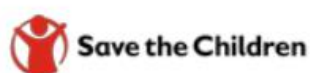# Full Costing of the WINNN Programme

Operations Research and Impact Evaluation

Paola Vargas and Sarah Keen

Acknowledgements

Executive summary

Introduction

This report presents the findings of the ORIE economic evaluation on the costs of the WINNN programme[1]. The aim of the work is to assess the costs of delivering the WINNN outputs over the programme duration (2011–2017). The level at which the output is focused determines the scope and the perspective of the costing. All outputs are costed from a programme perspective, which considers the expenditure of the WINNN programme. The infant and young child feeding (IYCF) interventions (Output 2) and community-based management of acute malnutrition (CMAM) programme (Output 3) are additionally costed from a societal perspective, which includes costs incurred by health service providers in providing the intervention and costs incurred by health service users, in addition to the expenditure of the WINNN programme.

The audiences for this full WINNN costing report are DFID, WINNN, the Nigerian government and civil society stakeholders.

Separate reports provide the results of the cost-effectiveness analysis (CEA) of the IYCF interventions and CMAM programme interventions (Cost-effectiveness of the WINNN programme, 2017), and a value for money (VfM) analysis of the overall WINNN programme. These reports will complement the costing and cost-efficiency analysis findings in this report and will help provide a better answer to the VfM question of whether the best possible outcome was obtained within the given budget and considering improvements in equity.

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 implementing partners (IPs): SCI, Action Against Hunger (ACF), and the UN Children's Fund (UNICEF).

WINNN is designed to deliver three nutrition-specific interventions (micronutrient supplementation, IYCF interventions and the 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 the government to support nutrition programmes.

Based on the WINNN logical framework, 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 of micronutrient interventions to pregnant women and children under five through their integration 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

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[1] *Suggested citation:* Vargas, P., Keen, S. (2017), 'Full costing of the WINNN Programme: Operations Research and Impact Evaluation', Oxford Policy Management, Oxford, UK

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 levels. 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: The fifth output, ORIE, is a consortium that is independent of the three IPs, 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 interests of simplicity, throughout the report we refer to the first four WINNN outputs as micronutrient supplementation (Output 1), IYCF interventions (Output 2), the CMAM programme (Output 3) and government coordination and planning (Output 4).

Costing methodology

The costing study was designed to respond to the primary aim of assessing the costs of delivering the WINNN outputs over the programme duration, from a programme perspective for all four outputs and also from a societal perspective for the IYCF interventions and the CMAM programme. The methodology was developed in ORIE's inception phase and informed by a mapping of the intervention cost items and a focused literature review.

The context of the study is five states in northern Nigeria—Jigawa, Katsina, Kebbi, Yobe and Zamfara. WINNN supports the delivery of three nutrition-specific interventions—micronutrient supplementation, IYCF interventions and the CMAM programme—through the government primary healthcare system and Community Volunteers (CVs). In addition, it supports government planning and coordination for nutrition.

The primary objectives of the costing are:

- to report WINNN programme expenditure overall and analyse this broken down by WINNN output, cost category, state and year; and
- to estimate the cost-efficiency of the IYCF and CMAM interventions, which is the cost per beneficiary from a societal perspective defined as:
  ο IYCF: This is the **cost per woman reached** through WINNN-supported the IYCF interventions from September 2012 to August 2016 from a societal perspective;[2]
  ο CMAM: This is the **cost per child treated** at WINNN-supported CMAM facilities (including treatment received at the outpatient therapeutic programme (OTP) facilities and at the stabilisation care (SC) facilities) from September 2012 to August 2016 from a societal perspective.

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[2] Although the IYCF interventions also target husbands and mothers-in-law through counselling and community mobilisation, we necessarily use women for the unit cost calculation because the other beneficiaries are not recorded consistently in IYCF beneficiary monitoring statistics for all years and states.

The time horizon for the costing is 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.

There are some important limitations related to the internal and external validity of our data sources for the cost estimates. The four main limitations are as follows:

1. Sampling for the Health Facility Survey (HFS), Patient Registration Card data and interviews with the State Nutrition Officers (SNOs) and Local Nutrition Officers (LNOs) is not representative over the time period August 2011–September 2016.

