understood that WINNN interventions were not designed to achieve 100% coverage in the focal LGAs. However, this impact evaluation was designed at the request of DFID to assess impact at the level of the LGA in recognition that implementation would likely be clustered. As such, estimates of impact presented in this report may be diluted and is indicated throughout the text where this may be the case.

Finally, the study sample was drawn so as to provide representative estimates of WINNN programme and control areas only and is therefore not representative of northern Nigeria or indeed of the four states included in the study. This is because the selection of states and LGAs within those states was purposive and not random. For these reasons, the external validity of the study, in a statistical sense, is limited. However it is important to acknowledge that the study findings are still useful for learning and programme planning in the context of northern Nigeria.

2.4 How to read this report

2.4.1 Types of tables used in this report

Table 7, Table 8 and Table 9 below present examples of how results are tabulated in this report. We follow the same format of tables throughout this document.

Tables such as Table 7 present indicators for which we are presenting impact estimates. Tables such as Table 8 show indicators for which we are presenting only endline prevalences. As explained above, survey instruments changed between baseline and endline. Indicators for which there are no baseline equivalent cannot be used in a DID context and therefore do not have a DID estimate. Therefore, we present estimates for these indicators at endline separately from our DID estimates.

Tables similar to Table 7 should be interpreted as follows:

- The first 'indicator name' column shows the name of the indicator. In addition, and importantly for the interpretation of results, in brackets we describe the sub-population for which this indicator is defined.
- We then present results in two rows: the first row shows estimates of the indicator, while the second row shows the number of unweighted observations (N) that are used to calculate these estimates.
- We present results for both treatment and control areas separately. Within each of those, we present the estimate for the endline round of this survey (column: EL), and the baseline round of this survey (column: BL).
- We also present an estimate of the difference between endline and baseline rounds (column: DIFF (EL–BL)).
- Finally, in the last column, we present our DID estimate. This is the DID coefficient, which is estimated using key covariates and household fixed effects (column: Impact estimate (SE)) to control for household-specific characteristics that do not vary over time but that could be correlated with the WINNN treatment. We consider estimates presented in this column to be our main impact estimates. This is the change in difference between treatment and control group from baseline to endline.
- We show whether the above differences are statistically significantly different from zero using a statistical test and asterisks that show the statistical significance of this difference:
    - * = significant at the 5% level
    - ** = significant at the 1% level
    - *** = significant at the 0.1% level

This means that the more asterisks that are shown, the more likely that the observed difference is due to a real difference between the endline and baseline (and treatment and control groups for the DID estimates), rather than being due to chance. It is important to note that, where results are

not asterisked, this does not mean that there is no difference between the groups, but rather that any difference cannot be asserted with such a high degree of confidence (95% or more). Throughout the text, statements of significant differences between two groups account for the probability that such observed discrepancies could have occurred by chance in 5%, 1%, or 0.1% of the cases.

Table 7 Example of tabulation of impact estimates

Indicator name	Treatment			Control			Impact estimate (SE)
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Proportion of mothers who ever attended IYCF counselling in the community (*mothers aged 15–49 years*)	7.5	31.5	24.0***	4.3	7.4	3.1**	20.6*** (2.1)
N	*2,833*	*2,303*		*2,833*	*2,235*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DiD are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level. Mothers are defined as mothers aged 15–49 of children aged 0–35 months.

Tables similar to Table 8 should be interpreted as follows:

- The first 'indicator name' column shows the name of the indicator. In addition, and importantly for the interpretation of results, in brackets we describe the sub-population for which this indicator is defined.
- We then present results in two rows: the first row shows estimates of the indicator, while the second row shows the number of unweighted observations (N) that are used to calculate these estimates.
- We present results for the endline survey: the total estimate over all our sample (column: Total), the estimate for treatment areas (column: T), and the control areas (column: C).
- We also present an estimate of the difference between treatment and control areas (column: DIFF (T–C)) for those endline-only indicators.
- The same significance levels and interpretation of those significance levels apply to tables which follow the format of Table 7.

Table 8 Example of tabulation of endline prevalence

Indicator name	Endline			
	Total	T	C	Diff (T–C)
Of children (aged *6–35 months*) who ever had their MUAC measured:				
Proportion of children who had their MUAC measured in last six months	57.2	58.3	54.4	3.9
N	*607*	*421*	*186*	

2.4.2 State disaggregation

In order to provide further context to the findings presented above, we also present tables with state disaggregation to assess whether treatment effects on key exposure and outcome indicators vary by state. Note that our sampling strategy was not designed to have a large within-state sample size to identify small state-by-state WINNN effects. This means that this analysis will only identify relatively large effects as statistically significantly different from zero and confidence intervals around estimated effects will be relatively large. Despite these limitations, the results presented by state are informative and are described particularly for 'exposure' and 'outcome' indicators where state differentials are useful for learning.

Tables similar to Table 9 should be read in the same way as the regular tables presented above:

- The first 'indicator name' column shows the name of the indicator. In addition, and importantly for the interpretation of results, in brackets we describe the sub-population for which this indicator is defined.
- The next column, 'State' shows the name of the state.
- For each state, we present results in two rows: the first row shows estimates of the indicator for that particular state, while the second row shows the number of unweighted observations (N) in this state that are used to calculate these estimates.
- We present results for both treatment and control areas separately. Within each of those, we present the estimate for the endline round of this survey (column: EL), and the baseline round of this survey (column: BL).
- We also present an estimate of the difference between endline and baseline rounds (column: DIFF (EL–BL)).
- Finally, in the last column, we present our DID estimate for this particular state. This is the DID coefficient estimated using key covariates and household fixed effects (column: Impact estimate (SE)) to control for household-specific characteristics that do not vary over time but that could be correlated with the WINNN treatment. We consider estimates presented in this column to be the state impact estimates. This is the change in difference between treatment and control group from baseline to endline.
- The same levels of significance as used in the tables described above apply here.

Table 9 Example of state disaggregation table

Indicator name	State	Treatment			Control			Impact estimate (SE)
		BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Proportion of children who ever had their MUAC measured (*children 6–35 months*)	**Jigawa**	15.7	21.8	6.1*	9.0	12.3	3.3	0.6 (4.5)
	N	*652*	*490*		*734*	*599*		
	Katsina	18.3	22.5	4.2	11.2	7.8	-3.4	7.5* (3.7)
	N	*696*	*551*		*656*	*517*		
	Kebbi	5.0	9.9	4.9**	4.0	3.4	-0.7	6.3* (2.8)
	N	*824*	*616*		*753*	*539*		
	Zamfara	10.6	22.4	11.8***	6.6	7.2	0.7	8.2* (3.8)
	N	*703*	*558*		*668*	*520*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.

2.4.3 Types of graphs used in this report

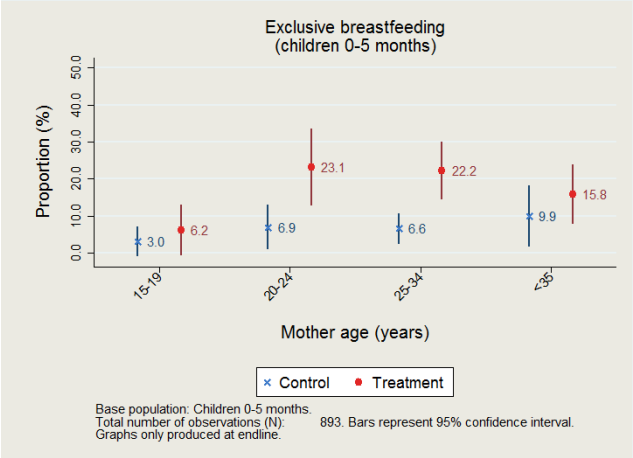
Figure 6 is an example of the graphs used in this report to present key indicators disaggregated by background characteristics of respondents at endline. Here we want to show how indicators related to WINNN (e.g. IYCF counselling participation) vary by background characteristics, that is, whether, after WINNN was implemented, indicators related to WINNN vary not only across treatment and control but also by some background characteristics. This is of interest at endline only (after WINNN implementation) since this is when WINNN will have had an effect. Hence we do not present baseline disaggregation.

For each of the categories of the background characteristic, the graph presents the indicator estimate (the point) and 95% confidence interval (the line), both in control and treatment areas. When confidence intervals do not overlap across categories, a statistically significant difference at

the 95% confidence level or higher exists. The base population and number of observations are specified at the bottom of each graph, as well as any other relevant information for the interpretation of the graph.

Note that the larger the confidence interval, the larger the standard errors and therefore the less precisely estimated the point estimate. This is largely due to the fact that the population under some of those categories is small and it is therefore harder to precisely estimate the point estimate.

Figure 6 Example disaggregation at endline



To explore cross-cutting issues of gender and poverty, key indicators are disaggregated across this report by four key dimensions:

- mother's age in categories;
- mother's education status: this is the highest level of educational attainment of mothers;
- community distance to closest WINNN health facility: this is based on GPS coordinate measurement (see Section 2.1.2 above) at the community and the closest WINNN health facility. Distance is measured in kilometres (km); and
- wealth quintiles: this based on a household wealth index developed by Shiyuan *et al.* (2008). It combines information on household size, composition, housing characteristics, water and sanitation characteristics, and asset ownership in a simple additive score, with a maximum value of 100. Households are then categorised into five groups of equal size based on this score (quintiles). (See Annex E of the Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017, for more details on this score.)

3 The WINNN programme

WINNN is an ambitious £52 million, six-year, DFID-funded programme (2011–2017) to improve maternal, new-born and child nutrition in five states of northern Nigeria (Jigawa, Zamfara, Kebbi, Katsina, and Yobe). WINNN was designed to support the piloting and testing of a set of evidence-based, cost-effective nutrition-specific interventions through government systems in its five focal states. These interventions are: micro-nutrient supplementation, the CMAM programme, and IYCF counselling. WINNN was designed to achieve this by building government systems and capacity for implementation, and ultimately by supporting institutionalisation of the interventions within routine healthcare systems. This was expected to help raise the political profile of undernutrition in Nigeria and leverage government to coordinate and fund nutrition programmes. WINNN supported micro-nutrient supplementation at Maternal, New-born, and Child Health Weeks[10] and worked to build political commitment across its five focal states. It supported CMAM-related services and IYCF-related services in three Local Government Areas (LGAs) in each state. These LGAs are identified as 'focal' or 'treatment LGAs' in this report. CMAM-related services and IYCF-related services were set up as demonstration sites and were not intended to reach universal coverage in the focal LGAs.

This section presents an overview of the components of the WINNN programme, the underlying theory of change and the status of WINNN implementation at the time impact was assessed. The status of implementation is largely derived by the qualitative evaluation, which assessed WINNN's contribution to nutrition sector governance contexts, including civil society and community engagement (Qualitative Evaluation of the WINNN Programme – summary report: Operations Research and Impact Evaluation, 2017). This ORIE report should be accessed separately for a complete analysis.

Figure 7 below has been prepared as a reference to make clear when various components of the WINNN programme were implemented across the four states. It is referenced throughout this section.

Figure 7 WINNN programme roll-out

[10] These are nationwide bi-annual events provided at specified health facilities concerned with the delivery of micronutrient interventions to pregnant women and children under the age of five.

3.1 The WINNN output areas

3.1.1 Output 1: Integration of micronutrient intervention into routine primary health services

Output 1 is concerned with the delivery of micronutrient interventions to pregnant women and children under the age of five through routine primary health services and MNCHW events. MNCHW events are nationwide biannual events provided at specific health facilities. They are an initiative of the Government of Nigeria and are supported by multiple donors. For WINNN, UNICEF coordinates this output at the federal and state level, and provides support across *all* LGAs in WINNN's five focal states, focusing on the following activities:

- Procurement and delivery of iron folate (for pregnant women), deworming (albendazole), oral rehydration solution (ORS) and Zinc (for children under five years) to the UNICEF zonal stores for routine primary health services and MNCHW events. States and LGAs are responsible for collection and distribution to the health facilities. WINNN also supports the distribution of Vitamin A.
- Strengthening the capacity, coordination and micro-planning of MNCHW events at state and LGA level, focusing on: planning, logistics, supervision, and monitoring.
- Social mobilisation for MNCHW events: engaging community influencers and town announcers, media work and disseminating public education messages/ merchandising.

It is important to emphasise that WINNN works with the government and numerous other development partners to plan and implement MNCHW events, at both national level and in the focal states.[11]

As seen in Figure 7, MNCHW events started as early as 2011 in Zamfara and Jigawa. Roll-out was delayed until late 2012 in Katsina and only started in 2015 in Kebbi (but WINNN supported the Immunization Plus Days platform before then). MNCHW events took place twice a year in all WINNN focal states.

The qualitative endline evaluation highlights that WINNN has strengthened the coordination, planning and implementation of the MNCHW events in its focal states, and has successfully promoted the release of government counterpart funding. A challenge has been the low levels of motivation among health workers in some WINNN focal states, with some not coming to work during MNCHW event. This was affected by non-payment of their salaries, due to the adverse economic situation in Nigeria since 2015, and an expectation that they would receive stipends for work at such health events. Despite this, there was good observation of MNCHW event protocols.

The MNCHW event social mobilisation strategy largely focused on reaching men with information on the event, since a lack of male permission is a main barrier for women's use of health facility services. However, in WINNN's focal communities for the IYCF interventions and the CMAM programme, the volunteers also directly sensitised mothers. In these focal communities, WINNN promoted strong community engagement in the social mobilisation, which was supported by

[11] DFID's *MNCH2* supports provision of MNCHW event data cards, training and supervision. Various partners fund the procurement of micronutrients for MNCHW events: Canadian International Development Agency, WHO, the Clinton Foundation ('Zinc, Iron, Folic Acid Supplementation' project), Rotary International, Global Alliance for Improved Nutrition, the European Union, Helen Keller International, Clinton Health Access Initiative, and Malaria Action Programme for States. DFID's MNCH-2 also supports the provision of zinc/ORS through routine services in non-WINNN LGAs, using resources from the Micro-Nutrient Initiative. Various partners support social mobilisation in the states, including: DFID's DFID *State Accountability and Voice Initiative*, the Federation of Muslim Women's Associations of Nigeria and various CSOs, which support MNCHW event social mobilisation.

multiple stakeholders. Elsewhere, the social mobilisation was less intensive and relied on information being cascaded through traditional leaders to town announcers, backed up by the radio announcements.

3.1.2 Output 2: Delivery of effective IYCF interventions in selected states and LGAs in northern Nigeria

Output 2 is concerned with IYCF counselling at the facility and in the community, and is focused largely on female caregivers who have children under the age of five, or who are pregnant. The f-IYCF counselling is focused around the five health facilities per WINNN LGA which provide the CMAM programme; as well as a number of non-CMAM facilities that provide ANC services in the focal LGAs. Before the expansion, the c-IYCF component was also focused around these targeted health facilities in the focal LGAs, with around three mothers' support groups attach to each. With the expansion which started in August 2015, the c-IYCF component of the IYCF interventions were extended to approximately two-thirds of the wards in WINNN-supported LGAs, and in 10 communities within each of these wards. Throughout this report, the narrative refers to the IYCF interventions as a whole or to its component parts as appropriate.

WINNN support to the IYCF interventions includes the following:

- Supporting the establishment of f-IYCF counselling, designed to be provided by trained health workers. The health workers are tasked with providing IYCF counselling at CMAM days, routine PHC services, such as ANC and PNC services, as well as health events such as MNCHW events and Immunisation Plus Days. This includes IYCF counselling to small groups of mothers and also one-to-one counselling.
- Supporting the establishment of **c-IYCF** counselling in focus communities within treatment LGAs**,** which is provided by trained CVs. CVs are tasked with establishing and facilitating 'mothers' support groups'[12], as well as broader IYCF counselling in communities, including sensitisation of husbands and traditional and religious leaders[13]. Other components of the c-IYCF component also include food demonstration sessions.
- Supporting IYCF training for state and LGA officers, who then provide step-down training to health workers and CVs.
- Providing ongoing supportive supervision and monitoring of the IYCF-related services in partnership with the LGA health teams.
- Advocacy to promote adequate public funding for the IYCF interventions, development of the IYCF policy agenda, and legislation related to IYCF. For example, WINNN supported the Federal Ministry of Health to develop the National IYCF Strategy and Behaviour Change Communication Strategy. In addition, WINNN has adopted the training package on the c-IYCF component of the IYCF interventions developed by the Nigerian Federal Government (adapted from the generic UNICEF package on the c-IYCF component), and the training package on the f-IYCF component of the IYCF interventions, also developed by the Nigerian Federal Government (based on manuals developed by UNICEF and WHO).

As depicted in Figure 7 above, IYCF counselling interventions were the last WINNN components to be rolled out and started in targeted states in 2013. The first states to roll out IYCF counselling

[12] Support groups are supposed to convene on a monthly basis and to not exceed 20 members (WINNN Behaviour Change Communication Strategy, 2015)

[13] Male CVs engage with husbands of pregnant and lactating women in places in the community where they typically gather to encourage them to take action to improve IYCF practices. Male CVs also invite them to support groups sessions to discuss what they can do to help their wives. Male CVs are also tasked with sensitising traditional and religious leaders on IYCF practices and how to mainstream IYCF messages within their sermons (WINNN Behaviour Change Communication Strategy, 2015).

were Kebbi and Katsina, in March 2013, followed by Zamfara in May 2013 and Jigawa in July 2013.[14]

The ORIE qualitative research found that, overall, the f-IYCF component of the IYCF interventions has been integrated into routine health facility services and successfully implemented across states, as evidenced by strong technical and political support for the intervention. The WINNN monitoring data indicate that a large number of mothers have attended IYCF counselling at the facilities. However, the inadequacy of human resources for health has been a constraint on the depth and quality of the counselling (Qualitative Evaluation of the WINNN Programme, 2017).

The qualitative research also found that roll-out of c-IYCF counselling at the community level has been expansive, including a diversification of channels to maximise outreach from household visits to community meetings, IYCF promotion at women's Islamia schools, among religious leaders and at community events like naming ceremonies. The qualitative endline report found good support for the IYCF interventions from community leaders in most of the focal IYCF interventions communities.

3.1.3 Output 3: Delivery of effective treatment for SAM through local health systems in selected states and LGAs in northern Nigeria

Output 3 is concerned with the provision of CMAM-related services. The intended beneficiaries are children under the age of five with SAM in the WINNN focal LGAs. WINNN supports OTP facilities in around five PHC facilities in each of its three focal LGAs, per state. WINNN also supports inpatient therapeutic feeding programmes or stabilisation care in at least one health facility per focal LGA. Throughout this report, the narrative refers to the CMAM intervention as a whole or to its component parts as appropriate.

WINNN support to the CMAM programme includes the following:

- Funding of therapeutic commodities for treatment at CMAM facilities, such as using RUTF, F75/F100, and ReSoMal. WINNN also supports the government to fill the procurement gap in respect of antibiotics (amoxicillin) and deworming pills (albendazole). These commodities are delivered to the UNICEF zonal stores, and from there states and LGAs are responsible for onward transportation to the health facilities. States and LGAs are also responsible for the funding and procurement of routine drugs.
- Supporting training on the CMAM programme for state and LGA officers (who then provide step-down training to health workers and CVs).
- Supporting SAM detection, and community sensitisation on acute malnutrition prevention and treatment at CMAM facilities, through mobilisation of CVs.
- Providing ongoing supportive supervision and monitoring of the CMAM-related services, in partnership with the LGA health teams.
- Advocacy and technical support to promote CMAM-related systems reform, policy and public funding.

While WINNN is the only development partner supporting the CMAM programme and IYCF counselling in its focal LGAs, various development partners support these interventions in other LGAs in the WINNN focal states and at federal level. These include the European Union's Directorate-General for European Civil Protection and Humanitarian Aid Operations (ECHO) (implemented by Save the Children International and ACF), a large CMAM programme funded by the Children's Investment Fund, which operates at federal level and across the northern states,

[14] Note that WINNN also operated in Yobe. However, the scope of this evaluation does not cover Yobe and hence implementation in this state is not taken into account here.

including all five WINNN states. Like WINNN, these programmes aim to strengthen nutrition policy, government commitment, public funding and civil society engagement.

As outlined in Figure 7 above, CMAM programme activities started in 2012 in Zamfara and Jigawa, and were rolled out later in Katsina (late 2013) and Kebbi (early 2014). The Qualitative Evaluation of the WINNN Programme, 2017 highlights the challenging health sector context in which the CMAM intervention was implemented, including insufficient human resources for health and inadequate basic amenities in health facilities. SQUEAC reports for Kebbi and Katsina (Nzioka 2016a/b) also report a high proportion of clients coming from beyond the intended catchment area.

3.1.4 Output 4: Strengthening of nutrition coordination and planning mechanisms at national and state level

Output 4 is concerned with supporting more effective government planning and coordination of nutrition-related interventions (at federal and state levels), and building government commitment. This includes support to the following:

- national, state and LGA-level committees on food and nutrition – to promote inter-sectoral coordination and attention to nutrition;
- policy and plans for nutrition work;
- promotion of public funding and releases for nutrition-specific interventions; and
- promoting civil society engagement in the planning and monitoring of nutrition work.

The objectives under Output 4 are closely entwined with the other WINNN outputs, and at its heart Output 4 aims to strengthen government commitment to addressing undernutrition and its underlying causes.

3.1.5 Cross-cutting: voice, accountability and gender

The WINNN voice and accountability strategy focuses on enabling the voice and engagement of CSOs and civil society actors (media, senior religious leaders etc.) in nutrition sector planning and monitoring at national, state and LGA levels. This includes the establishment of feedback mechanisms to enable the voice of community members to be heard, and to enable responsiveness to their concerns and needs.

