



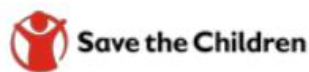
# Cost-effectiveness of the WINNN Programme

## Summary Report

### Operations Research and Impact Evaluation

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## Introduction

Operations Research and Impact Evaluation (ORIE) is led by Oxford Policy Management (OPM) in conjunction with three other UK-based institutions, the London School of Hygiene and Tropical Medicine (LSHTM), the Institute of Development Studies (IDS) and Save the Children UK (SCUK), and four Nigerian partners, the University of Ibadan, Kaduna Polytechnic, Ahmadu Bello University at Zaria (ABU), and the Food Basket Foundation International (FBFI).

ORIE is funded by the Department for International Development of the UK Government and implemented in collaboration with the Government of Nigeria.

This report presents summarises the findings of the ORIE economic evaluation on the cost-effectiveness of the WINNN programme. The aim of this report is to evaluate the cost-effectiveness of the WINNN-supported infant and young child feeding (IYCF) interventions and community-based management of acute malnutrition (CMAM) programme over the WINNN programme duration (2011–2017). The cost-effectiveness of the two interventions is evaluated from both a health services and a societal perspective. The health services perspective evaluates the costs incurred by health service providers in providing the intervention, including in this context costs incurred by WINNN and government. The societal perspective includes in addition costs incurred by health service users (i.e. patients and carers) and other members of society who may be directly or indirectly affected by the intervention (or no intervention).

Separate reports provide detailed results of the [costing of the WINNN outputs](#) and a Value for Money (VfM) analysis of the overall WINNN programme. These reports complement the cost-effectiveness analysis (CEA) findings in this report and will help provide a more comprehensive view on the VfM question of whether the best possible outcome was obtained with a given budget and with improvements in equity.

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This research was carried out by the ORIE consortium. The ORIE project is managed by Patrick Ward at OPM. For further information on this report, please email [psu.ORIE@opml.co.uk](mailto:psu.ORIE@opml.co.uk) or see the website: <http://www.heart-resources.org/tag/orie/>

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## The WINNN programme

The WINNN programme is an ambitious £52 million, six-year DFID-funded programme (2011–2017) to improve maternal, newborn and child nutrition in five states in northern Nigeria: Jigawa, Katsina, Kebbi, Yobe and Zamfara. WINNN is implemented by three partners: Save the Children, ACF and UNICEF.

WINNN is designed to deliver three nutrition-specific interventions (micronutrient supplementation, IYCF interventions and a CMAM programme) that evidence has shown are effective and cost-effective, while also supporting effective government coordination and planning for nutrition. 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 encourage government to support nutrition programmes.

Based on the WINNN logframe, the outputs of the WINNN programme are as follows:

Output 1: Integration of micronutrient intervention into routine primary health services. This output is concerned with the delivery and integration of micronutrient interventions to pregnant women and children under five in routine primary health services.

Output 2: Delivery of effective IYCF interventions in selected states and LGAs in northern Nigeria. This output is concerned with facility and community-based interventions focused on mothers of children under two and pregnant women, to improve IYCF practices through exclusive breastfeeding (EBF), weaning and complementary feeding.

Output 3: Delivery of effective treatment for severe acute malnutrition (SAM) through local health systems in selected states and LGAs in northern Nigeria. This output is concerned with the provision of treatment for SAM via the CMAM programme through integrated primary health services.

Output 4: Strengthening of nutrition coordination and planning mechanisms at national and state level. This output is related to more effective government planning and coordination in nutrition and related sectors at the federal and state levels, as well as building government commitment.

Output 5: ORIE. The fifth output is a consortium independent of the three implementing partners and managed by Oxford Policy Management (OPM). ORIE is responsible for undertaking operations research and assessing the impact and effectiveness of the WINNN programme.

In the interest of simplicity, throughout the report we refer to the second and third WINNN outputs—for which we evaluate cost-effectiveness in this report—as IYCF interventions (Output 2), and the CMAM programme (Output 3).

## Cost-effectiveness methodology

CEA involves evaluating the impact of interventions on both costs and outcomes. It answers the question of whether the best possible outcome was obtained with a given budget, which allows decision-makers to compare interventions in terms of VfM. The methodology for the CEA was developed in ORIE's inception phase, in consultation with various stakeholders, including WINNN Implementing Partners (IPs) and DFID, and informed by a focused literature review.