2. Asking people to estimate the time spent on an activity, even if the recall period is short, is notoriously difficult. This issue affects our estimates of WINNN programme expenditure through the time spent by WINNN personnel and health workers on WINNN activities, as well as the CVs and caregiver opportunity costs of their time spent on WINNN activities. It also affects the estimates of state/LGA personnel time spent on the CMAM programme and the IYCF interventions supervision and monitoring.

3. There is a key limitation when interpreting the disaggregation by WINNN outputs. The apportioning of staff and other common costs to different WINNN outputs was not done in a standardised way in the case of UNICEF, due to the change in the agency's global financial system data capturing coding during the course of the project.

4. WINNN is not the only nutrition programme in Nigeria. Thus, costing findings for micronutrient supplementation and government planning and coordination should be interpreted as the DFID contribution to these activities. It is for this reason that cost-efficiency or cost-effectiveness analyses for these outputs would be problematic.

Key findings

The costs of WINNN from a programme perspective

Overall WINNN expenditure for Years 1–5 of the programme (September 2011 to August 2016) totalled £33.6 ($52.3) million. The CMAM programme constituted the largest share of total expenditure (41%), followed by micronutrient supplementation (32%), the IYCF interventions (15%) and support to government coordination and planning (12%).

The absolute expenditure on each intervention has varied across the years due to the gradual expansion of the programme, the varying timing of procurement of some medical commodities, and different contributions from states and LGAs to WINNN output across the years. Over the years, WINNN has spent increasing amounts on the IYCF interventions and government coordination and planning. The 47% increase in expenditure on the IYCF interventions from Year 4 to Year 5 can be explained by the expansion of the community IYCF (c-IYCF) component of the IYCF interventions to additional wards in the beginning of Year 5. Annual spend over the years on the CMAM intervention and micronutrient supplementation has varied a bit more. Expenditure on the CMAM intervention in Year 3 was the largest, with the roll-out to the remaining states taking place that year. However, this decreased in subsequent years as a result of lower set-up costs and bulk procurement of ready-to-use therapeutic food (RUTF) in the first three years of the programme (inflating costs in those particular years). Expenditure on micronutrient supplementation also varied across the years. This could also reflect the gradual expansion of the

programme to all states[3], the possibly lumpy procurement of some medical commodities and the varying contributions from states and LGAs to this output across years.

Human resources constituted the largest expenditure category (33% of total expenditure), followed by RUTF and F75/F100 (23%), other medical commodities (13%), and expenditure on monitoring and evaluation (M&E) (10%). The majority of the human resources category, 79%, corresponded to expenses on WINNN staff working at the federal, state and local levels, and staff shared with other programmes. The remaining 21% corresponded to expenses on non-staff items, such as technical assistance or stipends for health workers. RUTF accounted for 99% of the therapeutic commodities expenditure for the CMAM programme. Other micronutrient supplements included iron folate, deworming, and oral rehydration solution and zinc for routine primary health care (PHC) services and MNCHW events and some other costs (less than 1%) on other medicines for the treatment received at the CMAM programme, such as antibiotics. M&E expenses included venue hire, M&E materials, per diems, travel, and other costs for supervision and programme assessments.

As anticipated, the main cost drivers for each WINNN output resemble the main components of that specific intervention. For instance, RUTF provision is the main cost driver of the CMAM programme (55%). WINNN expenditure on micronutrient supplementation is driven by the cost of medical commodities (42%) delivered through routine primary health services and MNCHW events. The IYCF interventions and government coordination and planning are relatively more people-intensive than other WINNN outputs, with human resources constituting the largest cost category at 52% and 57%, respectively.

WINNN is not a capital-intensive programme in the standard sense but it has made significant investments in strengthening the government capacity to implement nutrition interventions. Only 5% of WINNN programme expenditure has been on traditional capital items, such as vehicles, medical equipment and other equipment (e.g. computers). Expenditure on human resources, however, has constituted 33% of overall expenditure. This represents the cost of WINNN staff (and consultants) at the national, state and local levels supporting the delivery of the three key comprehensive nutrition-specific interventions through the public health system and the effective planning and coordination of nutrition interventions more generally.