With reference to gender, WINNN intends to develop and strengthen: (a) vertical strategies to mainstream issues of gender and social exclusion through core strategies (MNCHW events, IYCF counselling, a CMAM programme and capacity building for health care workers); and (b) horizontal strategies at community level, focusing on the identification of solutions to the gendered nature of health-seeking behaviour and feeding practices. The WINNN strategy recognises the important role of key women (such as mothers, elderly women, mothers-in-law and traditional birth attendants) as change agents in their communities in regard to influencing nutrition practices.

3.2 The results chain of the impact of the WINNN programme

The overall WINNN programme results chain is detailed in the DFID Business Case and articulated in the WINNN theory of change diagram presented in Annex F of Volume II of this report Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017). The results chain is long and complex and contains a number of assumptions of relevance that are explored in depth in the qualitative endline report (Qualitative Evaluation of the WINNN Programme, 2017). While a simplified version is presented in this section, the full theory of change underlying the WINNN

programme and the quantitative impact evaluation can be found in Annex E of Volume II (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017).

In this section, we present a simplified results chain specifically for indicators that are assessed in this quasi-experimental impact evaluation. **The purpose of this section is to clearly delineate the rationale for how the WINNN components that are assessed in this quantitative impact evaluation are thought to lead to an impact on key indicators of interest.**

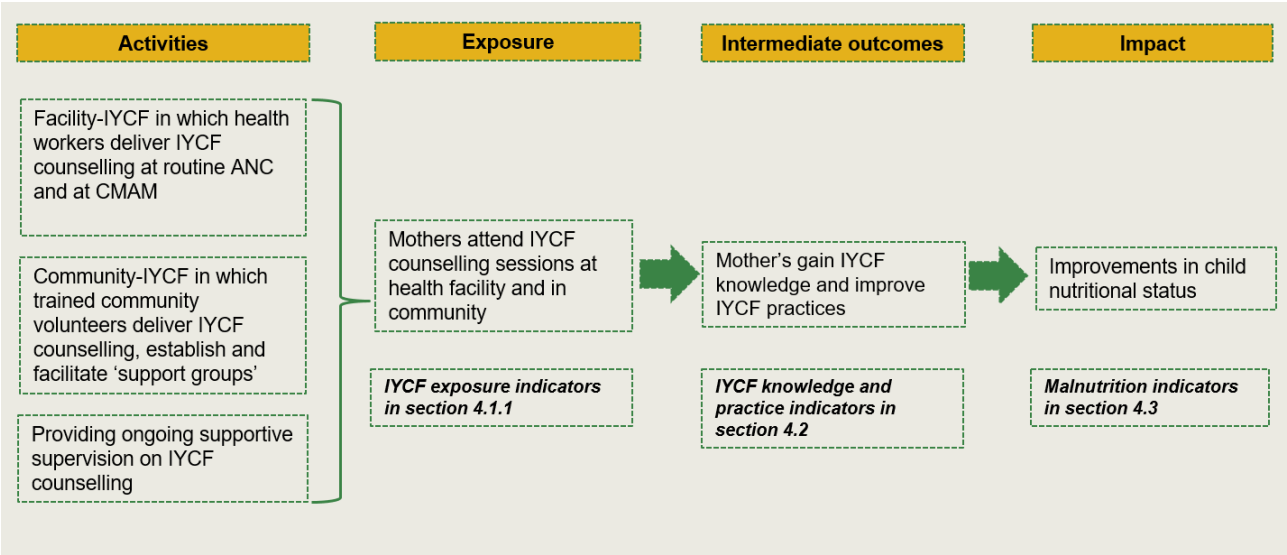
It is important to note that WINNN carried out a number of additional activities under each WINNN output, such as ongoing supportive supervision and advocacy at national, state and LGA level, as well as among community-level stakeholders like men and religious leaders. All of these activities are outlined in the full results chain and are excluded, in the interests of simplicity, in the presentation of the results chain below.

3.2.1 Simplified results chain for WINNN Outputs 2 (IYCF counselling) and 3 (CMAM programme)

WINNN Output 2: Delivery of effective IYCF interventions in selected states and LGAs in northern Nigeria

Figure 8 outlines the simplified chain of results for WINNN Output 2: how IYCF counselling can lead to improved nutritional outcomes. First, WINNN promotes IYCF counselling at the health facilities through routine ANC and during treatment at CMAM facilities and in the community through trained volunteers and the establishment of IYCF support groups. These activities increase the exposure of mothers to key IYCF messages at the facilities and/or in the community. It is assumed that these messages are effective, i.e. that they are internalised to some extent by mothers who attend IYCF counselling. Knowledge that is increase and beliefs that are altered through these sessions are then expected to trigger changes in mothers' IYCF practices. In turn, these improved practices should improve the nutritional outcomes of children.

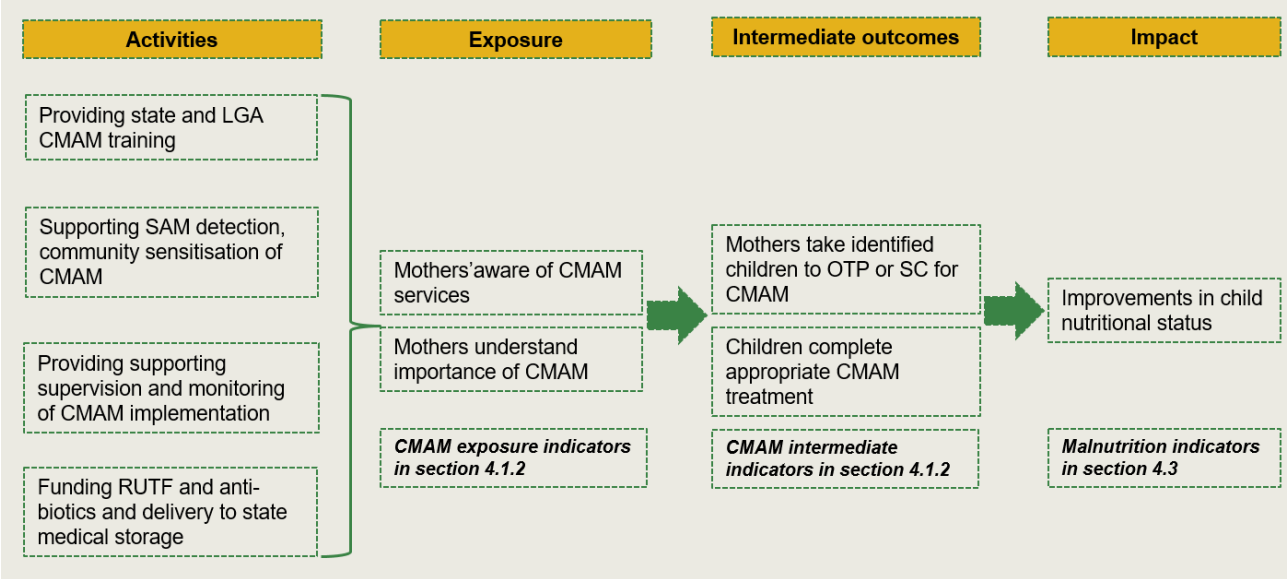
Figure 8 Simplified chain of results for WINNN Output 2 (IYCF counselling)



WINNN Output 3: Delivery of effective treatment for SAM through local health systems in selected states and LGAs in northern Nigeria

Figure 9 outlines the simplified chain of results for WINNN Output 3: how CMAM interventions can lead to improved nutritional outcomes. First, WINNN provides training on the CMAM programme at the state and LGA levels, and supports SAM detection and community sensitisation on the CMAM programme. These activities are expected to improve mothers' awareness of CMAM-related services and to lead to a better understanding of their importance. Increased knowledge about the CMAM-programme, improved screening, and improved diagnosis through these activities are then expected to encourage mothers to take children whom they consider to be sick to OTP facilities and to complete appropriate treatment at CMAM facilities if they do have SAM. In turn, these improved practices should improve the nutritional outcomes of children.

Figure 9 Simplified chain of results for WINNN Output 3 (CMAM programme)

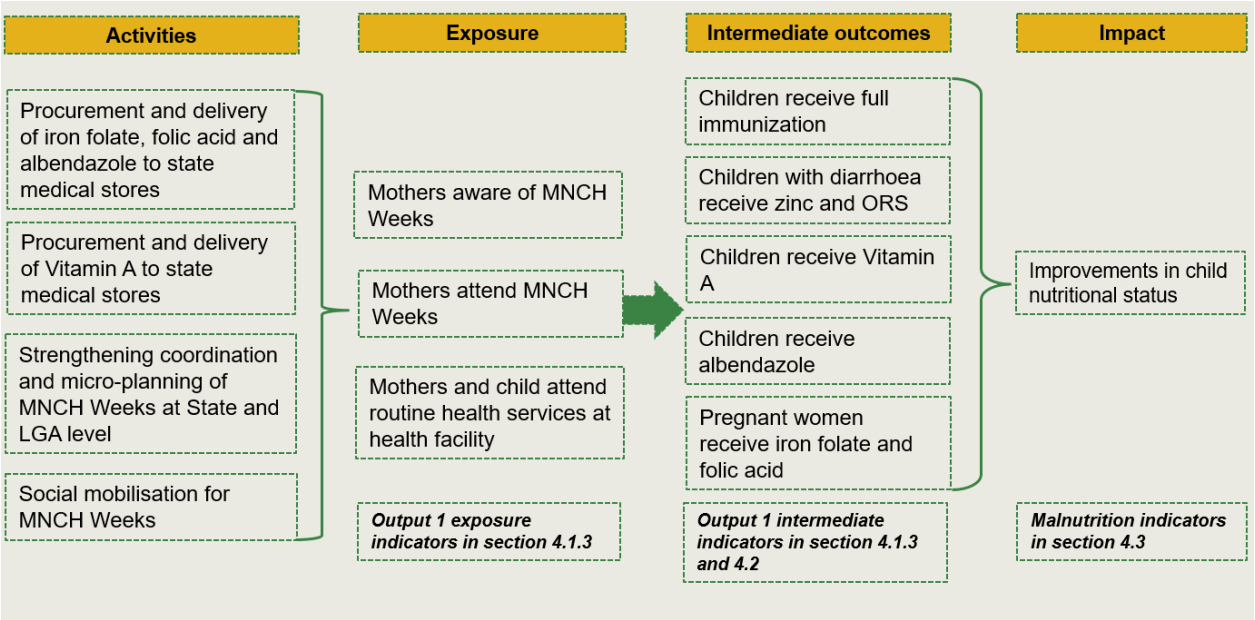


3.2.2 Simplified results chain for WINNN Output 1 (Micronutrient supplementation)

WINNN Output 1: Integration of micronutrient intervention into routine primary health services

Figure 10 outlines the simplified chain of results for WINNN Output 1: how micronutrient supplementation at MNCHW events and at routine medical visits can lead to improved nutritional outcomes. First, WINNN provides and delivers iron folate, folic acid, albendazole, and Vitamin A to medical stores, which should be distributed at MNCHW events and at health facilities. The WINNN programme also strengthens the coordination and micro-planning of MNCHW events and the social mobilisation around them. This is expected to improve mothers' awareness of MNCHW events. Mothers are then expected to attend MNCHW events, where children should receive Vitamin A drops and albendazole, and pregnant women should receive iron folate. Mothers should also attend ANC, where iron folate and folic acid should be distributed, and ORS and zinc should be provided to children with diarrhoea, at routine medical visits. In turn, increased micronutrient intake should improve the nutritional outcomes of children.

Figure 10 Simplified chain of results for WINNN Output 1 (micronutrient supplementation)



4 Findings

4.1 Experience of WINNN and other nutrition interventions

The following sections present the results of how respondents in our baseline and endline surveys experienced IYCF counselling (Section 4.1.1), CMAM programme interventions (Section 4.1.2), and MNCHW events (Section 4.1.3). This chapter is mostly of a descriptive nature, presenting indicators which mainly relate to WINNN outputs. The aim is to discuss how WINNN interventions and MNCHW events reached individuals living in treatment areas. See Section 2.4 on how to interpret the findings presented in the tables and graphs below.

4.1.1 Experience of IYCF counselling

The baseline and endline surveys asked mothers of children aged 0–35 months whether they received IYCF counselling.[15] Because respondents had difficulties in distinguishing different circumstances at which IYCF counselling might have taken place (such as, for example, in communities by CVs, versus at community support groups), the survey asked mothers about whether they had received IYCF counselling in the community generally and whether they had received IYCF counselling at health facilities at specific ANC and PNC sessions for their children.

Table 10 below shows that the WINNN programme significantly increased the proportion of mothers who had ever received counselling in the community by 21 percentage points in treatment areas. In treatment areas the proportion of mothers who reported having received IYCF counselling in the community increased from 8% at baseline to 32% at endline, while in control areas the increase since baseline was smaller, at about 3 percentage points.

Table 10 Community IYCF counselling attendance

Indicator name	Treatment			Control			Impact estimate (SE)
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Proportion of mothers (*mothers 15–49 years)* who ever attended IYCF counselling in the community	7.5	31.5	24.0***	4.3	7.4	3.1**	20.6*** (2.4)
N	*2,833*	*2,303*		*2,833*	*2,235*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level. Mothers are defined as mothers aged 15-49 of children aged 0–35 months.

Indicator name	Endline			
	Total	T	C	Diff (T-C)
Proportion of mothers (*15-49 years*) who have …				
… attended ANC session and received IYCF counselling at any ANC session 1/	35.3	42.2	28.5	13.7***
N	*4,541*	*2,305*	*2,236*	
…attended postnatal care and received IYCF counselling at any postnatal check up 1/	16.6	20.2	12.9	7.3***

[15] As explained in Section 2, mothers are defined as mothers 15–49 years old who have a child aged 0–35 months.

N	*4,538*	*2,301*	*2,237*	
… **received IYCF counselling at the community and health facility 2/**	11.9	19.7	4.2	15.4***
N	*4,556*	*2,314*	*2,242*	
…received IYCF counselling at the community or at health facility 2/	47.1	58.3	36.1	22.2***
N	*4,556*	*2,314*	*2,242*	
… ever heard about food demonstration sessions at community	17.3	26.0	8.8	17.2***
N	*4,538*	*2,303*	*2,235*	
… ever attended food demonstration sessions at community	6.0	11.0	1.1	9.8***
N	*4,538*	*2,303*	*2,235*	
Mean number of times mothers (*15-49 years*) have received IYCF community counselling in last 6 months 3/	1.0	1.1	0.6	0.5***
N	*877*	*732*	*145*	
Mean number of people who participated in group counselling last time 4/	30.5	30.0	32.5	-2.5
N	*526*	*440*	*86*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T-C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Data for these indicators only collected at endline.
Indicators are only presented at endline since a more detailed module on IYCF counselling exposure was only included at endline once understanding of the specific programme interventions improved.
1/ At a health facility for any of their children aged 0-35 months.
2/ Received IYCF counselling at the facility either at antenatal care or at post-natal care.
3/ Mothers who attended IYCF counselling in the community.
4/ Mothers who attended IYCF group counselling last time they received IYCF counselling.

Table 11 **shows that more than two-fifths of all mothers (42%) at endline and in treatment areas had received IYCF counselling at ANC sessions at health facilities.** About 42% of all mothers in treatment areas at endline reported ever having received IYCF counselling at an ANC session at a health facility, compared to 29% in control areas. Similarly, about 20% of mothers in treatment areas at endline had received IYCF counselling at PNC in health facilities compared to 13% in control areas.

In addition, our analysis suggests that a combination of both facility and community IYCF-related services has been effective to increase reach out to mothers in treatment areas.

Indicator name	Endline			
	Total	T	C	Diff (T-C)
Proportion of mothers (*15-49 years*) who have …				
… attended ANC session and received IYCF counselling at any ANC session 1/	35.3	42.2	28.5	13.7***
N	*4,541*	*2,305*	*2,236*	
…attended postnatal care and received IYCF counselling at any postnatal check up 1/	16.6	20.2	12.9	7.3***
N	*4,538*	*2,301*	*2,237*	
… **received IYCF counselling at the community and health facility 2/**	11.9	19.7	4.2	15.4***
N	*4,556*	*2,314*	*2,242*	
…received IYCF counselling at the community or at health facility 2/	47.1	58.3	36.1	22.2***
N	*4,556*	*2,314*	*2,242*	
… ever heard about food demonstration sessions at community	17.3	26.0	8.8	17.2***
N	*4,538*	*2,303*	*2,235*	
… ever attended food demonstration sessions at community	6.0	11.0	1.1	9.8***
N	*4,538*	*2,303*	*2,235*	

Mean number of times mothers (*15-49 years*) have received IYCF community counselling in last 6 months 3/	1.0	1.1	0.6	0.5***
N	*877*	*732*	*145*	
Mean number of people who participated in group counselling last time 4/	30.5	30.0	32.5	-2.5
N	*526*	*440*	*86*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T-C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Data for these indicators only collected at endline.
Indicators are only presented at endline since a more detailed module on IYCF counselling exposure was only included at endline once understanding of the specific programme interventions improved.
1/ At a health facility for any of their children aged 0-35 months.
2/ Received IYCF counselling at the facility either at antenatal care or at post-natal care.
3/ Mothers who attended IYCF counselling in the community.
4/ Mothers who attended IYCF group counselling last time they received IYCF counselling.

Table 11 shows that 20% of all mothers in treatment areas at endline reported having received IYCF counselling at both the community and the health facility, while 58% attended at least one of those services.

WINNN targets for IYCF counselling relate to the absolute number of women and mothers who have been reached or been in contact with IYCF counselling. Hence, results from Table 10 and

Table 11 cannot directly be compared to those targets and it is not possible to make a statement

Indicator name	Endline			
	Total	T	C	Diff (T-C)
Proportion of mothers (*15-49 years*) who have …				
… attended ANC session and received IYCF counselling at any ANC session 1/	35.3	42.2	28.5	13.7***
N	*4,541*	*2,305*	*2,236*	
…attended postnatal care and received IYCF counselling at any postnatal check up 1/	16.6	20.2	12.9	7.3***
N	*4,538*	*2,301*	*2,237*	
… **received IYCF counselling at the community and health facility 2/**	11.9	19.7	4.2	15.4***
N	*4,556*	*2,314*	*2,242*	
…received IYCF counselling at the community or at health facility 2/	47.1	58.3	36.1	22.2***
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… ever heard about food demonstration sessions at community	17.3	26.0	8.8	17.2***
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N	*4,538*	*2,303*	*2,235*	
Mean number of times mothers (*15-49 years*) have received IYCF community counselling in last 6 months 3/	1.0	1.1	0.6	0.5***
N	*877*	*732*	*145*	
Mean number of people who participated in group counselling last time 4/	30.5	30.0	32.5	-2.5
N	*526*	*440*	*86*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T-C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Data for these indicators only collected at endline.
Indicators are only presented at endline since a more detailed module on IYCF counselling exposure was only included at endline once understanding of the specific programme interventions improved.
1/ At a health facility for any of their children aged 0-35 months.
2/ Received IYCF counselling at the facility either at antenatal care or at post-natal care.
3/ Mothers who attended IYCF counselling in the community.
4/ Mothers who attended IYCF group counselling last time they received IYCF counselling.

about how these IYCF counselling attendance estimates compare to what would be expected.

Table 11 **also shows that about 26% of mothers in treatment areas at endline had heard**

Indicator name	Endline			
	Total	T	C	Diff (T-C)
Proportion of mothers (*15-49 years*) who have …				
… attended ANC session and received IYCF counselling at any ANC session 1/	35.3	42.2	28.5	13.7***
N	*4,541*	*2,305*	*2,236*	
…attended postnatal care and received IYCF counselling at any postnatal check up 1/	16.6	20.2	12.9	7.3***
N	*4,538*	*2,301*	*2,237*	
… received IYCF counselling at the community and health facility 2/	11.9	19.7	4.2	15.4***
N	*4,556*	*2,314*	*2,242*	
…received IYCF counselling at the community or at health facility 2/	47.1	58.3	36.1	22.2***
N	*4,556*	*2,314*	*2,242*	
… ever heard about food demonstration sessions at community	17.3	26.0	8.8	17.2***
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N	*4,538*	*2,303*	*2,235*	
Mean number of times mothers (*15-49 years*) have received IYCF community counselling in last 6 months 3/	1.0	1.1	0.6	0.5***
N	*877*	*732*	*145*	
Mean number of people who participated in group counselling last time 4/	30.5	30.0	32.5	-2.5
N	*526*	*440*	*86*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T-C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Data for these indicators only collected at endline.
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2/ Received IYCF counselling at the facility either at antenatal care or at post-natal care.
3/ Mothers who attended IYCF counselling in the community.
4/ Mothers who attended IYCF group counselling last time they received IYCF counselling.

about food demonstration sessions. About 11% of all mothers in treatment areas have ever attended such sessions. These relatively low awareness and coverage indicators are likely to have been due to the recent commencement of food demonstrations as part of the quality improvement strategies introduced in 2015 following the Annual Review recommendation.

Indicator name	Endline			
	Total	T	C	Diff (T-C)
Proportion of mothers (*15-49 years*) who have …				
… attended ANC session and received IYCF counselling at any ANC session 1/	35.3	42.2	28.5	13.7***
N	*4,541*	*2,305*	*2,236*	
…attended postnatal care and received IYCF counselling at any postnatal check up 1/	16.6	20.2	12.9	7.3***
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… received IYCF counselling at the community and health facility 2/	11.9	19.7	4.2	15.4***
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…received IYCF counselling at the community or at health facility 2/	47.1	58.3	36.1	22.2***
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Notes: The 'N' shows the number of unweighted observations. Significance levels of the T-C difference and DID are reported with stars:
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2/ Received IYCF counselling at the facility either at antenatal care or at post-natal care.
3/ Mothers who attended IYCF counselling in the community.
4/ Mothers who attended IYCF group counselling last time they received IYCF counselling.