CEA evaluates costs and outcomes in an incremental way, i.e. it evaluates the difference (or increment) in costs and difference in outcomes between a scenario with the intervention under study and a comparator (usually a non-intervention scenario).

For the CMAM intervention, the analysis compares two scenarios. The first is one with WINNN-supported CMAM-related services in focal LGAs (CMAM programme implemented scenario), in which children under five with SAM may have been admitted to CMAM facilities for treatment, received alternative treatment (outpatient or inpatient treatment without therapeutic feeding), or received no treatment/self-treatment. The second scenario (CMAM programme non-implemented scenario) includes children under five with SAM in non-CMAM programme intervention LGAs who may have received alternative treatment, or no treatment/self-treatment.

For the IYCF intervention, the first scenario includes WINNN-supported (facility- or community-based) IYCF-related services in focal LGAs. In this scenario, mothers of children under two may or may not have been exposed to facility- or community-based IYCF counselling. The second scenario includes mothers of children under two in LGAs not supported by WINNN who may or may not have been exposed to IYCF counselling in routine primary healthcare or other non-WINNN programmes. For each scenario pathway, a number of possible child breastfeeding outcomes can be experienced, such as being exclusively, predominantly or partially breastfed to not being breastfed at all.

The ratio of the difference in costs and difference in outcomes is called the incremental cost-effectiveness ratio (ICER). The ICER represents the additional cost that would be incurred to avert or gain one unit of the outcome measure. The resulting ICER of the WINNN-supported CMAM and IYCF interventions will reveal the optimal alternative (in relation to the comparator), which may be: same cost but more effective than the alternative, less expensive and at least as effective as the alternative, or more expensive while providing additional benefit that is worth the cost. This last scenario is the most common likely outcome of CEA analysis. The ICER is then evaluated against the willingness to pay for gain in one unit of the outcome.

In this report, we calculate ICER ratios for two main outcome measures: disability-adjusted life years (DALYs) and lives saved. These two measures are widely used in economic evaluations of health interventions and are useful for directly comparing Vfm in terms of health gain across different interventions. DALYs are primarily a measure of disease burden and combine years of life lost due to premature death and years of life lost due to disability. Lives saved is a measure of the difference between the number of deaths in the comparator scenario minus the number of deaths in the intervention scenario.

The context of the study is five states in northern Nigeria: Jigawa, Katsina, Kebbi, Yobe and Zamfara. The time horizon for the costing covers most of the programme duration (September 2011 to August 2016). The sixth and final year of the programme is not included due to the timing of this report. Various sources of information, including primary data collection and secondary sources, have been used to model the different parameters for the ICER calculation. First, primary results will be presented that are based on data sources and assumptions presented in the methods section. The implementation of the economic evaluation relied on various data sources and assumptions. Primary data was collected by ORIE and secondary sources of information included WINNN programme data and model assumptions based on published literature. Both WINNN IPs and the donor counterpart (i.e. DFID) were consulted in relation to key features of these data collection processes and sources of information.

## Findings

### Cost-effectiveness of the CMAM programme

**From a societal perspective**, the cost per child in the CMAM programme implemented scenario was £14.6 while the cost was £1.9 per child in the CMAM programme not implemented scenario. Thus, the cost difference between the two scenarios was £12.6. DALYs per child in the CMAM programme implemented and not implemented scenarios were 30.1 and 29.7 respectively. The proportion of children alive was 81.4% in the CMAM programme implemented scenario compared to 80.3% in the CMAM programme not implemented scenario. Hence, **the ICER for cost per DALY averted was £30.8 (\$48.0) and for cost per life saved was £1,138 (\$1,778).**

**From a health services perspective**, the cost per child in the CMAM programme implemented scenario was £12.9 while the cost was £1.5 per child in the CMAM programme not implemented scenario. The difference in costs was thus £11.4. This difference is slightly smaller than the cost difference in the societal perspective given that the health services perspective excludes the costs incurred by community volunteers (CVs) and caregivers. Hence, **the ICER for cost per DALY averted was £27.8 (\$43.4) and for cost per life saved was £1,028 (\$1,606).**