The government and other development partners work in coordination with WINNN on the achievement of micronutrient supplementation and government coordination and planning outputs. Thus, **the WINNN expenditure on those outputs—£10.8 million on micronutrient supplementation and £3.9 million on government coordination and planning—represents the DFID-funded contribution to those activities in the focal states and nationally.**

The costs of the IYCF interventions

The average cost per mother reached for the facility IYCF (f-IYCF) component from a health services perspective was £10.0 ($15.6). Of this total, 87% (£8.7) was for WINNN higher-level programme costs, and the remaining 13% (£1.3) was for health facility-level costs (health worker inputs and facility overheads). CV and caregiver costs were not included in the costing of the f-IYCF component since the extent of CV involvement in delivering facility-based IYCF services could not be estimated (thus we assume health workers only provide this service), and caregivers'

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[3] WINNN rolled out maternal, newborn and child health weeks (MNCHW events) in Zamfara and Jigawa in Year 1, followed by Katsina and Yobe in Year 2. In Kebbi, WINNN supported the platform of the Immunisation Plus Days in Year 2 and Year 3, up until MNCHW events were first implemented in Year 4.

costs are expected to be negligible as they incur costs on the f-IYCF component while they attend other facility-based services.

The average cost per mother reached for the c-IYCF component from a societal perspective was £12.3 ($19.2). Of this total, 70% (£8.7) was for WINNN higher-level programme costs, 10% (£1.2) was for state and LGA costs, and 20% (£2.5) was for CV costs to establish and facilitate mothers' support groups. Again, the costs to mothers were considered negligible as they attend group meetings locally and only once per month. **The cost per mother from a health services perspective is £9.9 ($15.4). This is very similar to the cost of the facility-based service from a health services perspective.**

WINNN higher-level programme costs are the main cost driver of the IYCF interventions. From a societal perspective, 87% of the cost per mother reached through the f-IYCF component and 70% of the cost per mother reached through the c-IYCF component is expenditure by the WINNN programme. WINNN expenditure on the IYCF interventions is primarily spent on human resources (52%) to support the delivery of the intervention. Other substantial areas of WINNN programme costs on the IYCF interventions include expenditure on materials, allowances and meeting expenses (33%), such as for mobilisation of CVs, M&E, and training of health workers, state and LGA officers.

WINNN expenditure on the IYCF interventions is large in proportion to the current programme expenditure incurred by state and LGA governments. WINNN programme costs per mother reached are 3.5 times larger (£8.68) than the total cost currently incurred by the government in health worker inputs, facility overheads, and state-/LGA-level supervision and planning of activities (£0.81, £0.49, and £1.19 respectively).

Heath worker costs are not a large component of the costs of the f-IYCF component. We estimate that health worker costs are £0.81 per mother reached, or 8% of the total cost per mother reached through f-IYCF component. This is indicative of the IYCF interventions not being very demanding on the health system as it is a service that is easily integrated into other PHC services, such as antenatal care (ANC), postnatal care (PNC), or MNCHW events, which does not need a bespoke day or independent infrastructure. However, even this may be a stretch for the current cadre of health workers, with CVs stepping in to assist in the delivery of the f-IYCF component. This cost could even be over-estimated since CVs usually step in to delivery of the f-IYCF component as well, but we could not cost their involvement as relevant information is not available.

Health worker costs in the f-IYCF component model, at £0.8 per mother reached, are less costly than CVs costs in the c-IYCF component model, at £2.5 per mother reached. Social costs per CV hour are much lower than those for health workers[4]. Thus, the larger costs of CVs can be explained by the fact that c-IYCF component is more of a standalone intervention compared to f-IYCF component, which is more integrated into existing PHC services, the costs of which are not accounted for as part of our modelling. CVs will spend more time organising and facilitating IYCF activities in the community, while health workers will only spend a relatively small portion of their time delivering counselling sessions at the facility.