Table 11 IYCF counselling at endline at health facility or community

Table 11 **also shows that mothers who have received IYCF counselling in treatment areas in**

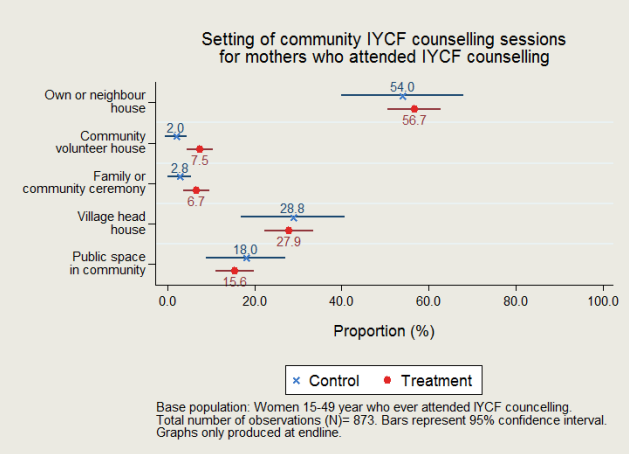
Indicator name	Endline			
	Total	T	C	Diff (T-C)
Proportion of mothers (*15-49 years*) who have …				
… attended ANC session and received IYCF counselling at any ANC session 1/	35.3	42.2	28.5	13.7***
N	*4,541*	*2,305*	*2,236*	
…attended postnatal care and received IYCF counselling at any postnatal check up 1/	16.6	20.2	12.9	7.3***
N	*4,538*	*2,301*	*2,237*	
… received IYCF counselling at the community and health facility 2/	11.9	19.7	4.2	15.4***
N	*4,556*	*2,314*	*2,242*	
…received IYCF counselling at the community or at health facility 2/	47.1	58.3	36.1	22.2***
N	*4,556*	*2,314*	*2,242*	
… ever heard about food demonstration sessions at community	17.3	26.0	8.8	17.2***
N	*4,538*	*2,303*	*2,235*	
… ever attended food demonstration sessions at community	6.0	11.0	1.1	9.8***
N	*4,538*	*2,303*	*2,235*	
Mean number of times mothers (*15-49 years*) have received IYCF community counselling in last 6 months 3/	1.0	1.1	0.6	0.5***
N	*877*	*732*	*145*	
Mean number of people who participated in group counselling last time 4/	30.5	30.0	32.5	-2.5
N	*526*	*440*	*86*	

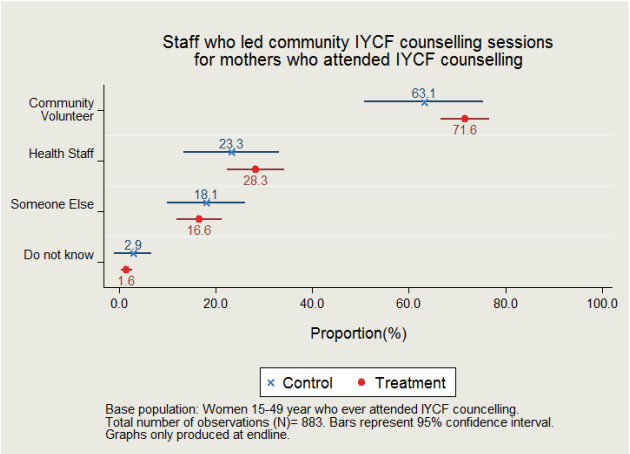
Notes: The 'N' shows the number of unweighted observations. Significance levels of the T-C difference and DID are reported with stars:
***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Data for these indicators only collected at endline.
Indicators are only presented at endline since a more detailed module on IYCF counselling exposure was only included at endline once understanding of the specific programme interventions improved.
1/ At a health facility for any of their children aged 0-35 months.
2/ Received IYCF counselling at the facility either at antenatal care or at post-natal care.
3/ Mothers who attended IYCF counselling in the community.
4/ Mothers who attended IYCF group counselling last time they received IYCF counselling.

the community at endline reported that on average they received IYCF counselling once in

the last 6 months and that on average the group was comprised of 30 people. Figure 12 also shows that in the majority of cases, this counselling happened at the house of a community member (57% in own or neighbour's house and 28% in village head's house) and was led by community volunteers (71%).

Figure 11 IYCF community counselling setting and staff leading the sessions at endline





Note that Table 10 and

Indicator name	Endline			
	Total	T	C	Diff (T-C)
Proportion of mothers (*15-49 years*) who have …				
… attended ANC session and received IYCF counselling at any ANC session 1/	35.3	42.2	28.5	13.7***
N	*4,541*	*2,305*	*2,236*	
…attended postnatal care and received IYCF counselling at any postnatal check up 1/	16.6	20.2	12.9	7.3***
N	*4,538*	*2,301*	*2,237*	
… received IYCF counselling at the community and health facility 2/	11.9	19.7	4.2	15.4***
N	*4,556*	*2,314*	*2,242*	
…received IYCF counselling at the community or at health facility 2/	47.1	58.3	36.1	22.2***
N	*4,556*	*2,314*	*2,242*	
… ever heard about food demonstration sessions at community	17.3	26.0	8.8	17.2***
N	*4,538*	*2,303*	*2,235*	
… ever attended food demonstration sessions at community	6.0	11.0	1.1	9.8***
N	*4,538*	*2,303*	*2,235*	
Mean number of times mothers (*15-49 years*) have received IYCF community counselling in last 6 months 3/	1.0	1.1	0.6	0.5***
N	*877*	*732*	*145*	
Mean number of people who participated in group counselling last time 4/	30.5	30.0	32.5	-2.5
N	*526*	*440*	*86*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T-C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Data for these indicators only collected at endline.
Indicators are only presented at endline since a more detailed module on IYCF counselling exposure was only included at endline once understanding of the specific programme interventions improved.
1/ At a health facility for any of their children aged 0-35 months.
2/ Received IYCF counselling at the facility either at antenatal care or at post-natal care.
3/ Mothers who attended IYCF counselling in the community.

4/ Mothers who attended IYCF group counselling last time they received IYCF counselling.

Table 11 also show that some mothers in control areas attended IYCF counselling sessions. For example, at endline, about 7% of all mothers in control areas had ever attended community IYCF counselling sessions. Similarly, about 9% had heard of food demonstration sessions. As discussed in Section 2.3.3 this is evidence of potential spillover effects from treatment LGAs to control LGAs. However, it is important to reiterate that the risk of bias resulting from this is judged to be low given that the change in control areas is small in size and that a significant WINNN impact on exposure to community IYCF counselling is still found in treatment areas.

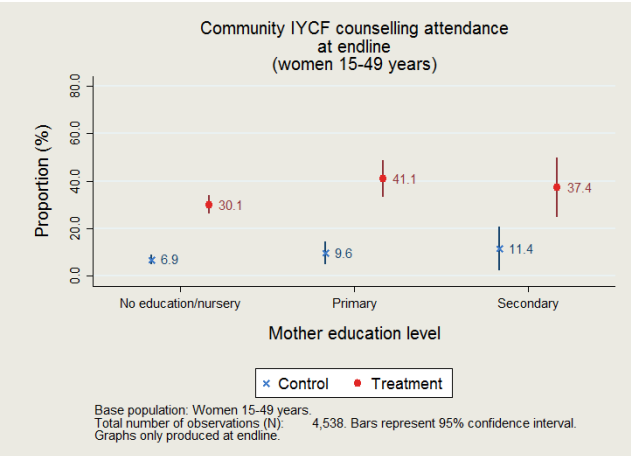
Which groups of mothers were reached by IYCF counselling?

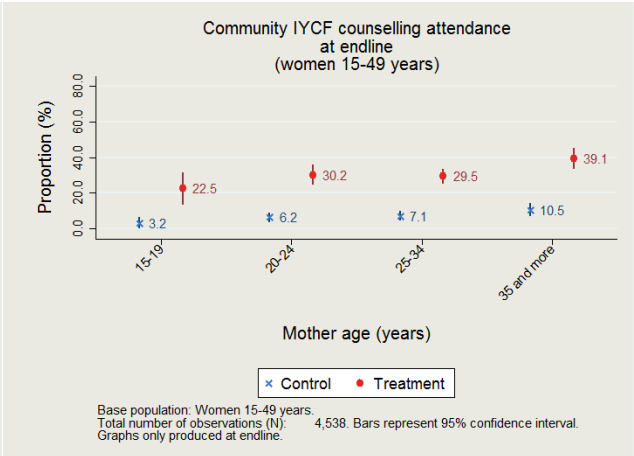
Figure 12 below shows that exposure to IYCF counselling in the community was correlated with the age and education levels of mothers. At endline in treatment areas, older mothers (aged 35 years or more) were more likely to report that they had ever attended IYCF counselling in the community, compared to younger mothers.

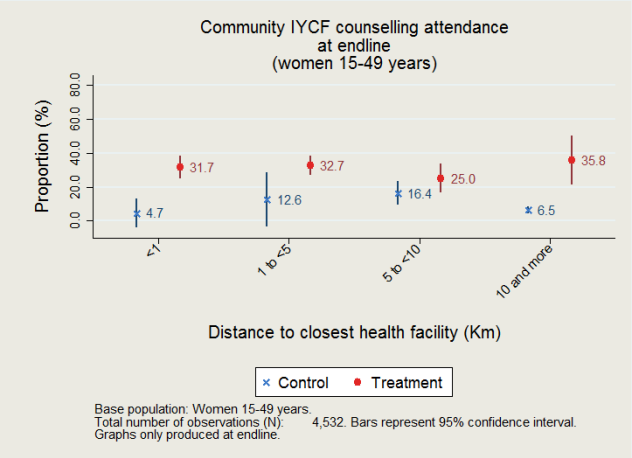
The quantitative finding that older mothers were more likely to be counselled on IYCF is corroborated by our qualitative research. The qualitative research found that in the areas visited within the context of that study many CVs believed strongly that older women's understanding and consent is critical to engendering change in IYCF practices. For this reason, CVs focused strongly on including older women in IYCF counselling sessions. In contrast, young mothers (particularly adolescents) have more limited mobility, and some CVs explained the difficulties of engaging adolescents in meetings. WINNN is aware of these challenges, and is presently designing a specific approach for reaching adolescent mothers with IYCF counselling (WINNN Behaviour Change Communication Strategy, 2015).

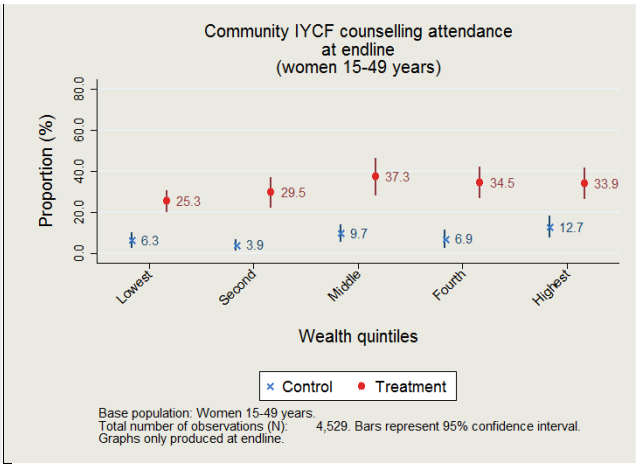
Similarly, mothers with primary education were more likely to report that they attended IYCF counselling in the community, compared to mothers without education. In addition, mothers from households in the poorest quintiles were less likely to attend community IYCF counselling. Disaggregation by community distance to the nearest WINNN facility showed no clear discernible trend.

Figure 12 Proportion of mothers who have ever attended IYCF counselling in the community at endline, by mother's age, education, distance from nearest health facility, and wealth quintile









How did the coverage of IYCF community counselling vary by state?

Table 12 below shows that the WINNN programme significantly increased attendance of mothers at IYCF community counselling in all states, but there are differences across states. At endline, Katsina had the largest proportion of mothers in treatment areas reporting that they ever received IYCF counselling in the community (43%). This was followed by Jigawa (35%), while these proportions were significantly lower in Kebbi and Zamfara (26% and 22%, respectively). Nevertheless, all states showed a significant impact of the WINNN programme on exposure to community IYCF counselling, due to significantly larger changes over time in treatment compared to control areas. The largest improvements were experienced in Katsina and Jigawa, where the intervention increased attendance at community IYCF counselling by 30 and 22 percentage points, respectively.

These findings on the expansion of IYCF counselling are also corroborated by our qualitative research. The qualitative evaluation focused only on the WINNN focal communities for the IYCF interventions. In most of these focal communities we found that the IYCF counselling has been expansive. This has been promoted by strong support from community leaders and the IYCF interventions supportive supervision. The qualitative research indicated that the supervision of the c-IYCF component had been particularly strong in the sampled wards in Katsina and Jigawa (see Qualitative Evaluation of the WINNN Programme, 2017).

Table 12 Proportion of mothers who have received IYCF counselling in the community by state

Indicator name	State	Treatment			Control			Impact estimate (SE)
		BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Mother who received IYCF counselling in the community (*mothers 15–49 years*)	**Jigawa**	6.1	34.6	28.5***	1.9	7.7	5.9***	21.9*** (4.3)
	N	*643*	*492*		*745*	*604*		
	Katsina	15.4	43.2	27.8***	7.0	6.6	-0.4	30.0*** (4.3)
	N	*636*	*565*		*642*	*532*		
	Kebbi	7.1	25.8	18.7***	4.7	6.3	1.6	11.2 (4.4)
	N	*819*	*663*		*748*	*562*		
	Zamfara	1.7	21.5	19.8***	4.4	8.5	4.1	17.9*** (4.5)
	N	*735*	*583*		*698*	*537*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.

4.1.2 Experience of CMAM programme interventions

Table 13 and Table 14 below present information on the extent of examination for undernutrition with MUAC tape. It is important to note that the WINNN programme did not have an active community case finding component. Therefore, the findings presented below are to demonstrate operational aspects of the CMAM programme and are not to be used in the assessment of WINNN's operational performance.

The proportion of children ever examined for undernutrition using the MUAC tape increased by 6 percentage points in treatment areas (Table 13 below). This includes examinations using the MUAC tape both at home and at health facilities, e.g. on a CMAM day. At endline, about 20% of all caregivers to children in the survey in treatment areas reported that children were ever examined for undernutrition using the MUAC tape, a significant increase of about 7 percentage points since baseline.

Table 13 Undernutrition examination using MUAC

Indicator name	Treatment			Control			Impact estimate (SE)
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Proportion of children who have ever had their MUAC measured (*children 6–35 months*) 1/	12.9	20.1	7.1***	7.6	7.8	0.3	6.1** (1.9)
N	*2,875*	*2,215*		*2,811*	*2,175*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
1/ MUAC measurement at home, at facility, or at any other venue.

The indicators presented in Table 14 and Figure 13 are useful in describing the dynamics of the CMAM intervention through MUAC measurement. **Table 14 shows that almost a quarter (22%) of children who had ever been examined for undernutrition at endline in treatment areas had had their MUAC measured in the 30 days prior to the endline survey**. About 58% of children had had their MUAC measured in the six months prior to the survey. Over these six months, and of children that had been examined in that time period, on average children were examined three times for undernutrition.

Table 14 Undernutrition examination using MUAC at endline

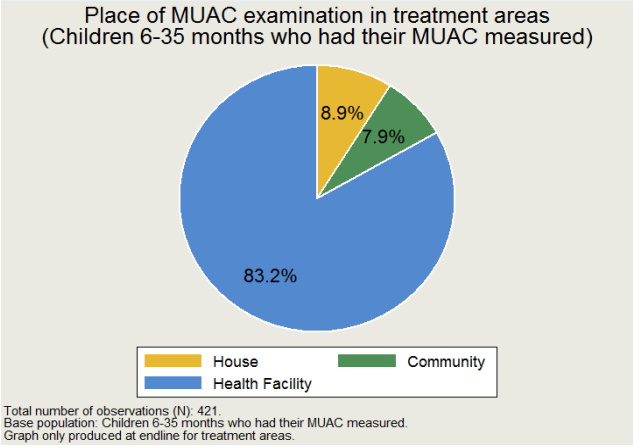
Indicator name	Endline			
	Total	T	C	Diff (T–C)
Of children (*6–35 months*) who ever had their MUAC measured:				
Proportion of children who had their MUAC measured in last 30 days	23.7	21.8	28.6	-6.9
Proportion of children had their MUAC measured in last six months	56.4	57.6	53.2	4.5
N	*596*	*415*	*181*	
Of children (*6–35 months*) who were examined for undernutrition in the last six months using MUAC:				
Number of times the child was examined in the last six months	2.8	2.8	2.8	0.0
N	*334*	*232*	*102*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Indicators Note that indicators in Table 14 are only presented at endline because of changes in the questionnaire from baseline to endline to better reflect changes in CMAM programme implementation.

Undernutrition screening using MUAC happened predominantly at health facilities. In Figure 13, we see that in a large majority of cases (83%) children in treatment areas were examined using

MUAC in health facilities and in only a very few cases (9%) did this take place in their home or in the community (8%). The relatively low proportion of children who have ever had MUAC measured at home is indicative of WINNN's implementation model, in which active case finding in communities was de-prioritised when it was apparent that resources for the purchase of RUTF would not be sufficient to cover demand.

Figure 13 Location of last undernutrition examination using MUAC



Indeed, other research conducted by ORIE found evidence that presents a similar story. For example, the ORIE facility survey found that only about 11% of clients at OTP facilities reported that they had ever had a visit at home to get their child's MUAC measured (ORIE Health Facility Survey – Final Report, 2017). In addition, the ORIE qualitative research found that many CVs providing CMAM-related services who were interviewed now focus much less on community screening. This was in part due the large number of clients that attended CMAM days at the health facility without being referred, which CVs interpret as a low need for malnutrition screening in the communities, and also the long hours that CVs work on CMAM days (See Qualitative Evaluation of the WINNN Programme, 2017

Table 15 Proportion of children taken for treatment at CMAM facilities

Indicator name	Treatment			Control			Impact estimate (SE)
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Proportion of children (*0–35 months*) who …							
… were ever taken to any CMAM facility for treatment	6.7	7.7	0.9	3.7	3.1	-0.6	1.8 (1.1)
… were ever taken to an OTP centre for treatment with RUTF	5.8	7.3	1.5	3.2	3.0	-0.2	1.8 (1.0)
… were ever taken to a stabilisation care facility for treatment with F75/F100/RUTF	0.9	0.4	-0.5*	0.5	0.2	-0.3	0.0 (0.4)
N	*3,382*	*2,669*		*3,312*	*2,621*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.

See Qualitative Evaluation of the WINNN Programme, 2017

Table 15 **shows that the proportion of children who were ever taken to a CMAM facility for treatment in treatment areas (irrespective of whether this was an OTP or a stabilisation care facility) did not change much between baseline (7%) and endline (8%).** The proportion of children taken to a stabilisation care facility (with F75/F100/RUTF) was 1% in treatment areas at baseline and less than 1% at endline. In all three cases, our impact estimates were not significantly different from zero. Note that these treatment indicators explicitly ask for treatment, for example using RUTF, and not just screening.

When interpreting the estimates presented in See Qualitative Evaluation of the WINNN Programme, 2017

Table 15, it is important to note that these estimates cannot be compared to WINNN targets for the CMAM intervention as WINNN monitoring data collects absolute numbers of children admitted to CMAM facilities, whereas the estimates in this table present the proportion of children who were ever taken for treatment at CMAM facilities.

Table 16 restricts the base population to children aged 6–35 months who have SAM at the time of the survey and presents estimates for examination with MUAC and access to treatment at CMAM facilities. Children with SAM included in this analysis are all children who have SAM based on either z-scores and/or oedema (see Section 4.4 for SAM prevalences using different measures). About 23% of children with SAM in treatment areas ever had their MUAC measured and 18% were ever taken to any CMAM facility for treatment, indicating that quite a low proportion of children with SAM are actually able to reach treatment. This was low because the CMAM programme was piloted in a limited number of health facilities in each focal LGA, and the supply of RUTF was limited. The services also treated some additional children who were resident outside the LGA.

It is important to note that the indicators presented in

Table 16 are not estimates of CMAM programme coverage. Coverage surveys usually include an active case finding method or a house-to-house screening of SAM cases in their sampling, which is very different to the ORIE sample. Thus, the ORIE sample was not designed to measure CMAM programme coverage in same manner. It is also important to note that this quantitative impact evaluation is not able to report on WINNN's primary CMAM programme outcome indicator – recovery rate. This indicator could not be collected given the panel of household survey design and is therefore reported by WINNN. ORIE synthesizes achievement on this indicator and all WINNN logframe indicators in a separate report – the Integrated Evaluation Report of the WINNN Programme.

Table 16 MUAC measurement and treatment at CMAM facility for children with SAM

Indicator name	Endline			
	Total	T	C	Diff (T–C)
Proportion of children (*6–35 months with SAM*) who …				
… have ever had their MUAC measured 1/	23.0	29.6	15.1	14.5*
N	*299*	*157*	*142*	
… were ever taken to any CMAM facility for treatment	14.7	17.5	11.3	6.2
N	*299*	*157*	*142*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DiD are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Indicators are only presented at endline because prevalence of oedema, which is used to calculate the SAM indicator, was only collected at endline. Also, we are interested in this indicator for programmatic purposes which relate to programme implementation after baseline.1/ MUAC measurement at home, at facility, or at any other venue.

Table 17 shows that, on average, caregivers reported taking their child to an OTP facility five times the last time they received treatment with RUTF at an OTP facility.

Table 17 Number of times children were taken to the OTP facility for treatment at endline

Indicator name	Endline			
	Total	T	C	Diff (T–C)
Mean number of times children (*0–35 months*) went to the health facility last time they received treatment with RUTF at an OTP facility /1	5.3	5.4	5.1	0.3
N	*275*	*190*	*85*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DiD are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Indicator only presented at endline since this was collected at endline only once understanding of the specific programme interventions improved.
1/ Of children aged 0–35 months who were ever taken for treatment at an OTP facility.