A sensitivity analysis done on the probability of accessing the WINNN-supported CMAM programme, using estimates from Simplified Lot Quality Assurance Sampling (LQAS) Evaluation of Access and Coverage (SLEAC) coverage surveys, showed improved cost-effectiveness results, although the difference was not substantial: from a societal perspective we calculated a cost per DALY averted of £28.1 (\$44.0) and cost per life saved of £1,039 (\$1,622), while the figures were £25.2 (\$39.4) and £934 (\$1,458) respectively from a health services perspective. The difference in cost per DALY is around £3 (\$4) cheaper than with the ORIE endline estimates while cost per life saved is around £95 (\$150) cheaper. **Thus, the ORIE survey estimates provide more conservative estimates of cost-effectiveness of the CMAM programme compared to using SLEAC estimates.**

### Cost-effectiveness of the IYCF interventions

The CEA for the IYCF intervention uses a difference-in-difference (DID) methodology in which the differences in costs and outcomes between the WINNN and non-WINNN intervention scenarios are assessed between baseline (2013) and endline (2016). **The ICER is then calculated as a ratio of the DID estimates of costs and mortality outcomes.**

When using the societal perspective, the cost per mother (i.e. cost per mother reached times the probability of exposure to the IYCF interventions) at baseline was £2.90 and £2.22 for WINNN and non-WINNN intervention areas respectively. Hence, the difference in costs at baseline was £0.69 per mother. At endline, the cost per mother was £8.54 and £4.19 for WINNN and non-WINNN areas respectively. Thus, the difference in costs at endline was £4.35 per mother. As a result, **the DID cost estimate from a societal perspective was £3.66 per mother. When using a health services perspective, the DID cost estimate was £3.15 per mother.**

The predicted mortality at baseline using breastfeeding rates in the Lives Saved Tool (LiST) was the same for both WINNN and non-WINNN LGAs at 116.61 per 1,000 live births. At endline, the predicted mortality was 108.64 in WINNN areas and 113.83 in non-WINNN areas. Thus, **the difference-difference estimate of mortality per 1,000 live births was 5.19 (or 0.00519 deaths averted per live birth) between non-WINNN and WINNN LGAs.**

The ICER for cost per life saved is then calculated as a ratio of the DID cost per mother estimate and the DID mortality outcome. **From a societal perspective, the incremental cost per death averted is £706 (\$1,102) and £607 (\$947.9) from a health services perspective. As in the case of the CMAM programme, the ICER in the health services perspective is slightly lower due to the exclusion of costs borne by CVs.**

The LiST does not allow calculation of DALYs averted for the IYCF interventions. Thus, we assume 37 DALYs lost per premature death (as in case of the CMAM programme) to convert per life saved to per DALY averted. **We estimate that the incremental cost per DALY averted for the WINNN IYCF interventions is £19.1 (\$29.8) from a societal perspective and £16.4 (\$25.6) from a health services perspective.** The DALY estimate is based on the assumption that long-term mortality and disability in children who were alive in the IYCF interventions model is similar to those who were alive in the CMAM model after recovering from an episode of malnutrition. This is a conservative estimate (i.e. DALYs experienced by children who were alive in the IYCF interventions model may be under-estimated) given that we expect the SAM condition to have a higher disability weight compared to other conditions affected by suboptimal breastfeeding.

## Conclusions

**The cost-effectiveness results of the CMAM programme for the WINNN programme compare well with estimates in recent studies of CMAM programmes in northern Nigeria and elsewhere.** Using a health services perspective, Wilford *et al.* (2012) estimated an ICER of US\$42 per DALY averted and US\$1,365 per life saved in Malawi. Similarly, Bachmann (2009) estimated an ICER of US\$53 per DALY averted and US\$1,760 per life saved in Zambia. From a societal perspective, Puett *et al.* (2013) estimated an ICER of US\$29 per DALY averted and US\$1,344 per life saved in southern Bangladesh. The lower estimates from southern Bangladesh are so because the model was assumed to be implemented by community workers, meaning that outpatient staff and overhead costs were not included. Finally, Frankel *et al.* (2015) estimated an ICER of US\$30 per DALY averted and \$1,117 per life saved in a recent study in northern Nigeria. The lower estimates in that case are likely explained by the different methodology used to estimate costs, which produced a lower cost per child treated, and different assumptions around programme coverage and mortality outcomes.

**The ICER per DALY averted of £30.8 (\$48.0) from a societal perspective and £27.8 (\$43.4) from a health services perspective suggest that the WINNN-supported CMAM intervention was ‘very cost-effective’ using the World Health Organization’s (WHO) CHOICE model threshold for cost-effectiveness.** The WHO-CHOICE model suggests that if the ICER per DALY averted is below the value of gross domestic product (GDP) *per capita* then the intervention is ‘very cost-effective’. The GDP *per capita* of Nigeria in 2015 was \$2,617 according to the World Bank (World Bank, 2017); hence, the ICER per DALY averted is ‘very cost-effective’ in all analyses.