The costs of the CMAM programme

The overall cost per child treated with the CMAM programme was £74.8 ($116.7) from a health services perspective and £83.7 ($130.7) from a societal perspective. This is based on

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[4] We estimate an hourly salary of $1.85 of an average health worker implementing f-IYCF component, versus an hourly opportunity cost of $0.38 of a CV. See Section 4.2.1 and Section 4.2.2 for further details on the assumptions in relation to health workers and CVs costs, respectively.

the assumption that 15% of SAM cases were treated in SC facilities and then referred back to OTP facilities, while the remaining 85% of SAM cases were treated only in an OTP facility.[5]

The cost per child treated is found to be higher in SC facilities than in the OTP facilities, at £86 versus £62, respectively, from a health services perspective, and at £102 versus £69, respectively, from a societal perspective. This is not surprising given the more intensive treatment received at SC facilities which is needed to cure SAM children with complications. Both levels of care also have very different human resource structures, with SC facilities usually operating seven days a week, with relatively more qualified staff, given the level of care required, which has implications in terms of costs.

The main cost drivers of the CMAM programme are RUTF and WINNN higher-level programme costs. Our estimates show that they constitute 34% (£28.8) and 33% (£27.2), respectively, of the overall cost of the CMAM programme per child treated. In the case of the OTP component of the CMAM programme, RUTF and WINNN higher-level programme also constitute the largest elements (42% or £28.6 and 35% or £23.7, respectively) of the costs per child of the treatment received at the OTP facility. For the cost per child of treatment received at SC facilities, the figure is quite different, given that the level of care provided is more intense in terms of human resources and infrastructure. In this case, the costs incurred by the government in health worker inputs and facility overheads constitute the largest elements, at 56% (£56.9) of the costs per child of the treatment received at the SC facility, followed by WINNN higher-level programme costs, at 23% (£23.7).

The CMAM programme is not very capital intensive. Our estimates show that 2.6% (£2.2) of the overall cost per child treated relates to capital expenditure. However, further investments in health facility and supply chain infrastructure would need to be considered more holistically for future implementation and sustainability, as evidenced by the current limitations of some facilities lacking enough supplies to provide the full set of CMAM services (ORIE Health Facility Survey-final report, 2016).

Introducing the societal costs of CVs and caregivers increases the cost burden of CMAM care per child treated, and not by a negligible amount. CVs incur costs per child treated in terms of their time and expenses of £1.90, and caregivers £4.73 at an OTP facility and £15.58 at a SC facility (£7.1 on average for the CMAM programme overall). These costs combined constitute 11% (£9.0) of the overall cost of the CMAM programme per child treated from a societal perspective. These may be smaller relative to other costs from an overall perspective, but they represent a large burden for the CVs and caregivers themselves, and thus a scale-up model should evaluate whether some compensation should be offered.

Discussion

An investment of £33.6 ($52.3) million over five years in five states in northern Nigeria represents a significant contribution to funding three nutrition-specific interventions in those states, and moreover in more generally supporting effective government planning and coordination for nutrition. However, this level of investment still represents a financial gap when compared to the National Strategic Plan of Action for Nutrition (NSPAN) (2014–2019) or, more ambitiously, the Scaling Up Nutrition full coverage targets.[67]

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[5] The assumption is based on evidence from fhi360, 2012.
[6] Federal Republic of Nigeria (2014) *National Strategic Plan of Action for Nutrition.*
[7] World Bank (2014) *Costed Plan for Scaling Up Nutrition: Nigeria.*

WINNN is a people-intensive programme, with 33% of overall WINNN expenditure being on human resources. Also, WINNN higher-level programme costs constitute a significant component of the cost per beneficiary of both the IYCF and CMAM interventions, even though WINNN has a delivery model which is integrated into existing health systems. Although the purpose of this report is not to suggest the cost model for the government taking over these interventions, these findings do raise questions as to how government would take over the WINNN programme costs. Some of these costs will likely be initial investment, complementary to the government expenditure, or just reduced, given the less expensive salary structure of government human resources.

The RUTF cost estimate of £29 ($45) per child treated is not surprising given it is a high cost input with a price that is set in the international marketplace, and given that UNICEF is playing a significant role in its procurement, both for Nigeria and internationally. There are no real economies of scale for this cost item, other than perhaps slight improvements in purchasing power for a larger order or in transportation costs. However, future reductions in the unit price of RUTF are expected to be crucial to determine sustainability for scaling up and the possibility of the government taking over this cost.