To understand the caregiver's knowledge of treatment with RUTF, the evaluation collected information about knowledge of the correct preparation and use of RUTF (

Table 18 and

Table 19). At baseline, about 66% of caregivers of children who had ever been admitted to an OTP facility in treatment areas correctly responded with 'no' when asked if RUTF needed any preparation, whereas this increased to 92% responding correctly at endline. With regards to awareness that RUTF should not be shared, about 68% of caregivers responded correctly at baseline and at endline. In addition, caregivers were asked if RUTF was available for purchase from the market, to which only 17% at baseline and at endline indicated that it was available. Given such low response rates on this particular indicator this could not be investigated in more detail in the quantitative survey.

Table 18 RUTF preparation knowledge

Indicator name	Treatment			Control		
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)
Proportion of caregivers of children (*0–35 months*) who have ever taken their child for treatment at an OTP facility and who respond correctly to:						
Does RUTF need preparation before it can be fed to child? (No)	66.4	91.9	25.5***	68.6	94.3	25.7***
N	*178*	*192*		*108*	*86*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.

Table 19 RUTF use knowledge at endline

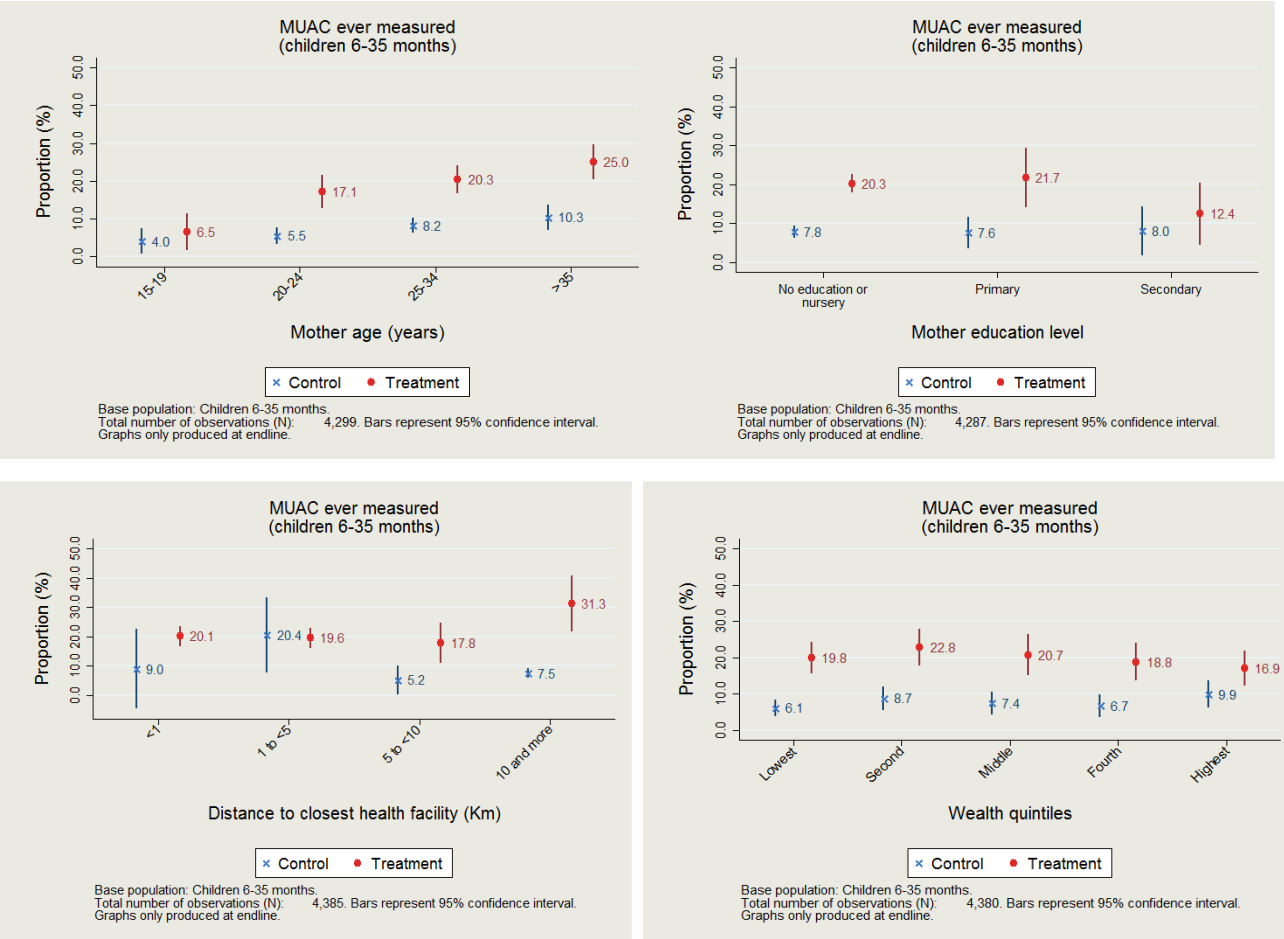
Indicator name	Endline			
	Total	T	C	Diff (T–C)
Proportion of caregivers of children (*0–35 months*) who have ever taken their child for treatment at an OTP facility and who respond to:				
Shared the RUTF sachet? (No)	68.5	67.7	70.6	-2.9
N	*278*	*192*	*86*	
Can you buy RUTF sachets outside the health facility? (Yes)	16.7	17.8	14.2	3.7
N	*278*	*192*	*86*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Indicators are only presented at endline due to comparability issues between baseline and endline information. At endline, the question was adapted to better reflect the CMAM programme intervention.

Which groups of children were more likely to be examined for undernutrition using MUAC?

The proportion of children who had ever had their MUAC measured in treatment areas at endline was highly correlated with their mother's age (Figure 14). As explained above, MUAC measurement could happen both at home and at the health facility during a CMAM day. About 25% of all children in treatment areas who had mothers aged 35 years or more had ever been examined for nutritional status using MUAC tape. The same was true for only 7% of children with mothers who were 15 to 19 years old at endline.

Figure 14 Proportion of children who had ever had their MUAC measured at endline, by mother's age, mother's education, community distance from nearest WINNN health facility, and wealth quintile



How did MUAC measurement vary by state?

Table 20 shows that there were significant differences across some states in terms of the proportion of caregivers reporting that their children had ever been examined for undernutrition using MUAC tape. About 22% of children in treatment areas in Jigawa, Katsina, and Zamfara had ever had their MUAC measured at endline, whereas the same was true for only 10% of children in Kebbi. In terms of improvements between baseline and endline in treatment areas, significant improvements were made in Zamfara, Kebbi and Jigawa. However, it is important to note that these were the states where the proportion of children who had ever had their MUAC measured was also originally the lowest at baseline. In contrast, in control areas MUAC examination remains relatively low, with no significant improvement from baseline to endline.

Table 20 Proportion of children who have been examined for undernutrition using MUAC, by state

Indicator name	State	Treatment			Control			Impact estimate (SE)
		BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Proportion of children who had ever had their MUAC measured (*children 6–35 months*)	**Jigawa**	15.7	21.8	6.1*	9.0	12.3	3.3	0.6 (4.7)
	N	*652*	*490*		*734*	*599*		
	Katsina	18.3	22.5	4.2	11.2	7.8	-3.4	7.5* (4.0)
	N	*696*	*551*		*656*	*517*		
	Kebbi	5.0	9.9	4.9**	4.0	3.4	-0.7	6.3* (2.9)
	N	*824*	*616*		*753*	*539*		
	Zamfara	10.6	22.4	11.8***	6.6	7.2	0.7	8.2* (3.8)
	N	*703*	*558*		*668*	*520*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.

4.1.3 Experience of MNCHW events

The survey also investigated exposure to MNCHW events at baseline and endline. It is important to note that at the time the baseline survey was conducted in 2013, MNCHW events had not been conducted in Kebbi. Therefore, there are no baseline estimates for this state. However, at endline MNCHW events being implemented in Kebbi and so the estimates for Kebbi exist. Hence, estimates across baseline and endline are not directly comparable as estimates for Kebbi are only presented at endline.

Table 21 first presents prevalences and impact estimates in only Jigawa, Katsina and Zamfara, since only in those three states can direct comparison be made between baseline and endline. Second, we present separately in Table 22 prevalences for those same indicators at endline only and including Kebbi.

It is important to reiterate that MNCHW events are state-wide initiatives and hence are also implemented in control areas. In the treatment LGAs that this survey covered, WINNN's role was in particular in social mobilisation around, and creating awareness of, MNCHW events among mothers of children.

Table 21 below presents the prevalences and impact estimates for Jigawa, Katsina and Zamfara only. It is clear that awareness of MNCHW events has increased since the baseline, with a significant increase in the proportion of mothers who had ever heard of MNCHW events in both treatment and control areas. The lack of a significant DID estimate for this indicator (the last column in the table) indicates a general positive improvement in awareness of MNCHW events across both treatment and control areas, and thus should be interpreted as a positive result for WINNN, as strengthening MNCHW events across the entire state is an explicit objective of WINNN Output 1.

We see a similar trend in the proportion of mothers who have ever attended MNCHW events, with a significant and positive improvement in both treatment and control areas since the baseline. However, in this case we do see a significant DID estimate for attendance, indicating an increase in MNCHW event attendance by six percentage points in treatment areas compared to controls. This means that, in a context of increased MNCHW events awareness and attendance, the WINNN programme has been able to 'boost' the attendance, particularly in treatment or WINNN focal areas.

The qualitative research found that this has likely been affected by more intensive social mobilisation around MNCHW events in treatment LGAs. As mentioned in Section 3.1.1, in WINNN's focal communities for IYCF interventions and the CMAM programme, WINNN promoted strong community engagement in social mobilisation around MNCHW events, supported by multiple stakeholders, while elsewhere the social mobilisation was less intensive. For example, CVs were engaged to raise awareness of MNCHW events among mothers only in the treatment LGAs visited by qualitative researchers; and some IYCF interventions Ward Focal Supervisors reported supporting MNCHW events social mobilisation as part of their contribution to the programme (Qualitative Evaluation of the WINNN Programme, 2017).

Table 21 Experience of MNCHW events in Jigawa, Katsina and Zamfara

Indicator name	Treatment			Control			Impact estimate (SE)
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Proportion of mothers (*15–49 years*) who …							
… have ever heard about MNCHW events	13.2	47.5	34.3***	10.5	39.0	28.5***	2.8 (3.5)
N	*2,010*	*1,640*		*2,080*	*1,673*		
… have attended the last MNCHW event 1/	5.0	14.8	9.8***	4.8	8.2	3.4*	6.3*** (2.0)
N	*2,009*	*1,640*		*2,080*	*1,673*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
We do not present impact estimates including Kebbi here since Kebbi did not hold MNCHW events at baseline and therefore data are not comparable from baseline to endline.
1/ At baseline this indicator refers to attendance at last MNCHW event. At endline, this indicator refers to attendance at any of the last two MNCHW events for Katsina and Zamfara, and to the last MNCHW event for Jigawa.

Table 22 below presents the prevalences of MNCHW event awareness and attendance in all four states at endline only. As noted above, only endline estimates are provided because MNCHW events were not operational in Kebbi at baseline. **Mothers in WINNN treatment areas were more likely to be aware of, and to attend, MNCHW events than mothers in control areas.** About 43% of all mothers in treatment areas reported that they had ever heard about MNCHW events and 13% reported having attended the MNCHW events preceding the survey. Similarly, in control areas, 35% of all mothers reported hearing about MNCHW events, as compared to 7% attending.

Table 22 MNCHW event awareness and attendance in all four states at endline

Indicator name	Endline			
	Total	Treatment	Control	Diff (T–C)
Proportion of mothers (*15–49 years*) who …				
… have ever heard about MNCHW events	38.9	42.9	35.0	7.9**
N	*4,538*	*2,303*	*2,235*	
… have attended the last MNCHW events 1/	10.0	12.9	7.2	5.8***
N	*4,538*	*2,303*	*2,235*	

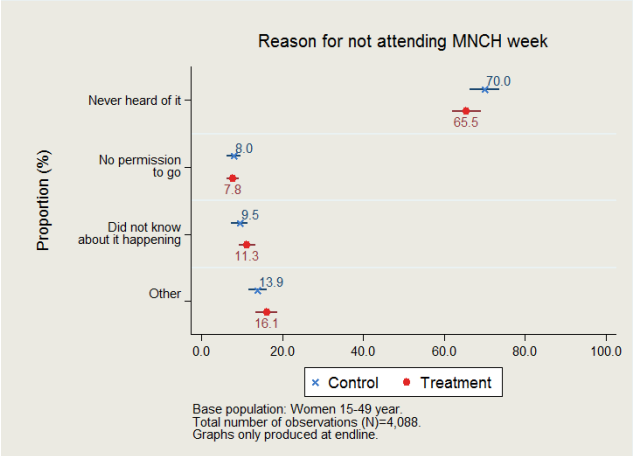
Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Data only presented at endline because MNCHW events did not take place in Kebbi at baseline.
1/ This indicator refers to attendance to any of the last two MNCHW events for Katsina, Zamfara and Kebbi, and to the last MNCHW event for Jigawa.

Figure 15 shows that for the majority of mothers the main reason for not attending MNCHW events was that they either had never heard of it (65% to 70%) or that they did not know about the last MNCHW events taking place (9% to 11%). About 8% of mothers reported that they could not

attend because they did not have permission from their husband. Other reasons, such as the cost of transport, were less relevant.

The qualitative evaluation of the WINNN programme found that many of the sampled men who knew about the MNCHW events, but who do not usually allow their wife to use health facility services, did not tell her about the event. Since the WINNN social mobilisation focused largely on reaching men with information about the MNCHW events, this suggest that a lack of male acceptance may explain some of the mothers' lack of awareness about the events.

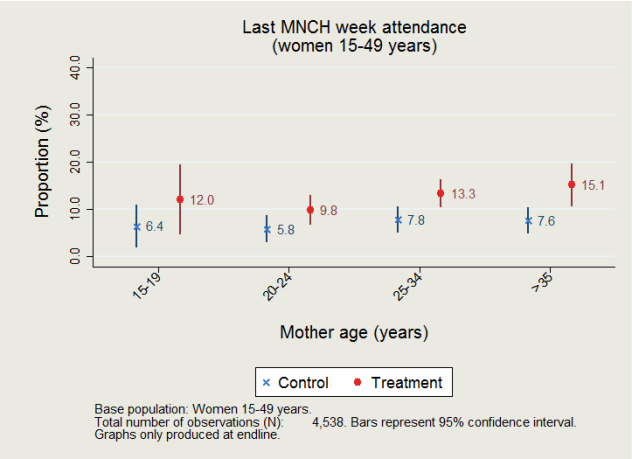
Figure 15 Proportion of mothers who gave different reasons for not attending last MNCHW event

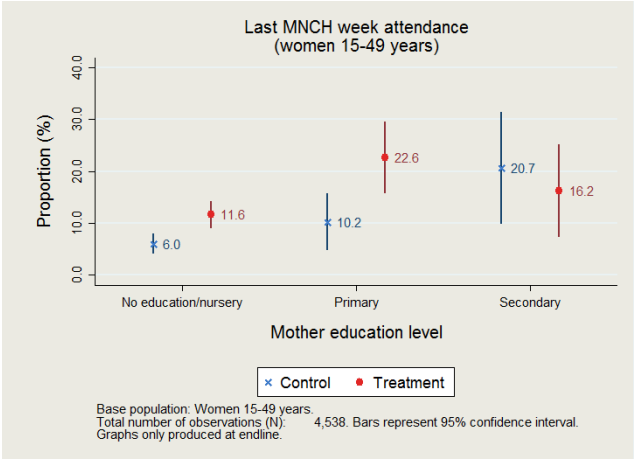


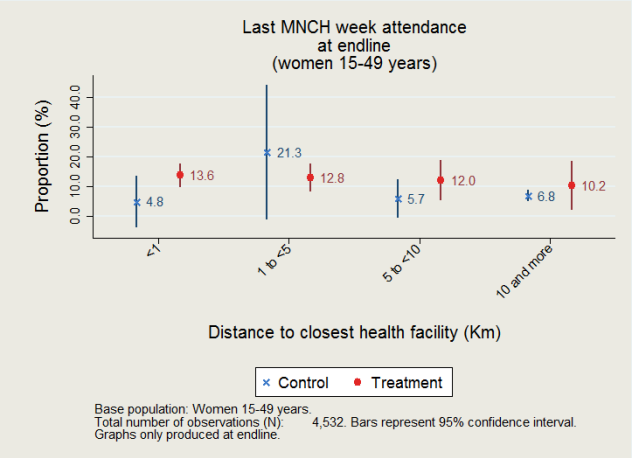
Which groups of mothers were more likely to attend MNCHW events?

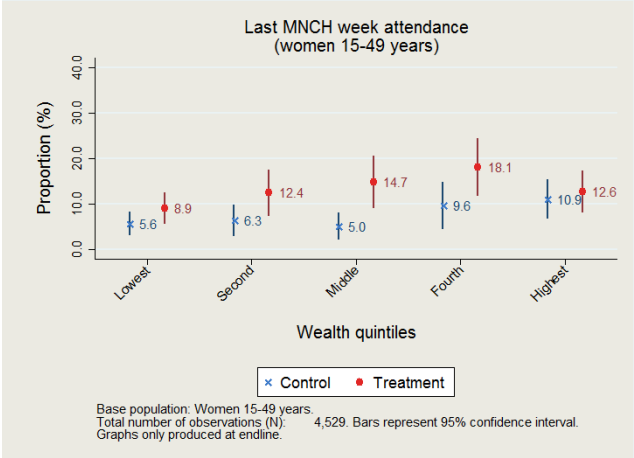
At endline, attendance at the latest MNCHW event previous to the implementation of the survey was correlated with the educational level of the mother and – to some extent – with the socioeconomic status of the mother (Figure 16). In treatment areas, 22% of mothers with primary education reported having attended the last MNCHW event, whereas only 12% of mothers without educational attendance reported the same. This difference was highly significant. Similarly, about 18% of all mothers living in treatment areas and in households in the fourth richest quintile based on our wealth assessment reported attending the last MNCHW event, compared to 9% of mothers in the lowest quintile.

Figure 16 Proportion of mothers who report having attended the most recent MNCHW event, by mother's age, mother's education, community distance from nearest WINNN health facility, and wealth quintile









How did MNCHW event attendance vary by state?

Table 23 shows that **the proportion of mothers who attended MNCHW events increased in treatment areas from baseline to endline in all states**, with the highest increases in Katsina (13% increase) and Jigawa (10% increase). Note again that there are no baseline values and there is no difference (BL–EL) in Kebbi since no MNCHW event took place at the time of the baseline survey. In control areas, we see an increase in attendance between baseline and endline as well. This is explained by the fact that MNCHW events are a state-wide intervention, so improvements in both treatment and control areas are expected and are interpreted as being a positive indication of impact. Of note are the trends observed in Zamfara, where we see significant improvements in attendance in treatment areas that are not replicated in control areas. This indicates that the promotion of MNCHW event attendance was particularly strong in WINNN focal areas, compared to control areas.

It is also important to note that the proportion of mothers who reported having attended the last MNCHW event varied significantly by state. This proportion was significantly higher at endline in Katsina (23%) and Jigawa (13%), compared to Zamfara (6%) and Kebbi (5%). The low proportions in Kebbi could be explained by the late commencement of MNCHW events in this state in early 2015, compared to starting in 2013 in the other three states.

Table 23 Proportion of mothers who reported having attended the most recent MNCHW event, by state

Indicator name	State	Treatment			Control			Impact estimate (SE)
		BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Mother attended last MNCHW event (*15–49 years*)	**Jigawa**	3.5	13.1	9.6***	2.8	7	4.1*	4.4 (3.0)
	N	*643*	*492*		*742*	*604*		
	Katsina	9.4	22.7	13.4***	4.3	13.8	9.4**	4.4 (3.8)
	N	*633*	*565*		*641*	*532*		
	Kebbi 1/	-	4.8		-	3.5		-
	N	-	*663*		-	*562*		-
	Zamfara	2.3	8.4	6.1**	6.8	5.6	-1.2	11.3*** (3.0)
	N	*733*	*583*		*697*	*537*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
1/There are no values at endline since MNCHW events did not take place in Kebbi in 2013.

Operational service delivery at MNCHW events

The endline survey also collected additional information on key interventions that are delivered through MNCHW events. While the MNCHW event protocol includes a comprehensive set of health services and commodities to be provided during these events, the endline survey focused on key commodities and services that are easily identifiable to a respondent and have a limited recall bias, since mothers might have attended MNCHW events a few months before them being interviewed.

As outlined in Table 24, we find a similar proportion of mothers who attended MNCHW events and reported receiving Vitamin A drops across both treatment and control areas at both baseline and endline. Note once again that the results in Table 24 do not include Kebbi since MNCHW events had not taken place in Kebbi at the time the baseline interviews took place.

Note that Table 24 and Table 25 show delivery of services at MNCHW events, for programmatic purposes, for mothers who had attended MNCHW events either at the last round for Jigawa or in either of the last two rounds for the other states. Therefore, we do not present impact estimates since the population size is too small and would not give reliable estimates.

Table 24 Receipt of Vitamin A drops at MNCHW events for mothers who attended MNCHW events

Indicator name	Treatment			Control		
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)
Proportion of mothers (*15–49 years who went to the last MNCHW event*) whose children received: /1						
Vitamin A drops	93.0	76.0	-17.0***	92.7	78.5	-14.2*
N	*98*	*267*		*88*	*136*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
We do not present estimates including Kebbi here since Kebbi did not hold MNCHW events at baseline and therefore data are not comparable from baseline to endline. We do not present impact estimates due to the small size of the sample.
1/ At baseline this indicator refers to attendance at last MNCHW event. At endline, this indicator refers to attendance at any of the last two MNCHW events for Katsina and Zamfara, and at the last MNCHW event for Jigawa.

Table 25 presents access to key MNCHW event interventions across treatment and control groups at endline. In general, we find a similar level of access to key interventions in both groups, which is to be expected given MNCHW events are not localised to treatment areas.