**The WINNN-supported CMAM programme is also considered to be cost-effective using other recent cost-effectiveness thresholds in the literature.** A recent development in the literature is the cost-effectiveness threshold based on opportunity cost. This country-level threshold was proposed by Woods *et al.* (2016) – the authors combined the GDP *per capita* and the value of a statistical life to propose a threshold to reflect the health opportunity cost. Based on this study, the threshold range for Nigeria is \$239 to \$1,545. Hence, an intervention that costs more than the higher estimate of \$1,545 per DALY averted is considered not cost-effective.

**There is a lack of existing ICER estimates in the global literature for similar IYCF interventions, limiting the comparison of the cost-effectiveness of the WINNN-supported**

**IYCF interventions.** The studies found in the focused literature review of IYCF interventions calculate cost per beneficiary measures but none of them evaluated long-term outcomes, either in terms of reduced mortality or morbidity.

Using the approximation of 37 DALYs to convert per life saved to per DALY averted for the WINNN IYCF interventions, the **ICER estimates calculated of £19.1 (\$29.8) from a societal perspective and £16.4 (\$25.6) from a health services perspective suggest that the WINNN-supported IYCF interventions were also ‘very cost-effective’ using the WHO-CHOICE model threshold.**

**Both ICER measures, i.e. the cost per life saved and the cost per DALY averted, are lower for the IYCF interventions than the CMAM programme.** This is to be expected, as preventative services such as the IYCF interventions usually represent better VfM and can help to reduce the need for a more expensive treatment. However, the CMAM programme remains very cost-effective and addresses a large disease burden, which brings significant health and economic benefits.

**The CMAM and IYCF interventions have much lower cost per DALY averted compared to many other interventions that are competing for the health care budget.** For example, the cost per DALY averted is \$117 for family planning programmes, \$922 for antiviral therapy (DFID, 2011) and \$94 for an integrated prevention campaign focused on diarrhoea, malaria and HIV (Marseille *et al.*, 2014).

## Key lessons and recommendations

The principle objective of this CEA was to assess the return on investment of the WINNN interventions, not to develop detailed operational recommendations. ORIE has produced a separate document, the [Integrated Evaluation Report of the WINNN programme](#), which draws on evidence from across ORIE workstreams to fully draw out lessons learned and recommendations targeted toward 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 do nevertheless emerge from the CEA 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 economic analysis of the WINNN programme has demonstrated that nutrition-specific interventions in Northern Nigeria can be cost-effective.
- 2) While both interventions were found to be cost-effective, we learnt that high-level programme delivery costs, including those incurred by the WINNN programme, make up a significant proportion of the total programme cost (see [ORIE Costing report, 2017](#)) for detailed analysis of the programme costs). Funding bodies should work with local governments to assess ways of reducing these costs while building local capacity and transferring programme ownership to state governments to scale up these interventions to the population level.
- 3) This study has important lessons for future CEAs. ORIE engaged the implementers early in the programme, which allowed for the development of survey tools that were tailored to the evaluation to provide robust data (see [Quantitative Impact Evaluation of](#)

[the WINNN Programme – Volume 1, 2017](#) on the effectiveness data). This also allowed investigators to pilot test and improve the data collection methods for within-programme and follow-up data. As a result, compared to other economic studies of nutrition-specific interventions, this evaluation had to make fewer assumptions for the CEA.

- 4) However, the cost-effectiveness estimates were constrained by the lack of data on health outcomes and particularly long-term ones such as children mortality. This should be planned for in future studies. This study also identified gaps in data in non-intervention areas, such as the type and quantity of care received by children and their outcomes of care – this was overcome by making informed conservative assumptions based on the literature.
- 5) Cost-effectiveness estimates were also constrained by the lack of long-term data on costs, which should equally be planned for in future studies. Data issues were also encountered in relation to programme-specific costs at state government level, with data both challenging to obtain and having significant variations in estimates and quality. These issues can be overcome through structured and coordinated efforts between funding bodies and state governments to develop and/or improve programme-specific budgetary reporting mechanisms.
- 6) Our study found that the cost-effectiveness estimates of nutrition-specific interventions varied based on the perspective of decision-making, and therefore it is important for future studies to plan data collection and present results from both the societal as well as health services perspective.