Table 25 Receipt of key MNCHW events interventions for mothers who attended MNCHW events

Indicator name	Endline			
	Total	T	C	Diff (T–C)
Proportion of mothers (*15–49 years, who went to the last MNCHW event*) whose children received the following:				
Deworming pills	61.4	61.1	62.0	-0.9
N	*438*	*292*	*146*	
Undernutrition examination with MUAC	42.1	45.0	36.9	8.1
N	*444*	*296*	*148*	
ORS 1/	66.3	70.5	58.4	12.1
N	*58*	*40*	*18*	
Zinc 1/	65.8	66.9	63.8	3.1
N	*53*	*36*	*17*	
Proportion of mothers (*15–49 years, who went to the last MCNHW event*) who received :				
Long-lasting insecticidal nets	51.2	52.8	48.5	4.3
N	*450*	*299*	*151*	
Tetanus toxoid vaccine	39.8	38.7	41.7	-3.0
N	*441*	*292*	*149*	
Proportion of pregnant women (*15–49 years, who went to the last MNCHW event*) who received :				
Folic acid/iron folate	73.8	73.9	73.6	0.4
N	*95*	*59*	*36*	
Iron supplements	80.0	83.8	74.7	9.1
N	*95*	*59*	*36*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Indicators are only presented at endline since those indicators were only collected at endline once understanding of the specific micronutrient supplementation interventions improved.
1/ Children with diarrhoea.

Did mothers experience a recall bias when answering MNCHW event questions?

In this section, we explore recall bias mothers may have experienced in answering questions related to awareness of, attendance at, and experience of MNCHW events.

At baseline, MNCHW events were in operation in Katsina, Jigawa and Zamfara. The baseline survey was carried out in June/July 2013 and the most recent MNCHW event took place in May 2013. Therefore, we expect any recall bias to be limited, given the last MNCHW events took place within two months of the baseline survey.

At endline, MNCHW events were operational in all four states. The endline survey was carried out in July/August 2016 and the most recent MNCHW event took place in June 2016 in Jigawa and in July 2016 in Katsina, Kebbi and Zamfara. As the MNCHW event in Jigawa took place within two months of the endline survey, we do not expect there to be any recall bias for survey respondents in Jigawa. In the other three states, there is a chance that they responded to the endline survey before the July 2016 MNCHW event. For this limited group of respondents there is a chance of recall bias as the previous round of MNCHW events would have been more than two months ago: in December 2015 in Katsina, in February 2016 in Kebbi and in January 2016 in Zamfara.

To explore this in more detail, we created an indicator that captures the number of days that elapsed between the date of the interview of the mother and the last MNCHW event that the

mother could have attended. This is a mother's potential bias and allowed us to create two groups of respondents. We assume respondents who were interviewed before the July 2016 MNCHW event were at risk of recall bias as the previous MNCHW event was at least six months ago (potential bias group) whereas respondents who were interviewed after the July 2016 MNCHW event would experience no recall bias (no potential bias group) as they would have just experienced the MNCHW events. First, we see in Table 26 that only 23% of mothers were at risk of having any recall bias across treatment and control areas.

Table 26 Prevalences of potential recall bias among mothers at endline

Indicator name	Bias	Overall	Treatment	Control
Mother's potential recall bias (mothers 15–49 years)	**No potential recall bias**	77.3	77.0	77.6
	Potential recall bias	22.7	23.0	22.4
	N	*4,556*	*2,314*	*2,242*

Second, we compared the prevalence and impact estimation models of the entire sample to the two recall bias groups (explained above). We find that prevalences at endline in both treatment and control areas in the full sample and in the no potential bias group are within the same range and the significance levels of the impact estimates are robust to the exclusion of mothers with a potential recall bias. Thus, these findings suggest that, even if we took out mothers with a potential recall bias from the analysis, the results would remain unchanged. Therefore this analysis indicates that there is no evidence of potential recall bias diluting the estimates found above in this section. Further details on this analysis can be found in Volume II of this report, in Section 3.1.5 (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017).

An additional source of recall bias could have arisen from the fact that MNCHW events were not a heavily branded campaign. What this means in practice is that respondents may have unknowingly attended MNCHW events without knowing it or confused the MNCHW event campaign with the door-to-door polio campaign which also distributed Vitamin A.

As MNCHW events are health facility based interventions and the polio campaigns were door-to-door campaigns, we expected this risk of this confusion to be minimal. However, we do recognise the potential for under-reporting awareness and attendance at MNCHW events due to issues of non-recognition. Care was taken during the training of the survey team and implementation of the survey to minimise such risks. Interviewers were trained to describe the MNCHW event intervention in relation to the door-to-door polio campaign as well as the fact that MNCHW events are occur at selected health facilities, are often announced by town criers, and is often an event at which many women gather to received services – notably Vitamin A – as opposed to a health facility delivering routine services.

However, it is possible that MNCHW event awareness and attendance indicators under-report the true estimate. Discussions with WINNN reveal that MNCHW events are the only source of Vitamin A in WINNN States so we would expect congruence between these estimates and those related to Vitamin A supplementation outlined in the next section. The fact that MNCHW event awareness and attendance are much lower than Vitamin A coverage indicates these indicators may indeed be under-estimated and therefore should be interpreted carefully. Even if we considered Vitamin A coverage to be a suitable proxy and upper bound for MNCHW events attendance, the conclusions we would draw remain the same indicating that there is a large portion of the target population that remains to be served.

4.2 Did WINNN improve micronutrient supplementation?

In this section, we present evidence of the impact of WINNN on micronutrient supplementation. As outlined in Output 1 (see Section 3.1.1 for more details on Output 1), the WINNN programme is concerned with the delivery of micronutrient supplements to both pregnant women and children under five. The Government of Nigeria, with the support of WINNN, provides these commodities mainly at MNCHW events, but also at health facilities for routine ANC and PNC services. Some of these supplements are also part of the CMAM OTP and stabilisation care protocols (Federal Ministry of Health, 2011).

While this section primarily focuses on an analysis of Vitamin A intake, it also extends its analysis to include indicators on other key services delivered through MNCHW events or as part of routine services at PHC centres, such as folic acid, ORS, deworming and vaccines.

4.2.1 Vitamin A intake

The WINNN programme supports the distribution of Vitamin A throughout WINNN-supported LGAs primarily through MNCHW events. Table 27 suggests that WINNN had a significant positive impact on the proportion of children aged 6–35 months who had received a Vitamin A drop in the six months preceding the survey. This finding was highly significant (99.9% significance level) and robust across several specifications (see Section 3.31 in Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017).

Table 27 Vitamin A drop distribution

Indicator name	Treatment			Control			Impact estimate (SE)
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Ever received a Vitamin A drop (*children 6–35 months*)	45.3	43.2	-2.2	51.3	32.1	-19.2***	15.9*** (3.3)
N	*2,869*	*2,218*		*2,804*	*2,177*		
Received a Vitamin A drop in the last six months (*children 6–35 months*) 9/	37.6	28.0	-9.6***	43.5	17.8	-25.6***	15.4*** (3.3)
N	*2,858*	*2,212*		*2,793*	*2,166*		

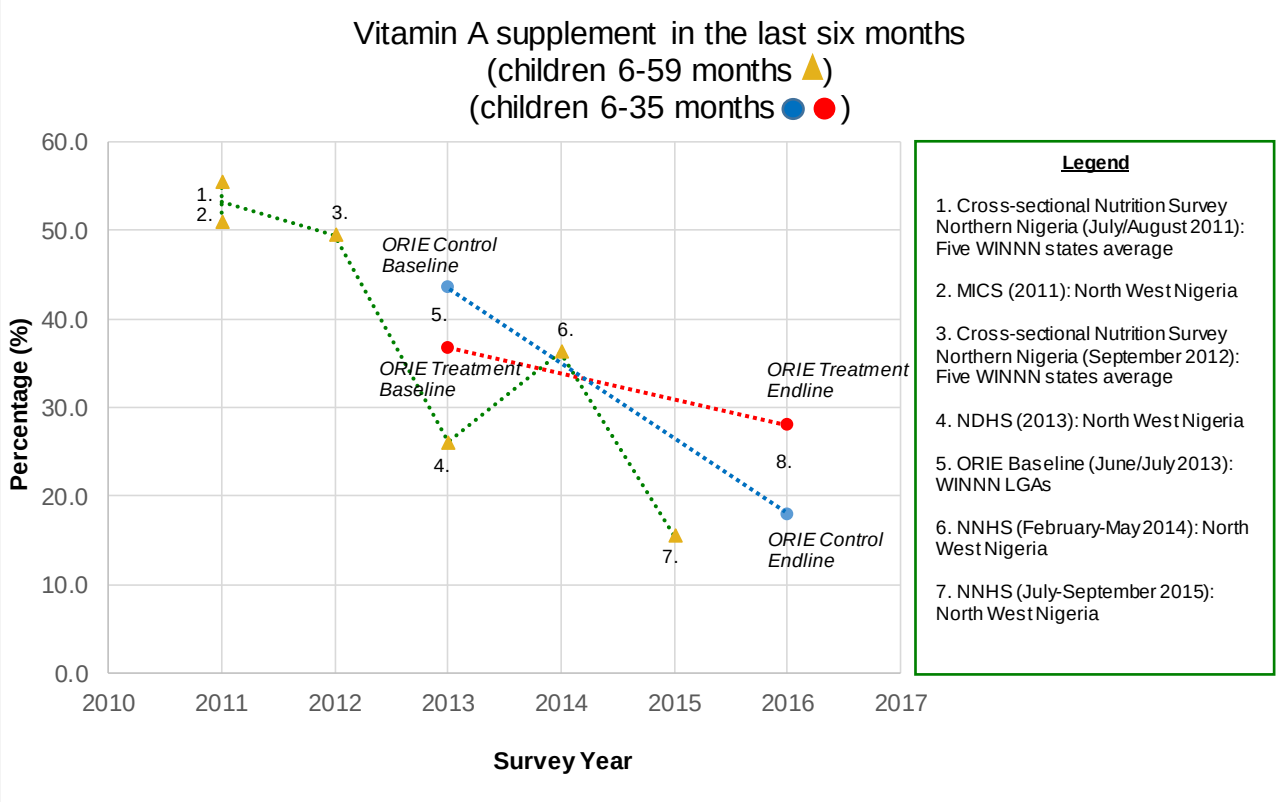
Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.

It is interesting to note that the analysis suggests that WINNN counteracted a general negative trend between baseline and endline in these indicators – overall the proportion of children reporting having received Vitamin A decreased between baseline and endline, but less so in treatment areas due to WINNN. This was probably achieved by WINNN increasing attendance at MNCHW events.

While it is unclear why we see the general negative trend between baseline and endline, we cross-checked these results against Vitamin A supplementation estimates from other surveys representative of Northern Nigeria such as the NDHS, MICS and NNHS. As indicated in Figure 17 below, we see estimates from other surveys confirming the general decline in Vitamin A supplementation between 2011 and 2016. While it would be inappropriate to directly compare ORIE estimates with that from other surveys due to the difference in the base population, the figure does illustrate that ORIE estimates mirror the general decline in this indicator over time. Furthermore, the shallower slope between ORIE baseline and endline in treatment areas graphically presented in the figure demonstrates WINNN's positive impact in counteracting the generally negative trend over time. Anecdotally, it has been suggested that this may be due to the

fact that the door-to-door polio campaigns during which Vitamin A was distributed have stopped in Northern Nigeria. However, this cannot be confirmed by data collected in this survey.

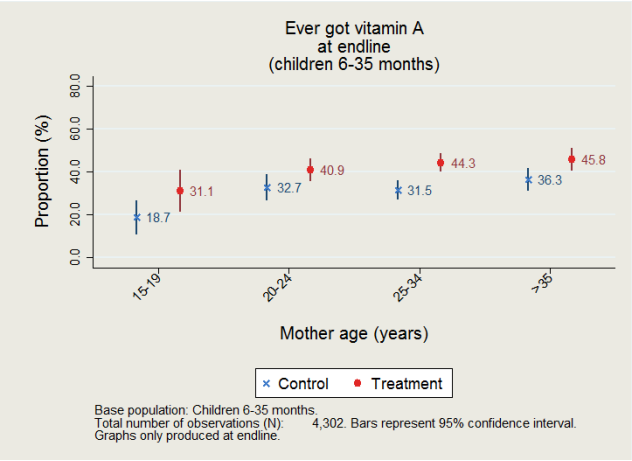
Figure 17 Vitamin A supplements in the last six months (comparison with other surveys)

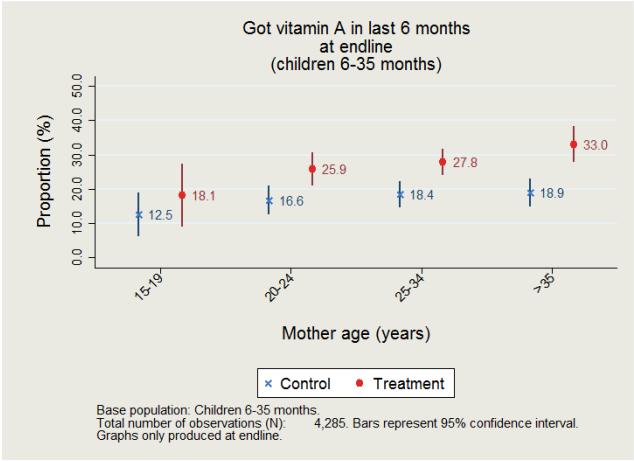


Note: Please note that the base population for the NNHS and MICS surveys in this figure is children 6-59 months whereas the base population for ORIE baseline and endline estimates are children 6-35 months. Therefore, point estimates are not directly comparable but are illustrative of broad trends in this indicator. The reason ORIE presents a narrower age range is explained in Section 2.1.1. **)

This quantitative analysis supports the fact that mother's age plays an important role in the uptake of key micronutrients. Figure 18 shows that the proportion of children at endline who had ever received Vitamin A drops is significantly higher among the group whose mother's age is 35 years or more compared to the group whose mother's age is 15–19 years.

Figure 18 Vitamin A distribution by age of mother at endline





How did treatment effect on Vitamin A intake vary by state?

Table 28 shows the differential treatment effects by state for two Vitamin A indicators. Interestingly, in treatment areas, there was no differential change in Vitamin A intake from baseline to endline, except in Zamfara (a 9% significant decrease). However, we see a large negative and significant decrease in Vitamin A intake in control areas from baseline to endline. Therefore, trends by state seem to indicate in all states (except Kebbi) that the WINNN programme counteracted a negative trend in regard to Vitamin A intake. In particular, the overall improvement due to the WINNN programme in terms of Vitamin A intake seems to be driven by positive changes in Zamfara and Katsina where changes are positive (20 and 18 percentage point change, respectively) and highly significant (at the 99.9% level). The estimates for Kebbi, on the other hand, indicate no or little significant impact. It is possible that this is partly a result of later roll-out of MNCHW events in Kebbi.

Table 28 Vitamin A, by state

Indicator name	State	Treatment			Control			Impact estimate (SE)
		BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Ever received Vitamin A (*children 6–35 months*)	**Jigawa**	30.1	34.3	4.1	45.1	26.3	-18.8***	13.5 * (6.1)
	N	*651*	*491*		*732*	*600*		
	Katsina	59.4	60.6	1.2	68.6	50.7	-18***	20.2*** (5.2)
	N	*694*	*553*		*656*	*517*		
	Kebbi	45.7	41.1	-4.5	35.9	32.4	-3.5	-4.5 (6.7)
	N	*822*	*616*		*750*	*540*		
	Zamfara	42.7	33.7	-9*	56.9	24.3	-32.6***	18.7 ** (6.2)
	N	*702*	*558*		*666*	*520*		
Received Vitamin A in the last six months (*children 6–35 months*)	**Jigawa**	21.1	20.0	-1.1	35.8	12.0	-23.7***	14.2* (6.2)
	N	*647*	*489*		*730*	*597*		
	Katsina	48.3	42.6	-5.7	60.8	30.4	-30.5***	28.2*** (6.3)
	N	*692*	*551*		*654*	*514*		
	Kebbi	42.0	27.7	-14.3***	25.1	19.5	-5.6	-11.4 (6.5)
	N	*819*	*615*		*745*	*536*		
	Zamfara	37.0	19.7	-17.3***	52.5	13.2	-39.3***	18.3** (6.0)
	N	*700*	*557*		*664*	*519*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.

4.2.2 Other micronutrient supplementation and medication

The WINNN programme is concerned with the provision to medical stores of iron folate and folic acid for pregnant women, and albendazole for children under five, which are distributed at MNCHW events and at routine medical visits at the health facility. In addition, the WINNN programme also provides zinc and ORS for children under five who have diarrhoea, which are distributed at the health facility as part of routine health services. Finally, in accordance with the Nigerian CMAM guidelines (Federal Ministry of Health Nigeria, 2011), deworming should be provided as part of the OTP and stabilisation care protocols.

Table 29 presents estimates for iron and folic acid supplementation and albendazole received or bought by mothers during pregnancy. This table shows that there was a significant difference in the

proportion of mothers that received all three commodities (iron, folic acid and albendazole) in treatment areas, as compared to control areas, at endline. At endline, 62% of mothers received iron supplements in treatment areas and 58% received folic acid, but fewer (29%) received deworming medication. On average, 10% more mothers received iron, folic acid and deworming medication during their pregnancy in treatment areas as compared to control areas. These differences are highly significant.

Table 29 Micronutrient supplementation received during child's pregnancy at endline

Indicator name	Endline			
	Total	T	C	Diff (T–C)
During pregnancy, did the child's mother receive/buy…				
Iron supplements (*children 0–35 months*)	57.4	62.3	52.5	9.8***
N	*5,254*	*2,652*	*2,602*	
Folic acid supplements (*children 0–35 months*)	53.6	58.4	48.9	9.5***
N	*5,249*	*2,647*	*2,602*	
Drugs for intestinal worms during pregnancy (*children 0–35 months)*	23.8	28.7	19.0	9.8***
N	*5,119*	*2,584*	*2,535*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Indicators are only presented at endline since those indicators were only collected at endline once understanding of the specific micronutrient supplementation interventions improved.

Table 30 and

Table 31 present results with respect to key medicines received by children aged 0–35 months in the last six months.

Table 30 shows that, on average, 21% of children received ORS medication at endline, with 23% in treatment areas.

Table 31 shows that more children have received deworming medication in treatment areas (12%) than in control areas (7%). The impact estimate is significant at the 99.9% level and is positive for this indicator.

Table 30 ORS medication received by children at endline

Indicator name	Endline			
	Total	Treatment	Control	Diff (T–C)
Has child been given ORS in the last six months? (*children 0–35* months)	21.0	23.0	19.0	4.0*
N	*5,302*	*2,677*	*2,625*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Indicators are only presented at endline since those indicators were only collected at endline once understanding of the specific micronutrient supplementation interventions improved.

Table 31 Deworming medication received by children

Indicator name	Treatment			Control			Impact estimate (SE)
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Has child received deworming medication in the last six months? (*children 0–35 m*onths)	8.2	11.5	3.3**	7.0	6.5	-0.5	4.8** (1.7)
N	*3,353*	*2,677*		*3,273*	*2,625*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.

4.2.3 Vaccines

According to the MNCHW event guidelines (Federal Government of Nigeria, 2014), children attending MNCHW events should receive the full immunisation package, which consists of BCG, measles, DPT/PENTA and polio. These are the vaccines necessary for full immunisation of children aged 12–35 months according to the MNCHW event protocol. Additionally, in accordance with CMAM guidelines (Federal Ministry of Health, 2011), measles vaccination (if not already done) should be provided at the time of discharge from OTP and stabilisation care facilities. However, it is important to note that WINNN does not directly provide these commodities, nor is it its primary objective.

Table 32 shows that, overall, vaccination improved both in treatment and control areas over time for most vaccines. On average, measles vaccination in treatment areas went from 16% at baseline to 29% at endline, polio at birth went from 17% to 38%, full polio immunisation (polio 3) went from 51% to 71%, BCG vaccine went from 26% to 28%, and, while remaining low, full DPT/PENTA immunisation (DPT/PENTA 3) also went up from 2% to 5% from baseline to endline. Similar trends are observed in control areas.

As reiterated above, MNCHW events are state-wide initiatives and hence are also implemented in control areas. In the treatment LGAs that this survey covered, WINNN's role was in particular in social mobilisation around, and creating awareness of, MNCHW events among mothers of children. Since vaccines were not directly distributed by the WINNN programme at MNCHW events it should not be surprising to find no strong differential change between treatment and control areas from baseline to endline.

Table 32 Vaccination

Indicator name	Treatment			Control			Impact estimate (SE)
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Children (*12–35 months*) who received….							
Measles vaccine	16.8	33.2	16.4***	15.9	26.7	10.8***	2.8 (3.0)
N	*2,248*	*1,663*		*2,192*	*1,695*		
Polio 0 vaccine	17.4	38.2	20.7***	15.8	31.1	15.3***	5.1 (3.0)
N	*2,250*	*1,558*		*2,181*	*1,505*		
Polio 1 vaccine	55.0	75.7	20.7***	54.6	80.3	25.7***	-5.2 (4.0)
N	*2,210*	*1,722*		*2,169*	*1,738*		
Polio 2 vaccine	53.2	72.7	19.6***	52.3	77.8	25.5***	-5.6 (4.1)
N	*2,210*	*1,722*		*2,169*	*1,738*		
Polio 3 vaccine	51.1	71.0	19.9***	49.7	75.5	25.8***	-5.2 (4.1)
N	*2,210*	*1,722*		*2,169*	*1,738*		
BCG vaccine	25.9	28.4	2.5	17.7	21.0	3.3*	-2.4 (2.6)
N	*2,247*	*1,702*		*2,189*	*1,711*		
DPT/PENTA 1 vaccine	19.5	8.7	-10.9***	13.4	7.5	-5.9***	-5.0* (2.2)
N	*2,315*	*1,729*		*2,251*	*1,739*		
DPT/PENTA 2 vaccine	3.1	6.7	3.6***	3.5	6.2	2.7***	1.0 (1.3)
N	*2,315*	*1,729*		*2,251*	*1,739*		
DPT/PENTA 3 vaccine	2.2	5.2	3.1***	2.4	4.7	2.3***	1.1 (1.1)
N	*2,315*	*1,729*		*2,251*	*1,739*		
Full immunisation 1/	1.0	3.2	2.2***	1.5	3.0	1.4**	1.1 (1.0)
N	*2,191*	*1,650*		*2,148*	*1,681*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
1/ According to NDHS, full immunisation requires: one shot of BCG vaccine, one shot of measles vaccine, three shots of polio (excluding at birth) and three shots of DPT/PENTA.