## Recommendations

- 1) The cost-effectiveness evidence in this study found that both the CMAM programme and the IYCF interventions are cost-effective interventions for improving child health in northern Nigeria. This evidence is consistent with other studies conducted in Nigeria and other countries globally. This provides a basis to recommend that both programmes be considered by policy-makers and funding institutions as interventions that offer VfM in terms of improving child health outcomes.
- 2) The coverage or exposure rate of the CMAM programme and the IYCF interventions is one of the determinants of cost-effectiveness. While both programmes were found to be cost-effective in this study, the coverage rates of both interventions remain low. The wider literature suggests that higher coverage level is likely to make the interventions even more cost-effective – this is because the fixed costs (such as high-level administrative expenditure) per child tends to reduce with increase in coverage due to economies of scale. Strategies to increase coverage should therefore be pursued by state governments in order to improve the cost-effectiveness of those interventions. Such strategies can include strengthening active case finding through a strong network of CVs, improving the access to IYCF-related services or improving the quality of service delivery.
- 3) To further improve the cost-effectiveness of the CMAM programme, the programme should also aim to reduce default rates among enrollees, which will improve survival rates in children. While this may require additional resources, the expected health gains in treatment completers will likely outweigh the additional costs.



- 4) For the scale up of the CMAM programme and the IYCF interventions, resource implications must be considered carefully. This applies to both the resources required at higher-level as well as costs incurred at the level of health facilities and in the community. For instance, WINNN programme costs make up a large proportion of the cost of CMAM and IYCF interventions (i.e. 1/3rd of the total costs in case of the CMAM programme and at least 4/5<sup>th</sup> in case of the IYCF interventions). Therefore, the state governments should evaluate the budgetary capacity for scaling-up of these programmes.
- 5) Given the challenges surrounding high-quality data in northern Nigeria, it is important to develop, at least at LGA level, a population-level monitoring and surveillance system on the nutritional status of children, their access to services, short-term treatment outcomes (such as rate of recovery after care and rate of recurrent episodes of malnutrition) and long-term outcomes (including mortality and disability rates), so future evaluations can benefit from robust data.

## References

- Bachmann, M.O. (2009) 'Cost effectiveness of community-based therapeutic care for children with severe acute malnutrition in Zambia: decision tree model'. *Cost Effectiveness and Resource Allocation*, 7(1).
- DFID (2011) 'Improving newborn and child nutrition in Northern Nigeria: Business Case', London.
- Frankel, S., Roland, M. and Makinen, M. (2015) 'Costs, cost-effectiveness, and financial sustainability of CMAM in Northern Nigeria'. *Field Exchange*, 50: p. 3.
- Hansford, F., Visram, A., Jones, E., Ward, P. (2017), 'Integrated Evaluation Report of the WINNN Programme: Operations Research and Impact Evaluation', Oxford Policy Management, Oxford, UK
- Marseille, E., Jiwani, A., Raut, A., Verguet, S., Walson, J. and Kahn J.G. (2014) 'Scaling up integrated prevention campaigns for global health: costs and cost-effectiveness in 70 countries'. *BMJ Open*. 4(6):e003987.
- Puett, C. *et al.* (2013) 'Cost-effectiveness of the community-based management of severe acute malnutrition by community health workers in southern Bangladesh'. *Health Policy and Planning*, 28(4): pp. 386–399.
- Vargas, P., Keen, S. (2017), 'Full costing of the WINNN Programme: Operations Research and Impact Evaluation', Oxford Policy Management, Oxford, UK
- Visram, A., Jasper, P., Vargas, P., Hug, J., Jones, E., Adegoke, F., Khaled, A., Ward, P. (2017), 'Quantitative Impact Evaluation of the WINNN Programme – Volume 1: Operations Research and Impact Evaluation', Oxford Policy Management, Oxford, UK. Available at: <http://www.heart-resources.org/assignment/orie-quantitative-impact-evaluation-volume-i/>
- Wilford, R., Golden, K. and Walker, D.G. (2012) 'Cost-effectiveness of community-based management of acute malnutrition in Malawi'. *Health Policy and Planning*, 27(2): pp. 127–137.
- Woods, B. *et al.* (2016) 'Country-level cost-effectiveness thresholds: initial estimates and the need for further research'. *Value in Health*, 19(8): pp. 929–935.
- World Bank (2017) *World Bank national accounts data, and OECD National Accounts data files*. Available from: <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD> [accessed 26 May 2017].