4.3 Did WINNN improve IYCF practices?

As discussed in the introduction to this report, two key objectives of the ORIE impact evaluation were to assess whether WINNN has had an impact on two sets of outcome indicators: child undernutrition and IYCF practices in WINNN treatment LGAs. In this section, we present results related to IYCF practices. Impact estimates are based on the DID estimation methodology explained in Section 2.3 and need to be interpreted taking into account caveats presented there.

4.3.1 What was the impact of WINNN on IYCF practices?

The impact estimates related to IYCF practice indicators that were the primary objective of the WINNN programme are presented in Table 33 and

Table 34 below. Table 35 presents additional breastfeeding and complementary feeding indicators (usually assessed following WHO and UNICEF guidelines) to help understand the broader impact of the IYCF components of the WINNN programme. Note that the definitions of all indicators included in these tables follow international WHO and UNICEF standards. More detailed explanations of indicator definitions are provided in Annex E of Volume II of this report (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017).

The analysis suggests that WINNN increased the proportion of children aged 0–23 months that had been breastfed within 24 hours of birth by about 9 percentage points in treatment areas. This finding was highly significant (99% significance level) and robust to changes in the specification used to estimate this effect (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017). Even though we do not have estimates for baseline, an indicator looking at early initiation into breastfeeding within the first hour of birth was created at endline to be closer to the national policy on exclusive breastfeeding, which promotes early initiation within the first 30 minutes of birth (Federal Ministry of Health, 2010). Analysis at endline shows that early initiation into breastfeeding within the first hour was on average 30%, and was higher in treatment areas (38%) than in control areas (23%). This difference is significant at the 99% level (

Table 34).

In addition, the analysis suggests that the proportion of children aged 0–5 months that are exclusively breastfed in treatment areas increased from 9% at baseline to about 20% at endline. There was also an increase in control areas from 3% at baseline to 7% at endline. In our preferred analytical model this implies that we find no statistically significant impact that could be attributed to WINNN in treatment areas. Note, however, that estimates for this indicator are based on a relatively small group of children aged 0–5 months (see the 'N' row in the table), and hence it is possible that this could partly be due to low power to identify impact. In addition, note that the level of significance is not very robust to changes in the analytical model for this indicator and that some models which we estimate do point towards significant changes. It is possible that we are therefore unable to identify programme impact robustly in this instance. We present results from other analytical models in Section 3.3.2 of Volume II of this report (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017). Note also that Table 36 presents results from an ATT estimation of IYCF counselling effects on exclusive breastfeeding, which indicate that counselling did positively influence this indicator.

Table 33 Key IYCF practices indicators

Indicator name	Treatment			Control			Impact estimate (SE)
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Breastfeeding indicators							
Early initiation (< 24 hours) into breastfeeding (*children 0–23 months*)1/	64.4	82.8	18.4***	60.2	72.9	12.7***	9.3** (3.2)
N	*2,190*	*1,784*		*2,212*	*1,754*		
Exclusive breastfeeding (*children 0–5 months*) 2/	9.2	19.5	10.3***	3.1	7.2	4.1*	3.1 (5.3)
N	*578*	*453*		*554*	*446*		
Complementary feeding indicators							
Minimum dietary diversity (*children 6–23 months*) 3/	14.5	20.8	6.3***	12.8	20.7	7.8***	-0.8 (3.1)
N	*1,616*	*1,339*		*1,662*	*1,315*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and impact estimates are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
1/ Children born in the last 0–23 months who were breastfed and put to breast within one hour of birth.
2/ Child was fed breastmilk during previous day and nothing else.
3/ Children 6-23 months who receive food from four or more food groups according to UNICEF IYCF guidelines.

Table 34 WINNN logframe indicator: early initiation into breastfeeding under one hour

Indicator name	Endline			
	Total	Treatment	Control	Diff (T–C)
Early initiation (< 1 hour) into breastfeeding *(children 0–23 months)* 1/	30.3	38.0	22.6	15.4***
N	*3,538*	*1,784*	*1,754*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
1/ Indicator only presented at endline due to comparability issues from baseline to endline.

Further results presented in Table 35 suggest that WINNN did not have a discernible impact on other IYCF practices, as measured by other indicators. Despite improvements in some indicators, overall the estimates show that very few children were appropriately fed in the surveyed areas. The lack of impact on these additional IYCF practice indicators, such as complementary feeding are due to a number of reasons. Food demonstrations were added late to the IYCF interventions activities. Further, it is important to point out that converting knowledge into practice for complementary feeding indicators requires more than just knowledge. There are socio-cultural barriers as well as financial resource constraints that need to be overcome before seeing improvements.

Table 35 Other IYCF practice indicators

Indicator name	Treatment			Control			Impact estimate (SE)
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Breastfeeding indicators							
Child ever breastfed (*children 0–23 months)*	99.6	99.9	0.3*	99.7	99.8	0.1	0.2 (0.2)
N	*3,392*	*2,669*		*3,314*	*2,622*		
Continued breastfeeding at one year (*children 12–15 months*)† 1/	90.0	97.6	7.6***	94.9	98.2	3.3*	3.6 (2.6)
N	*454*	*354*		*459*	*373*		
Continued breastfeeding at two years (*children 20–23 months*)† 2/	27.2	29.8	2.6	28.7	33.7	5.0	-3.0 (6.2)
N	*308*	*232*		*336*	*230*		
Complementary feeding indicators							
Introduction to solid, semi-solid and soft foods (*children 6–8 months*) †	73.6	68.7	-5.0	71.9	62.5	-9.4	1.8 (6.3)
N	*287*	*246*		*284*	*222*		
Received at least two milk feedings during previous day (*children 6–23 months who are not currently breasted*)†	9.5	6.1	-3.4	10.5	3.2	-7.3**	5.1 (3.7)
N	312	205		346	215		
Minimum meal frequency (*children 6–23 months*) 3/	23.7	31.6	7.9***	21.5	25.4	3.9*	3.7 (3.8)
N	*1,625*	*1,332*		*1,666*	*1,309*		
Minimum acceptable diet (*children 6–23 months*) 4/	4.9	9.0	4.2***	4.5	9.0	4.6***	0.7 (2.1)
N	*1,632*	*1,338*		*1,676*	*1,315*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and impact estimates are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
1/ Infants aged 0–5 months who are exclusively breastfed and children aged 6–23 months who received breast milk, as well as solid, semi-solid, or soft foods, during the previous day.
2/ Children 12–15 months of age who are currently fed breast milk and had breast milk the previous day.
3/ Children 2–-23 months of age who are currently fed breast milk and had breast milk the previous day.

4/ Children 6–8 months who are breastfed and received food (excluding milk feeds) two times at least and children 9–23 months who are breastfed and received food (excluding milk feed) three times at least and children 6–23 months who are not breastfed and receive food four times (including milk feeds) at least.
9/ Breastfed children 6–23 months who had at least the minimum dietary diversity and the minimum meal frequency during previous day and/or non-breastfed children 6–23 months of age who received at least two milk feedings and had at least the minimum dietary diversity (excluding milk feeds) and the minimum meal frequency during the previous day.
†Because of small sample size, we present DID estimates without household fixed effects here.

Box 1: Using propensity score matching to estimate average treatment effects of IYCF counselling on exclusive breastfeeding

As described in Section 2.3.1, impact estimates presented in this report are ITT estimates, i.e. estimates of the average effect of WINNN across the population of individuals in WINNN-supported LGAs irrespective of whether these individuals have actually been in touch with or have heard of any of the WINNN components. This means that low prevalence of exposure to these components within WINNN-supported LGAs could lead to a lower proportion of individuals in these areas that could be directly impacted by these components. This, in turn, means that the ITT estimates, which are averages across the population of individuals in WINNN areas, could be 'diluted' compared to a situation where everyone in treatment areas was in touch with some WINNN components and could therefore be directly affected by those.

Overcoming this analytical problem is difficult because, in order to estimate a direct treatment effect of all WINNN-supported activities on only people that have directly benefitted from any of the WINNN components, it would be necessary to identify those people. This means that, for example, for mothers living in treatment LGAs it would be necessary to find a definition of what it means to be directly affected by WINNN. However, WINNN is a complex intervention with several interrelated components (see Section 3 for details on the WINNN interventions), and hence finding such a definition is difficult. For instance, is a mother 'directly affected by activities supported by WINNN' when she has ever attended IYCF counselling at the community, attended IYCF counselling at an ANC session, gone for treatment with her child at the OTP facility, or when a CV has visited her home and screened her child for undernutrition? All four of these situations describe different components of WINNN that could potentially be used, but even these are not comprehensive. WINNN has also operated via other channels (e.g. MNCHW events or stabilisation care facilities), and hence finding one unique definition of directly having benefitted from WINNN activities or, in other terms, of an individual's 'treatment status' within LGAs, is not practical.

However, it is possible to define treatment statuses for sub-components or sub-activities supported by WINNN. For example, it is possible to build an indicator for whether a mother has ever received any IYCF counselling (either at a facility or in the community). In WINNN-supported LGAs the assumption is that this would be WINNN-supported IYCF counselling. It is important to emphasise that this does not cover all possible interactions of mothers with WINNN-supported activities, such as, for example, via CVs in their community.

As mentioned in the main text of this section, it is possible that, despite comparatively large improvements in exclusive breastfeeding among children (0–5 months) in treatment areas from baseline to endline, we are not able to pick up significant ITT treatment effects because of small sample sizes for the sub-population of that particular indicator (Table 33). In addition, it is also possible that positive effects of IYCF counselling are diluted by non-exposure: it could be that because less than half of all mothers in treatment areas at endline have ever received IYCF counselling (Table 10 and

Indicator name	Endline			
	Total	T	C	Diff (T-C)
Proportion of mothers (*15-49 years*) who have …				
… attended ANC session and received IYCF counselling at any ANC session 1/	35.3	42.2	28.5	13.7***
N	*4,541*	*2,305*	*2,236*	

…attended postnatal care and received IYCF counselling at any postnatal check up 1/	16.6	20.2	12.9	7.3***
N	*4,538*	*2,301*	*2,237*	
… received IYCF counselling at the community and health facility 2/	11.9	19.7	4.2	15.4***
N	*4,556*	*2,314*	*2,242*	
…received IYCF counselling at the community or at health facility 2/	47.1	58.3	36.1	22.2***
N	*4,556*	*2,314*	*2,242*	
… ever heard about food demonstration sessions at community	17.3	26.0	8.8	17.2***
N	*4,538*	*2,303*	*2,235*	
… ever attended food demonstration sessions at community	6.0	11.0	1.1	9.8***
N	*4,538*	*2,303*	*2,235*	
Mean number of times mothers (*15-49 years*) have received IYCF community counselling in last 6 months 3/	1.0	1.1	0.6	0.5***
N	*877*	*732*	*145*	
Mean number of people who participated in group counselling last time 4/	30.5	30.0	32.5	-2.5
N	*526*	*440*	*86*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T-C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Data for these indicators only collected at endline.
Indicators are only presented at endline since a more detailed module on IYCF counselling exposure was only included at endline once understanding of the specific programme interventions improved.
1/ At a health facility for any of their children aged 0-35 months.
2/ Received IYCF counselling at the facility either at antenatal care or at post-natal care.
3/ Mothers who attended IYCF counselling in the community.
4/ Mothers who attended IYCF group counselling last time they received IYCF counselling.

Table 11), a potential positive direct treatment effect of IYCF counselling on rates of exclusive breastfeeding is hidden in the ITT analysis.

We use propensity score matching (PSM) to investigate whether this is potentially the case. To do so, we first construct an indicator that tells us whether a mother to a child has received any IYCF counselling. We assume that this indicator tells us whether a mother has ever directly benefitted from IYCF-supported counselling in WINNN-supported LGAs and that we can try to assess whether having directly benefitted as such makes a difference to a mother's decision to exclusively breastfeed their child.

Two types of estimations using PSM are possible in the present context:

- Comparing children with mothers who did attend IYCF counselling in **WINNN-supported LGAs** with children whose mothers did not attend IYCF counselling in **non-supported LGAs. (Treatment effect 1)**
- Comparing children with mothers **who did attend IYCF counselling in WINNN-supported LGAs** with children whose mothers did not attend IYCF counselling **in WINNN-supported LGAs. (Treatment effect 2)**

Both comparisons could give an indication for the direct difference that IYCF counselling makes in terms of the decision to exclusively breastfeed. Note, however, that the two estimates relate to two different conceptual effects: the first comparison (Treatment effect 1) would give an estimation of the effect on exclusive breastfeeding of receiving IYCF counselling **together with living in a WINNN-supported LGA,** compared to a situation without either of the two. This takes into account potential effects of other WINNN-supported activities that are being implemented in treatment areas but are not captured by the IYCF counselling attendance indicator alone. The second comparison gives an estimate of the effect of IYCF counselling on exclusive breastfeeding **within WINNN LGAs** only (Treatment effect 2), i.e. where both

individuals who did attend IYCF counselling and individuals who did not attend IYCF counselling benefitted from living in WINNN-supported LGAs.

The first two rows in Table 36 present the results for both Treatment effect 1 and Treatment effect 2. It is clear that the estimates for both treatment effects are positive and highly significant. **This means that, at endline, the likelihood of children (aged 0–5 months) being exclusively breastfed increased significantly due to IYCF counselling attendance by their mothers.**

Note, however, that the estimates differ in size: Treatment effect 1, the estimate of IYCF counselling effects combined with being assigned to WINNN LGAs, lies at around 19 percentage points, whereas Treatment effect 2, the effect estimated *within* WINNN LGAs, lies at around 12 percentage points. Because the first is larger, this seems to indicate that living in WINNN LGAs in itself has made a difference to exclusive breastfeeding rates, which makes sense given that WINNN-supported activities that promote improved breastfeeding practices went beyond IYCF counselling only (according to programme guidelines pregnant women receive health promotion on key household practices (including exclusive breastfeeding) at MNCHW events (Federal Government of Nigeria, 2014) and mothers or caregivers are offered counselling on IYCF practices and other health issues during care at an OTP or stabilisation care CMAM facility (Federal Ministry of Health, 2011)).

To see whether this is the case, we implement a third PSM analysis, **comparing children with mothers who never attended IYCF counselling in WINNN-supported LGAs to children with mothers who never attended IYCF counselling in control LGAs (Treatment effect 3).** Any significant differences between those groups should be due to the 'living in WINNN LGAs' effect and not due to direct IYCF counselling alone.

The results presented in Table 36 suggest that WINNN did indeed have such an effect on exclusive breastfeeding. The Treatment effect 3 estimate is positive and statistically significantly different from zero. **This finding suggests that other effects of WINNN-supported activities (i.e. effects other than the direct effect of IYCF counselling alone) possibly increased exclusive breastfeeding as well.** Note that this could be due to intended effects by other WINNN activities as described in the programme interventions protocols (Federal Government of Nigeria, 2014, and Federal Ministry of Health, 2011) or also due to unintended effects, such as, for example, network spillover effects where mothers tell each other about IYCF messages.

Table 36 PSM estimates of IYCF counselling on exclusive breastfeeding

Treatment effect estimation model using endline data		Impact estimate	Standard error	N (common support)
PSM-based treatment effect estimation on the proportion of exclusive breastfeeding among children (*0–5 months*) of the effect of …				
Treatment effect 1	**… IYCF counselling in treatment LGAs (treated) compared to no counselling in control LGAs (comparison group)**	19.4***	4.1	509
Treatment effect 2	**… IYCF counselling in treatment LGAs (treated) compared to no counselling in treatment LGAs (comparison group)**	12.0**	4.6	408
(Robustness analysis)				
Treatment effect 3	**… no counselling in treatment LGAs (treated) compared to no counselling in control LGAs (comparison group)**	6.5**	2.6	592

Notes: Analysis based on an unweighted PSM exercise implemented using endline data only which compares treated observations with a comparison group, defined as specified above. The 'N' shows the number of unweighted observations on common support used to calculate treatment effects. All estimations based on kernel matching with diverging bandwidth and trimming specifications. Details for each of the models, including bootstrapped standard errors, balancing tests, and robustness checks can be found in Volume II. Significance levels for the impact estimates are reported with stars: ***Significant at 99.9%level, **Significant at 99% level, *Significant at 95% level.

It is important to emphasise that this analysis is subject to several caveats. First, PSM cannot control for selection bias that originates from unobservable background characteristics of mothers. Second, balancing tests conducted after PSM indicate that, in particular for Treatment effect 1 and Treatment effect 2 above, control and treatment groups are not particularly well balanced after matching. This could indicate that some selection bias remains, even though results are robust with respect to alternative estimation strategies. Third, note that the estimation is based on a relatively low number of observations. Overall, robustness checks give us confidence that the above conclusions are correct, but for a full discussion of the technical details of this analysis, please refer to Section 3.4 of Volume II of this report.

4.3.2 Explaining and contextualising these findings

As described in Section 3, WINNN's results chain assumes that increased knowledge around improved IYCF practices among mothers in treatment areas will lead to the adoption of these practices. Therefore

Table 37 presents impact estimates related to changes in breastfeeding knowledge among the mothers surveyed. It is important to note that the IYCF counselling guidelines and showcards cover all aspects of appropriate breastfeeding practices from birth onwards, but special attention is given to early initiation and exclusive breastfeeding (Community IYCF Counselling Package, 2012).

The results indicate that WINNN did improve breastfeeding knowledge with respect to exclusive breastfeeding and non-standard feeding times, which are beneficial to a child's health. For example, WINNN increased the proportion of mothers who correctly knew that water should not be given to children under six months by about 11 percentage points. Similarly, it increased the knowledge indicator around non-standard feeding times by about four percentage points.

Table 37 Breastfeeding knowledge

Indicator name	Treatment			Control			Impact estimate (SE)
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Proportion of mothers (*15–49 years*) who knew that:							
Colostrum is good for the baby and should be given to her/him	78.4	77.5	-0.9	73.5	74.9	1.5	-1.0 (2.7)
N	*2,831*	*2,303*		*2,832*	*2,235*		
Baby should receive only breastmilk for six months	36.7	45.1	8.4***	15.0	25.2	10.1***	2.7 (3.0)
N	*2,831*	*2,303*		*2,831*	*2,235*		
Water should not be given to children under six months	8.3	19.1	10.8***	6.5	6.8	0.3	11.1*** (2.0)
N	*2,811*	*2,303*		*2,822*	*2,235*		
It is OK to feed a young baby under six months whenever he/she wants (non-standard feeding times)	89.2	94.3	5.1***	95.4	96.1	0.7	4.5** (1.6)
N	*2,824*	*2,303*		*2,829*	*2,235*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and impact estimates are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.

In addition, the results presented in

Table 38 indicate that, at endline, there was a significant difference between control and treatment areas in terms of knowledge about early initiation breastfeeding (within one hour) and the distribution of holy water or 'zamzam'. The proportion of mothers who knew about early initiation breastfeeding (within one hour) was about 14% higher in treatment areas than in control areas at endline. The survey also asked about 'holy water' or 'zamzam'. The results at endline indicate that the proportion of mothers who did not believe that zamzam should be given to children under six months was significantly higher in treatment areas (15%) than in control areas (8%). This highlights, however, that a high proportion do believe that zamzam should be given to infants at birth. Note that WINNN has not incorporated specific messages on 'zamzam' into its IYCF counselling sessions.

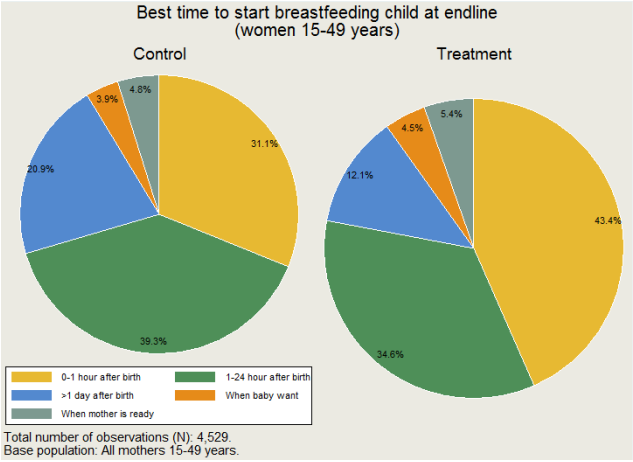
Table 38 Breastfeeding knowledge at endline

Indicator name	Endline			
	Total	T	C	Diff (T–C)
Proportion of mothers (*15–49 years*) who knew that:				
Baby should start breastfeeding immediately or within the first hour	37.7	44.7	30.8	13.9***
N	*4,538*	*2,303*	*2,235*	
Holy water (zamzam) should not be given to children under six months	10.9	14.6	7.3	7.2***
N	*4,538*	*2,303*	*2,235*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Indicators are only presented at endline since a more detailed module on IYCF practices and knowledge of women was only included at endline once understanding of the specific IYCF interventions improved. In particular, it appeared important to distinguish holy water from regular water, which is perceived differently by mothers.

Figure 19 shows that the proportion of mothers who say that the best time to initiate feeding is more than one day after birth was at 21% in control areas at endline, compared to 12% in treatment areas.

Figure 19 Proportion of responses given by mothers to when the best time to start feeding a baby is, at endline



However, despite these positive findings, the results also indicate that the general level of knowledge of certain aspects of appropriate breastfeeding behaviour is still low and knowledge improvements were not identifiable across all areas of interest. For example, the proportion of mothers correctly saying that a child should only receive breastmilk for six months did not increase due to WINNN (

Table 37). Similarly, the proportion of mothers that know that colostrum is good for the baby does not seem to have changed due to WINNN.

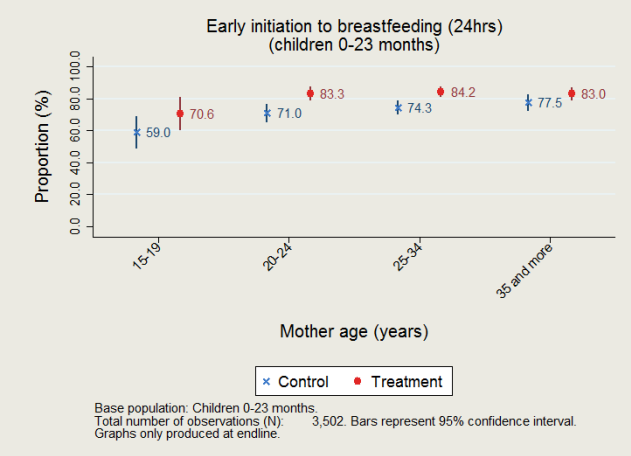
Moreover, the ORIE qualitative research has found that there are clear contextual challenges in regard to turning increased knowledge into belief and then practice for mothers in treatment areas. For instance, women (of all ages) have strong fears about not giving their infant additional water, without which mothers fear that the child would become dehydrated and perhaps die. A large number of women, across the visited locations in WINNN LGAs, spoke emotionally about the 'wickedness' of not giving water to an infant. While some women did know that breastmilk contains water, they did not feel able to 'take the risk' and to try exclusive breastfeeding for themselves. It is apparent that exclusive breastfeeding requires a 'leap of faith' for many women (Qualitative Evaluation of the WINNN Programme, 2017).

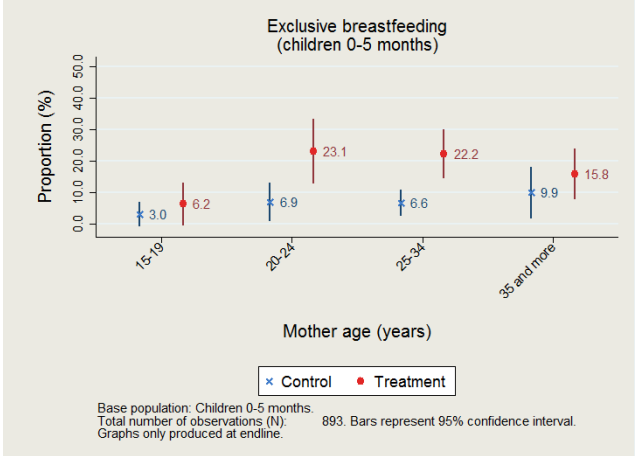
The qualitative research also found that early initiation, in contrast to exclusive breastfeeding, is more accepted. Indeed, there were fairly high rates of early initiation breastfeeding at baseline already. However, most mothers explained that the prior practice of discarding colostrum for three to seven days had changed within the last five years, influenced by information provided by health workers and WINNN CVs.

The practice of both exclusive breastfeeding and early initiation is also affected by power relations in the household. Some mothers were aware of the benefits of exclusive breastfeeding and early initiation, and wanted to practice it, but were unable to do so because their mother-in-law was not in support. Adolescent mothers have particularly weak agency in regard to making infant feeding decisions themselves. Operations research conducted in 2015 specifically looked at these issues and change processes in regard to early initiation and exclusive breastfeeding (ORIE Operations Research, 2015). The research shows the complex nature of power dynamics in the household around breastfeeding. Older women in the house are key decision makers in regard to infant feeding, and often the main barrier to change. Women explained that while their husbands are not traditionally involved in infant feeding decisions, their permission is required for a significant change to practice such as exclusive breastfeeding. In some communities, husbands who had been sensitised on IYCF practices had been key enablers for the uptake of exclusive breastfeeding since they are able to counsel their older female relatives (while mothers are generally unable to do so). The report made several recommendations, including increased targeting of men and the provision of specific information, education and communication material for them. It also advised to develop a specific advocacy strategy for older women. While those recommendations have been acknowledged, and taken on board by the WINNN programme, changes in cultural and social norms take many years.

This quantitative analysis supports the fact that mother's age plays an important role in the uptake of good IYCF practices. For example, Figure 20 shows that the proportion of children aged 0–5 months who are exclusively breastfed at endline is lower among children whose mothers are 15–19 years old, compared to mothers aged 20–34 years old. Note that, as described previously, attendance at IYCF counselling in treatment areas was also correlated with mother's age (Figure 12).

Figure 20 IYCF practices by age of mother at endline





How did treatment effects on early initiation to breastfeeding vary by state?

Table 39 presents state-by-state estimates for the proportion of children who were breastfed within 24 hours of birth.

Table 39 Early initiation into breastfeeding, by state

Indicator name	State	Treatment			Control			Impact estimate (SE)
		BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Early initiation into breastfeeding (24hrs) (*children 0–23 months*)	**Jigawa**	64.0	80.3	16.3***	64.7	71.0	6.2	15.6* (6.5)
	N	*489*	*374*		*585*	*485*		
	Katsina	63.6	89.2	25.6***	64.2	84.2	20.1***	2.0 (5.7)
	N	*477*	*455*		*519*	*430*		
	Kebbi	51.0	83.7	32.8***	60.1	72.8	12.7	22.8*** (5.3)
	N	*657*	*500*		*558*	*427*		
	Zamfara	74.5	77.9	3.4	53.8	66.8	13.0**	-2.0 (6.3)
	N	*567*	*455*		*550*	*412*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and impact estimates are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.

The impact identified on early initiation into breastfeeding in Table 33 seems to primarily be driven by improvements in Kebbi. For this state, the estimates presented in Table 39 are positive and statistically significant. In this regard, it is important to note that the baseline rates of early initiation were generally high in Katsina, Zamfara and Jigawa, and the lowest rates were in Kebbi (51%). Behavioural change theory denotes that the last fifth of people (the 'laggards') are the hardest to change, which may help to explain the more significant impact in Kebbi as opposed to already well performing states.

In addition, the qualitative research carried out in Kebbi found that in the one LGA visited, there was a strong trend among mothers, not seen in other states, of expressing and discarding colostrum for the first day, and then initiating breastfeeding the next morning (within 24 hours). This might have driven the positive impact on early initiation into breastfeeding (within 24 hours) in this state. Mothers in that LGA widely explained that it was previously common to express colostrum for three to seven days, and that the change to initiating breastfeeding within 24 hours is a new practice that has been influenced by information gained at ANC sessions and from WINNN CVs.

This 'bridging' between old and new practices helps to enable change and was not found in other states.

Box 2: Characteristics of mothers and children in WINNN treatment areas that are significant predictors of awareness and uptake of WINNN-supported interventions, and of provision of good nutritional care by mothers

The purpose of this additional analysis is to further investigate which background characteristics of mothers and children living in WINNN treatment LGAs are significantly related to key WINNN impact and outcome indicators along three dimensions: first, awareness among mothers of WINNN-supported services; second, uptake of WINNN supported services; and, third, provision of key nutritional care practices by mothers.

While previous sections have investigated such relationships by disaggregating indicators by key background characteristics separately (such as, for example, in Figure 12, where IYCF counselling attendance is disaggregated by mother's age, education level, distance to health facility, and wealth quintiles), this analysis attempts to implement a more refined modelling approach where several background characteristics are controlled for at the same time.

Method

To do this, we limit this analysis to data from WINNN-supported LGAs collected at endline. We also limit this analysis to a small set of key outcome indicators, which are presented in Table 40 below. As mentioned above, we consider these to be proxies for:

- mothers' awareness of WINNN-supported services;
- mothers' uptake of, or exposure to, WINNN-supported services; and
- mothers' provision of positive nutritional practices.

In order to identify variables that are significantly related to any of these outcome indicators with confidence, we run a set of five multivariate regression model specifications for each of them:

- First, a simple regression that includes variables that could, from a theoretical perspective, be of relevance. This includes information on the state where mothers and children live, the mother's age, the education level of mothers, the household's wealth quintile, and the distance from the nearest WINNN-supported health facility. By doing this, we include variables that have previously been used to disaggregate outcome indicators in these models.
- In addition, two regression models that include these theoretical variables plus variables that were automatically selected by backward and forward stepwise regressions from a full set of over 100 possible variables.
- A regression model that includes the set of theoretical variables plus variables that were selected by a LASSO regression from a full set of over 100 possible variables.
- Finally, a regression model in which the full set of covariates was selected by a LASSO regression, without forcing theoretically defined variables into the model.

In order to prevent the picking up of spurious associations, we consider variables to be significantly correlated with the outcome indicator only if such significant relationships are picked up by three or more of the specifications mentioned above. More technical detail on the multivariate regression model specifications and the full regression results can be found in Section 3.5 of Volume II of this report (Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017).

Results

Table 40 below summarises our key results. The first column on the left lists the key outcome indicators considered for this analysis. The second column lists, for each of those indicators, the variables that our analysis identified as being significantly related to each outcome indicator, as described above. The third column specifies the direction in which the outcome indicator and the background characteristic are related to each other.

Overall, key results can be summarised as follows:

- Across all analyses, **state differences played a significant role**. For instance, all else being equal, mothers were more likely to have heard about food demonstration sessions in Katsina, less likely

to have heard about MNCHW events in Kebbi, less likely to attend IYCF counselling in Zamfara, more likely to attend MNCHW events in Katsina, and less likely to practice early initiation into breastfeeding in Katsina or Zamfara.

- With respect to **being aware of WINNN-supported services**, the following key relationships were identified:
  - **having primary or secondary education** significantly increased the likelihood of being aware of WINNN-supported services;
  - **having attended Islamia education played a significant role** as well. Mothers who had attended Islamia education were, all else being equal, less likely to have heard of WINNN-supported services;
  - **living in relatively wealthier households** was positively related to having heard about MNCHW events; and
  - finally, **living in a polygamous marriage** increased the likelihood of having heard about WINNN-supported services.

- With respect to **exposure and uptake of WINNN-supported services**, the following key variables were identified:
  - As with awareness indicators, mothers who **had attended Islamia education** were less likely to have attended c-IYCF counselling and MNCHW events.
  - In addition, **children that were relatively older or who had a mother who was relatively older** were more likely to have had their MUAC measured.
  - Surprisingly, **living in a household from the richest quintile** of the distribution was negatively related to the likelihood of mothers attending MNCHW events.
  - Finally, **living at a greater distance from the nearest dispensary** decreased the likelihood of mothers attending MNCHW events.

- With respect to **good nutritional care,** the following key correlations were identified by this analysis:
  - Living **in households that were relatively wealthy** (either measured via wealth quintile or an asset ownership proxy) was positively related to both exclusive breastfeeding and early initiation into breastfeeding.
  - In addition, **having experienced food shortages** in the six weeks preceding the survey was negatively related to exclusive breastfeeding.
  - Finally, **having a very young mother** (under the age of 18) significantly reduced the likelihood of a child being exclusively breastfed.

Table 40 Correlation analysis between background characteristics and outcome indicators

Outcome indicators	Background characteristic identified	Direction of relationship	Comments
Awareness:			
Proportion of mothers who have ever heard about food demonstration sessions at the community	• Living in Katsina	*Positive*	Age is no longer a decisive factor once other background characteristics are taken into account
	• Having primary or secondary education	*Positive*	
	• Living in a polygamous marriage	*Positive*	
	• Having received Islamia education	*Negative*	
Proportion of mothers who have ever heard about MNCHW events	• Living in Kebbi	*Negative*	
	• Having primary or secondary education	*Positive*	
	• Living in a wealthier household	*Positive*	
	• Living in a polygamous marriage	*Positive*	
	• Having received Islamia education	*Negative*	
Exposure and uptake:			
Proportion of mothers who ever attended IYCF counselling in the community	• Living in Zamfara	*Negative*	No other variables identified across three or more models
	• Having received Islamia education	*Negative*	
Proportion of children who have ever had their MUAC measured	• Living in Kebbi	*Negative*	
	• Being older	*Positive*	
	• Having older mothers	*Positive*	
Proportion of mothers who attended MNCHW events	• Living in Katsina	*Positive*	
	• Living in a household from the richest quintile	*Negative*	
	• Having heard about MNCHW events	*Positive*	
	• Living further away from the nearest malaria buying facility	*Negative*	
	• Having received Islamia education	*Negative*	
Good nutritional care:			
Exclusive breastfeeding *(children 0–5 months)*	• Living in household from the middle of the wealth distribution	*Positive*	
	• Living in household where someone went without eating for 24 hours in the last six weeks.	*Negative*	
	• Having a mother under the age of 18	*Negative*	
Early initiation (< 1 hour) into breastfeeding *(children 0–23 months)*	• Living in Katsina or Zamfara	*Positive*	
	• Living in a household above the poorest wealth quintile	*Positive*	
	• Living in a household that owns a computer or laptop	*Positive*	

4.4 Did WINNN change child undernutrition prevalence?

In this section, we present results related to child undernutrition prevalence. Impact estimates are based on the DID estimation methodology explained in Section 2 and need to be interpreted taking into account the caveats presented there.

The estimates presented here are based on the anthropometric indices of all children aged 0–35 months in the study. These data are used to calculate three standard indices of child anthropometric status: namely, height-for-age, weight-for-age and weight-for-height.

Each of these indices provides different information about growth and body composition which can be used to assess nutritional status. In order to do this, a child's anthropometric measurements are compared to the new international growth standards published by the WHO in 2006. Each of the three anthropometric indices is expressed in standard deviation units (or a z-score) from the median of the Multicentre Growth Reference Study sample of children of the same age and sex. The estimated nutritional status of the survey population is expressed as the proportion of children with z-scores below a certain cut-off point (WHO, 1995, p. 161).

Length-for-age / height-for-age reflects linear growth of children.[16] Having a low length-for-age / height-for-age is referred to as **stunting**. This index identifies past or chronic undernutrition, which is the effect of long-term poor health and inadequate diet, which leads to poor linear growth – in particular for children younger than two years old (WHO, 1995, p. 164). Children are classified as stunted when their length-for-age / height-for-age z-score is less than -2. Following WHO guidelines, observations with z-scores smaller than -6 or larger than 6 were dropped.

Weight-for-length / weight-for-height reflects body weight relative to length and height. Having a low weight-for-length (in children under two) or weight-for-height (in children over two) is referred to as **wasting** and is attributed to acute undernutrition, which is a 'recent and severe process that has led to significant weight loss, usually as a consequence of acute starvation and/or disease' (WHO, 1995, p. 165). Children are classified as wasted when their weight-for-length or weight-for-height z-score is less than -2 and as severely wasted (also referred to as having SAM) when their weight-for-length or weight-for-height z-score is less than -3. Observations with z-scores smaller than -5 or larger than 5 were dropped from this analysis. The results are presented for children 6–35 months, in accordance with international guidelines.

Weight-for-age reflects body mass relative to chronological age. It reflects both children's height-for-age and their weight-for-height, which makes interpretation complex. Children with a low weight-for-age are classified as **underweight** when their weight-for-age z-score is less than -2. This index reflects both past (chronic) and / or present (acute) undernutrition, although it is unable to distinguish between the two. Observations with z-scores smaller than -6 or larger than 5 were dropped.

For all three indices, the age range was defined as from age 0 to 35 months. Although the WHO generally suggests reporting anthropometric indices for children starting at birth, some reports limit the analysis of weight-for-height to children aged six months or older. Hence, some z-scores and related prevalence were also tabulated among children aged 6–35 months. It is important to note that most surveys, such as the NDHS and SMART surveys, report anthropometric indices for children aged 0–59 months. As most undernutrition occurs among children less than two years of age and the estimates of these indices from the present survey is only calculated for children 0–35 months, it is likely that this report will provide higher prevalence estimates when compared to other surveys. Note that we conducted quality checks on the anthropometric data quality in order to ensure that data were of appropriate quality. (See Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017, Section 3.2, for results of this analysis).

[16] For children below two years of age, the term used for this index is length-for-age because such young children are measured lying down, whereas the term height-for-age is used children above two years old as they are measured while standing using a stadiometer.

4.4.1 Overall changes due to WINNN

Table 41 presents key results related to child undernutrition, as defined above. **Child undernutrition continues to be a severe public health issue in northern Nigeria**. There is no discernible effect of WINNN on child undernutrition, as measured by the proportion of children aged 6–35 months who are wasted and severely wasted, and on children 0–35 months who are stunted and underweight**.** It is important to note here that, in some of the robustness specifications implemented within the context of this analysis, the estimated impact on the proportion of children who are wasted is positive and significant.

In areas surveyed for this evaluation, at endline, child undernutrition in treatment and control LGAs remained at high levels. For example, in treatment areas, about 53% of all children 0–35 months were stunted at baseline, and 50% were stunted at endline. In control areas, we see a similar pattern, with 54% of children 0–35 months stunted at baseline, dropping down to 53% at endline. All of these estimates are close enough for differences to not be statistically significant – this means the small differences observed cannot be assumed to be real changes in the prevalence of stunting but are likely to be due to sampling error. Similar conclusions hold for the prevalences of wasting and underweight.

It is important to note that the determinants of malnutrition are complex and multi-determinant and it is not surprising that the WINNN interventions alone did not affect child malnutrition prevalence in treatment LGAs. This finding reflects the fact that child malnutrition is influenced by a variety of interrelated factors and is therefore difficult to tackle. Further, the evaluation only spanned the three-year time horizon of WINNN implementation and it is questionable as to whether over such a short period of time we could have been expected to see a significant reduction in child malnutrition.

Table 41 Child undernutrition prevalence

Indicator name	Treatment			Control			Impact estimate (SE)
	BL	EL	Diff (EL–BL)	BL	EL	Diff (EL–BL)	
Proportion of children who are:							
Wasted *(6–35 months)* 1/	14.9	17.6	2.7	17.5	17.0	-0.5	0.4 (2.1)
N	*2,726*	*2,174*		*2,580*	*2,120*		
Severelywasted (*6–35 months*) 2/	5.3	6.3	1.0	6.3	5.3	-1.0	0.3 (1.1)
N	*2,726*	*2,174*		*2,580*	*2,120*		
Stunted (*0–35 months*) 3/	52.1	49.2	-3.0	54.5	52.6	-1.9	0.2 (2.7)
N	*3,306*	*2,606*		*3,104*	*2,554*		
Underweight (*0–35 months*) 4/	38.7	38.5	-0.2	39.1	37.9	-1.2	0.9 (2.8)
N	*3,329*	*2,641*		*3,201*	*2,571*		

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
All undernutrition prevalence estimated in accordance with WHO guidelines, excluding extreme outliers.
1/ Height/length-for-age z-score < -2
2/ Weight-for-height/length z-score <-3
3/ Weight-for-height/length z-score <-2
4/ Weight-for-age z-score <-2

Finally, estimated prevalence of SAM using MUAC and/or oedema was at around 6% overall, in both treatment and control areas, at endline, while SAM using weight-for-height z-score and/or oedema was 8% and 6%, respectively, in treatment and control areas. Again, this shows that undernutrition prevalence hardly varied across the treatment and control areas surveyed in this study (

Table 42).

Table 42 SAM prevalence

Indicator name	Endline			
	Total	T	C	Diff (T–C)
Proportion of children (*6–35 months*) who are:				
Severely acutely malnourished based on MUAC measurement and/or oedema	5.5	5.6	5.5	0.1
N	*4,332*	*2,191*	*2,141*	
Severely acutely malnourished based on weight-for-height z-score and/or oedema	7.1	7.9	6.3	1.6
N	*4,294*	*2,174*	*2,120*	

Notes: The 'N' shows the number of unweighted observations. Significance levels of the T–C difference and DID are reported with stars: ***Significant at 99.9% level, **Significant at 99% level, *Significant at 95% level.
Indicators are only presented at endline because prevalence of SAM based on oedema and MUAC, which is used to calculate these SAM prevalence indicators, was only collected at endline

4.4.2 Explaining and contextualising these findings

The first key message derived from these findings is that in the areas surveyed by this study undernutrition is still very prevalent among children aged 0 to 35 months. The results discussed above suggest that at the time of the endline survey one in every two children under 35 months was stunted, almost two out of five children were underweight, and among children 6–35 months almost every fifth child was wasted. This reflects the highly critical situation in terms of child undernutrition present in northern Nigeria, which has also been confirmed by other recent surveys conducted in the region (see Section 5.2 of Quantitative Impact Evaluation of the WINNN Programme - Volume 2, 2017, for comparison with other surveys).

The second key message is that the above results exemplify the difficulty of changing the prevalence of child undernutrition in target areas. It is clear from the relevant literature that nutrition status is influenced by a variety of interrelated factors, such as political stability, immunisation, poverty, inequality, food security, health prevention, and water and sanitation circumstances (Teller and Alva, 2008). It is also clear that nutrition-specific interventions can be expected to have limited influence on undernutrition prevalence when many of these contextual factors remain unchanged (Stevens *et al*., 2012). Given the difficult wider public health environment in northern Nigeria, and together with earlier findings presented above about the levels of exposure to certain WINNN interventions and the level of uptake of improved IYCF practices, it would have been a surprising finding to see strong impacts attributable to WINNN on these indicators in the three years between baseline and endline.

How did treatment effects on child undernutrition vary by state?

As with other key indicators, we also analysed treatment effects on child undernutrition by state. We do not find any significant treatment effects across all states and all undernutrition indicators.

5 Conclusions and recommendations

5.1 Overview

This report has presented the main findings of the quantitative impact evaluation of WINNN, implemented in four states in northern Nigeria (Katsina, Kebbi, Jigawa, and Zamfara) between 2013 (baseline) and 2017 (endline).[17] The findings are based on a population-based panel household survey conducted in three treatment and three comparison LGAs in each of the four states. The evaluation integrates findings from the community-based qualitative follow-up study. The analysis in this report focused on three main components of WINNN: IYCF counselling, provision of CMAM programme services, and the promotion of MNCHW events in treatment areas. As such, this report presents the impact of WINNN across several impact and outcome areas, ranging from anthropometric status, to mother's adoption of key nutritional practices and coverage of key interventions. The next section discusses a number of important contextual factors which need to be taken into consideration in order to understand the level of impact detected in this study.

5.2 Contextualising the findings

5.2.1 Context of northern Nigeria

One of the most important contextual factors that must be considered when interpreting the findings is the severe scale of the burden of undernutrition in Nigeria. The NNHS 2015 estimates that 33% of children under five are stunted, and, together with Nigeria's large population, this translates into the second largest number of stunted children globally (NNHS, 2015; UNICEF, 2013)[18]. Within Nigeria, the women and children in the northern states have the worst health outcomes and the lowest access to health services, with high rates of infant and child mortality and less than 50% of women receiving any ANC.[19]

The challenge of operating in this context is compounded by WINNN's implementation model, which involves delivering interventions through the government health system – and indeed in so doing to strengthen the system. The health system in northern Nigeria is fragmented and weak, and often under-staffed and under-resourced (Qualitative Evaluation of the WINNN Programme, 2017The inadequacy of human resources for health (in terms of both skills and numbers), particularly in rural and remote areas, is an important constraint on the provision of health services.

Added to these complexities was the fiscal crisis, which started in 2015, due to the large drop in the price of oil, reflected in the non-payment of health workers' salaries for much of 2015-16, in most of the WINNN states. This understandably reduced health workers' motivation, and their absence from work has compounded the inadequacy of human resources for health. The adverse fiscal situation has also affected the release of public funds for nutrition (Qualitative Evaluation of the WINNN Programme, 2017

[17] Note that WINNN itself also operated in Yobe, a state which was not covered in this evaluation.
[18] United Nations Children's Fund, *Improving Child Nutrition: The Achievable Imperative for Global Progress* (New York: UNICEF, 2013).
[19] DFID Business Case for the MNCH2 programme (2014), citing the National Population Commission, Nigeria and UNICEF; 2011 MICS survey (preliminary unpublished data).

A further constraint is the intensely conservative gendered social norms and practices in northern Nigeria (see ORIE Gender Synthesis Report, 2015)[20]. These act as a constraint on women's uptake of health and nutrition services, and on changing ingrained traditional infant feeding practices. Women marry at an early age (at 15 years, on average), often to older men (and average age gap of 13.5 years), and bear children early (at 17 years, on average) (ORIE Baseline Study, 2013). Their mobility is often limited upon marriage, as are their opportunities to earn an income. Many women have limited decision-making power, relative to their husbands and older women in the home, over issues like use of household income, child health care and child feeding. Levels of formal education are low across the population, and especially among women. Husbands may refuse to allow their wives to attend services at health facilities or withhold the cash needed to travel to health facilities, and many older women have been resistant to the adoption of recommended IYCF practices that are contrary to the way they fed their own children. These factors hinder mothers' ability to care for their children, to access health and nutrition services for themselves and their children, and to adopt recommended IYCF practices, and have been shown to underpin poor child nutritional outcomes in Nigeria (Omilola, 2010; Ibrahim *et al*., 2015; Ajieroh, 2009).

5.2.2 Staggered implementation of the WINNN programme

Another important consideration is the staggered roll-out of the WINNN-supported interventions. This is illustrated graphically in Figure 7 (see Section 3 for programme roll-out figure). While Output 1 (micronutrient supplementation) commenced in all four states by early 2013, Outputs 2 and 3 (IYCF interventions and CMAM programme) commenced in late 2013 and 2014, respectively.

The staggered roll-out reflected the complexities of implementing interventions through a fragmented health system, and the need to ensure government ownership, commitment and capacity building. Due to the staggered roll-out of the WINNN-supported interventions, the treatment areas were not exposed to the full package of WINNN interventions until early 2014 (eight to 10 months after the baseline survey), giving less time for the programme to show an effect on outcome and impact indicators.

To implement their interventions across selected LGAs, WINNN's primary approach was to work through selected health facilities, combined with community outreach activities. At the start of the programme, WINNN focused its c-IYCF component of the IYCF interventions around selected health facilities and only in late 2015 was the c-IYCF component expanded, to cover additional wards and communities. While the business case intended WINNN's interventions to reach three LGAs per state, in practice, the c-IYCF model was implemented in 10 communities per ward, and covered around two-thirds of wards in each LGA (WINNN Behavioural Change Communication Strategy, 2015). In effect, the c-IYCF component only covered a portion of the communities in the target LGAs[21], thus clustering implementation.

As the impact evaluation was designed to measure impact at the level of the LGA, the evolution of WINNN's implementation model to a more focused and clustered approach may have led to the dilution of programme impact at the LGA level.

5.2.3 Timeframe for evaluation

Due to the later contracting of ORIE, the quantitative evaluation only covers the three years (2013–2016) of the six-year WINNN programme (2011–2017). ORIE was contracted late in 2012 and

[20] ORIE Gender Synthesis Report.
[21] Due to a lack of data on the number of communities in each ward, WINNN has not estimated the overall proportion covered.

implemented the baseline survey in June 2013. To enable the dissemination of findings and their use for decision-making before the WINNN project close in August 2017, the endline was conducted in June 2016. As many nutritional indicators are sensitive to seasonal effects, it was necessary to conduct the endline in the same month as the baseline, to control for any seasonal effects.

5.3 Key conclusions

In light of the contextual considerations outlined above, this section brings together key conclusions that emerge from this evaluation, considering the entire results chain of the WINNN programme presented in Section 3.2.

IYCF counselling, knowledge, and practices

Overall, WINNN monitoring data indicate that over half a million women were reached by the IYCF interventions across the five focal states in treatment areas during the four years of implementation. The WINNN-supported IYCF counselling focused on c-IYCF counselling (provided by CVs) and f-IYCF counselling delivered during PNC and ANC sessions and on CMAM days at WINNN-supported health facilities.

These numbers are reflected in the significant increases in the proportion of mothers of children under age three who received IYCF counselling in the community across WINNN treatment LGAs, which are attributable to the programme. On average, mothers in treatment areas at endline were significantly more likely to have received any type of IYCF counselling, both c-IYCF and f-IYCF, compared to control areas by more than 20 percentage points.

WINNN also significantly improved knowledge on some IYCF practices in mothers in treatment LGAs. Key knowledge indicators were assessed at baseline and endline and the evaluation finds a significant impact of WINNN on the proportion of mothers who recognised that water should not be given to infants under six months (20% at endline in treatment areas compared to 7% in controls). In addition, knowledge about non-standard feeding times, exclusive breastfeeding and about early initiation to breastfeeding was significantly higher in treatment areas than in control areas at endline.

Despite these gains, there remains a large population still to be reached as only 19% of mothers in treatment areas agree with the message that water should not be given to infants under six months who are being breastfed. Similarly, less than half (45%) report that breastfeeding should start immediately after birth, i.e. without delay.

The evaluation finds robust evidence that WINNN significantly increased early initiation to breastfeeding (within 24 hours) among children in WINNN LGAs by about nine percentage points. Analysis at endline shows that early initiation to breastfeeding (within the 24 hours) was higher in treatment areas (83%) than in control areas (73%). There was also some improvement in terms of exclusive breastfeeding (children 0-5 months) in WINNN LGAs that could be a consequence of IYCF counselling. WINNN did not have an impact on other complementary feeding indicators such as minimum dietary diversity which is likely due to the late start of food demonstrations and emphasis on messages relating to early initiation, exclusive breastfeeding and personal hygiene and sanitation. Improvement of complementary feeding indicators also requires mothers to overcome financial barriers thus making them particularly difficult to change.

Despite WINNN's achievements in improved IYCF knowledge and practice with less than half of all mothers in treatment areas at endline (42%) ever having received IYCF counselling at ANC sessions; only a third (32%) had attended IYCF counselling in the community; and only one-fifth (20%) had received IYCF counselling at PNC sessions. Additionally, only 20% of mothers had attended a counselling session both in the community and at a health facility. This shows that there is a significant challenge ahead as a large portion of the population remain to be reached.

The ORIE qualitative research also reveals that even when mothers were exposed to IYCF counselling directly, and had improved knowledge about good IYCF practices, there were challenges with regard to translating the knowledge into practice. For example, even though many mothers who were interviewed did know the benefits of exclusive breastfeeding for six months, many also reported that they felt that not giving any water to infants on hot days was too much of a risk to take. The power dynamics within households, in particular the relatively weak position of young, often poorly educated, adolescent mothers vis-à-vis their mother-in-law, prevented the uptake of some of the IYCF practices, given that the qualitative evaluation found that many mothers-in-law are resistant to change. Autonomous decision-making by mothers is often restricted by conservative community norms, which may contribute to a failure to implement favourable nutritional practices. Generally, messages around early breastfeeding were more accepted than the ones around exclusive breastfeeding, which is also reflected in the quantitative data.

Access to treatment at CMAM facilities

The WINNN-supported CMAM intervention treated more than 200,000 SAM patients over five years across the five WINNN supported states. WINNN's CMAM programme implementation model focused on CMAM days for outpatient therapeutic feeding with RUTF in PHC facilities, and r treatment at stabilisation care facilities for severe cases of undernutrition. The role of CVs was to support CMAM-related activities at PHC, track defaulters and community sensitisation on the CMAM programme (i.e. community outreach).

In treatment areas, the endline survey indicates that only 18% of children 6–35 months with SAM had ever accessed treatment at CMAM facilities and compares to only 11% in control areas**.** While this is not an estimate of CMAM programme coverage, it is indicative of the low proportion of children with SAM who actually reached treatment.

MNCHW event awareness and attendance

WINNN supported the implementation of MNCHW events via a variety of channels, which included assistance with the procurement of medication, coordination and planning support at state and LGA level, and social mobilisation for MNCHW events. MNCHW events are state-wide interventions that are also implemented in control areas, although WINNN undertook additional mobilisation efforts in treatment areas. The evaluation therefore assessed mother's awareness of, and attendance at, the MNCHW events in the areas surveyed, as well as the outcomes of increased social mobilisation efforts in the WINNN focal LGAs. Because at baseline MNCHW events had not yet started in Kebbi, impact estimates for these indicators were based on data from Katsina, Jigawa and Zamfara only.

The evaluation findings indicate there has been a significant increase in the awareness among mothers of MNCHW events in both treatment and control areas. As MNCHW events are state-wide interventions, an increase in awareness in both treatment and control areas is interpreted as being a positive result of WINNN's effort.

A similar trend is found for attendance at MNCHW events, with a general increase in mothers attending MNCHW events between baseline and endline in both treatment and control areas.

In this context of improved awareness and increased attendance in all evaluation areas, **the evaluation finds significantly higher attendance at MNCHW events in treatment areas compared to controls, which is largely due to WINNN's social mobilisation efforts in focal LGAs.** Despite these positive trends, the endline survey reveals that only 10% of mothers in treatment areas reported attending the most recent MNCHW events. However, we acknowledge that this indicator is notoriously difficult to capture, especially given MNCHW events were not strongly branded. As such, these findings are likely under-estimated and should therefore be interpreted with caution. As MNCHW events is the only source of Vitamin A in WINNN states, it may be the case that the Vitamin A coverage indicator may be a good proxy for MNCHW event attendance. Even if we considered Vitamin A coverage to be a suitable proxy and upper bound for MNCHW event attendance, the conclusions we would draw remain the same indicating that there is a large portion of the target population that remains to be served.

Vitamin A intake

WINNN monitoring data suggests that it has reached a 9,232,400 children with Vitamin A by the end of the fifth year of implementation. WINNN supported the distribution of Vitamin A primarily at MNCHW events.

WINNN positively and significantly affected the proportion of children who received Vitamin A in treatment areas. In treatment LGAs, WINNN positively affected the proportion of children (aged 6–35 months) who received Vitamin A drops in the six months preceding the survey at endline by over 15 percentage points. At endline, nearly 30% of children 6-35 months had received Vitamin A in the last six months compared to 18% in control areas.

WINNN counteracted a general negative trend in the proportion of children receiving Vitamin A since the baseline. ORIE survey data show that there was an overall decrease in the proportion of children who received Vitamin A drops in the areas surveyed. The overall decrease is consistent with estimates published in other regional surveys such as the NDHS, the NNHS and the MICS surveys. While the reason for this decline between 2011 and 2016 cannot be inferred from the data collected in this evaluation, it has been suggested that this could be due to a decrease in the intensity of the door-to-door polio campaign in this period. WINNN helped counteract this effect in its focal LGAs, probably by increasing attendance at MNCHW events.

Child undernutrition

Various surveys, including ORIE but also national surveys like the NDHS and NNHS, show that child undernutrition continues to be a severe public health issue in northern Nigeria. The prevalence of child undernutrition, as measured by the proportion of children who are stunted, wasted (acutely malnourished), severely wasted (severely acutely malnourished), or underweight, across northern Nigeria remains very high. Recent publications, such as, for example, NNHS 2015 (NNHS 2015), have shown that across north-west Nigeria about one in 10 children (aged 6–59 months) is acutely malnourished, about 3% are severely acutely malnourished, about a third (aged 0–59 months) are underweight, and over half (aged 0–59 months) are stunted. Efforts to reduce child undernutrition therefore remain very important.

In areas surveyed for this evaluation, at endline, child undernutrition in treatment and control LGAs remained at high levels. Among children aged 6–35 months (i.e. a different

population than the figures presented above) at baseline about half (50%) were stunted, over a third (38%) were underweight, about 17% were acutely malnourished and about 6% were severely malnourished. Indeed, the results of this quantitative impact evaluation reveal no significant improvement in anthropometric indicators as a result of the WINNN programme.

The determinants of undernutrition are complex and multi-determinant and it is not surprising that the WINNN interventions alone did not improve anthropometric indicators. Achieving a significant improvement in population-level anthropometric indicators is difficult and requires a complementary set of interventions that are delivered with sufficient intensity and coverage. The nutrition-specific interventions in the WINNN programme were not accompanied by a suitable range of nutrition-sensitive interventions. It is also questionable as to whether we could have been expected to see a significant change in anthropometric indicators during the three-year duration of the evaluation.

Adolescent mothers

Adolescent mothers (aged 15–19 years) in treatment areas were at a considerable disadvantage in regard to accessing and benefiting from WINNN services, compared to older mothers. We found that this was the case across a range of services. For example, adolescent mothers in treatment areas were significantly less likely to attend IYCF counselling in the community at endline (22%, compared to 39% among mothers aged 35 years or more) and their children were significantly less likely to ever have been screened for undernutrition using MUAC (5%, compared to 21% among children whose mothers were 35 years old or more).

Children of adolescent mothers (aged 15–19 years) in treatment areas were also less likely to benefit from improved breastfeeding practices and less likely to have received Vitamin A drops in the six months preceding the survey. For example, about 18% of children (aged 6–35 months) with adolescent mothers in treatment areas at endline received Vitamin A in in the six months preceding the survey, compared to 33% with mothers aged 35 years old or more. Similarly, about 6% of children (aged 0–5 months) with adolescent mothers were exclusively breastfed, compared to 23% of children with mothers aged 20–24 years. The results from qualitative research indicate that internal power dynamics within households that are skewed against young and adolescent mothers were partly responsible for this, an issue recognised by WINNN. The contribution of low levels of education and conservative social norms in relation young mothers appears to be a crucial constraint on achieving nutritional change.

Differences across states

Differences in implementation timelines and modalities across WINNN states have led to significant differences in terms of key indicators assessed in this evaluation. Together with evidence from qualitative research implemented within the context of ORIE, the following key findings can be highlighted.

In **Katsina and Jigawa,** this survey found comparatively high levels of community IYCF counselling attendance, higher levels of MNCHW event attendance, and higher levels of IYCF knowledge among mothers (aged 15-49 years) in treatment areas, compared to similar treatment areas in Zamfara and Kebbi. The qualitative research confirmed that c-IYCF counselling was strong in Katsina and Jigawa, in particular because of strong supervision and highly motivated CVs.

In **Kebbi**, this survey found comparatively low levels of IYCF counselling attendance among mothers (aged 15–49 years), significantly lower levels of MUAC screening among children (aged

0–35 months), and a significantly lower proportion of mothers who had attended the last MNCHW events than in Jigawa and Katsina. This translated into significantly lower levels of knowledge of appropriate breastfeeding practices among mothers and into lower programme effects on Vitamin A intake among children (aged 6–35 months) than in other states. In part, this could be explained by the later implementation of some components of WINNN in Kebbi, compared to other states, and late commencement of MNCHW events.

In **Zamfara**, we found lower levels of IYCF counselling attendance and MNCHW event attendance among mothers (aged 15–49) in treatment areas, compared to Jigawa and Katsina, but similar levels of MUAC screening among children (aged 0–35 months). Breastfeeding knowledge among mothers (aged 15–49 years) in treatment LGAs and programme effects on Vitamin A uptake and IYCF knowledge were similar to Jigawa and Katsina.

5.4 Key lessons and recommendations

The key conclusions presented above provide an overview of the findings that emerge from this evaluation along the results chain of the WINNN programme. While the impact evaluation showed no impact on anthropometric indicators, there is positive evidence of impact on a limited number of intermediate outcomes, such as IYCF knowledge and practices, awareness of and attendance at MNCHW events, as well as coverage of Vitamin A supplementation.

The principle objective of this quantitative impact evaluation was to assess impact, not to develop detailed operational recommendations. ORIE has produced a separate document, the ORIE Nigeria Integrated Report which draws on evidence from across ORIE workstreams to fully draw out lessons learned and recommendations targeted towards specific stakeholder groups such as the Nigerian Government, donors and programme implementers. The Integrated Report also draws on evidence from across ORIE workstreams to report on WINNN's logframe indicators.

However, a number of important lessons and recommendations emerge from the quantitative impact evaluation and are outlined below. In addition to DFID, the WINNN programme and the Government of Nigeria, these will hopefully prove useful to any professionals involved in the design of nutrition-specific and nutrition-sensitive programmes in Nigeria.

Lessons

1) The WINNN programme has tested and applied models of implementing nutrition-specific interventions within a weak and fractured health system and demonstrated that it is possible to make significant improvements in service delivery and in some intermediate outcome indicators through focussed and coordinated efforts.

2) However, the scale of resources allocated, though large, was not sufficient to provide comprehensive coverage in the focal LGAs. It is understood that WINNN was meant to be a demonstration project, therefore the anticipated scale of change in key impact and outcome indicators may have been ambitious given the resources available, the complexity of the context of implementation and the challenges of securing scale-up by government.

3) Given the challenges of high quality data in northern Nigeria, it is important to go beyond using absolute coverage targets in the design and monitoring of programmes. Monitoring programmes using population coverage indicators are essential to tracking the progress of implementation, identifying bottlenecks and setting expectations of achievement.

4) Given the various determinants of undernutrition and challenging context of Northern Nigeria, it is important that the package of nutrition-specific WINNN interventions are complimented with nutrition-sensitive interventions to address the wider set of determinants of undernutrition.

5) The quantitative impact evaluation of the WINNN programme was constrained to assessing impact at the level of the LGA which imposed limitations on its ability to flexibly assess the adapting operational models in selected communities within these LGAs. A further constraint was the mismatch between the implementation timeline and that of the evaluation. Coordinating timelines between implementation and evaluation is critical to ensuring the evaluation is not unduly limited in the evidence it is able to collect.

Recommendations

1) Improving the access of young, adolescent and less educated mothers to nutrition interventions needs focused interventions towards those mothers who have low levels of autonomous decision making regarding the nutrition of their child. This will require novel community based action and supported change.

2) There are significant cultural barriers in turning increased knowledge into improved practice – particularly for exclusive breastfeeding and mother's fears of not giving water to the infant. Additional research to further develop approaches to addressing these barriers will be required to see significant improvements in these IYCF practices.

3) WINNN's approach to intensive social mobilisation in focal LGAs has led to significant improvements in awareness and attendance at MNCHW events. This social mobilisation has also led to WINNN counteracting a general decline in the coverage of Vitamin A supplementation. However, the extent to which this intensive social mobilisation can achieve results at scale should be considered carefully in light of health system and human resource constraints in northern Nigeria.

4) If state governments judge that universal treatment at CMAM facilities for SAM is a priority and affordable, they will need to strengthen active case finding for CMAM-related cases to improve coverage of the CMAM programme among the at-risk population of children. Additionally, the feasibility of such an intensive 'vertical' CMAM model must be considered carefully given the limited human resources available and cost of this intervention. Alternative models must be explored that more closely integrate treatment into everyday routine primary health care services and make less of a time demand on health workers. This could also include adding complementary approaches to managing moderate acute malnutrition (MAM).

5) The decline in Vitamin A supplementation coverage across Northern Nigeria is worrying and warrants further investigation. While the quantitative data does not allow us to determine the reason for this negative trend, it is clear new strategies to increase Vitamin A supplementation to their former levels is an important priority. Alternatively, if this trend is an artefact of the Vitamin A monitoring methodology, new measurement strategies must be developed as this trend is appears in other population-based surveys.

6) The effectiveness of community-based strategies to mobilise and distribute essential interventions such as Vitamin A must not be underestimated. This is particularly

important if the decline in coverage of Vitamin A is driven by a shift in distribution from door-to-door via the polio campaign to health facility-based at MNCHW events. Community-based strategies, through paid community health workers for example, can be remarkably effective at reaching remote and under-served communities particularly in a society in which conservative and gendered social norms and practices prevail.

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