The IYCF interventions come at a much lower cost per beneficiary than the CMAM programme. We estimate a cost per child treated through the CMAM programme of £84 ($131) from a societal perspective and a cost per mother reached through the f-IYCF component of £10 ($16), and through the c-IYCF component of £12 ($19). This is to be expected, as curative services like the CMAM programme are usually more costly than preventative services such as the IYCF interventions.

There is a lack of existing estimates in the global literature, and in particular for Nigeria, of the cost per mother reached by other IYCF interventions similar to the IYCF component of the WINNN programme, making comparisons difficult. NSPAN (2014–2019) uses a cost for community nutrition programmes for behaviour change communication of $5 per child. The source of this estimate is not clear, but it appears to be based on a study in 1999 related to a community nutrition programme in Asia (Mason *et al.*, 1999). There are many methodological differences in the approach used in Mason *et al.* (1999), compared to ours. One of the most important is that our cost estimate of the IYCF interventions is per mother reached, not per child. A conservative assumption of two children under two years of age per mother reached would give an estimate of $10 per mother reached, which is not too different from our estimates.

Our estimate of the cost of the CMAM programme per child is broadly similar to another recent societal estimate from northern Nigeria, and to other estimates of cost per child in similar contexts and settings. Variations in programme costs arise from different costing perspective used (health service vs. societal), assumptions regarding the coverage and scale of the programme, and the human resource model of service delivery. Frankel, S., Roland, M. and M. Makinen (2015) estimated a similar overall societal cost per child treated of $123 in the CMAM programme supported by UNICEF with Children's Investment Fund Foundation (CIFF) funding. Bachmann (2009), which is the study used in the DFID Business Case (2011), estimates an overall cost per child cured of $203 in Zambia from a health services perspective. The five-year (2014–2019) strategic plan for nutrition in Nigeria, NSPAN, estimates a much lower cost per child, at $80. The lower cost might be explained by the different methodology used,[8] which

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[8] NSPAN 2014–2019 costing employed the 'program experience' methodology. This approach generates unit cost data that capture all aspects of service delivery, such as costs of commodities, transportation and storage, personnel, training, supervision, monitoring and evaluation, relevant overheads, wastage etc., for each intervention from actual programmes that are in operation in Nigeria, and considers the context in which they are delivered. Whenever possible, the unit costs of the nutrition-specific interventions in NSPAN were estimated using programmatic data that were provided by local IPs,

might not accurately reflect actual programmatic experience under WINNN, exclusion of societal costs, and different coverage estimates. **Interestingly, although there are differences in methodologies, the comparison with the cost estimates of other CMAM programmes also shows that RUTF and higher-level programme costs remain the largest shares of the overall cost, regardless of settings and delivery models.**

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the Federal Ministry of Health, and state governments, based on programme experience. In cases where the intervention was not yet being implemented or local data were not available, global unit cost estimates from the World Bank were used (NSPAN, 2014).

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List of tables and figures

List of abbreviations

ACF	Action Against Hunger
ANC	Antenatal Care
CEA	Cost-Effectiveness Analysis
c-IYCF	Community-based IYCF
CIFF	Children's Investment Fund Foundation
CMAM	Community-based Management of Acute Malnutrition
CV	Community Volunteer
COW	Community Worker
DALY	Disability-Adjusted Life Year
DFID	Department for International Development
EBF	Exclusive Breastfeeding
ECHO	European Union's European Civil Protection and Humanitarian Aid Operations
FANTA	Food and Nutrition Technical Assistance
f-IYCF	Facility-based IYCF
HFS	Health Facility Survey
IMF	International Monetary Fund
IP	Implementing Partner
IYCF	Infant and young child feeding
IU	International unit
J-CHEW	Junior Community Health Extension Worker
LGA	Local Government Area
LNO	Local Nutrition Officer
LTA	WINNN Local Technical Assistant
M&E	Monitoring and evaluation
MNCHW	Maternal, Newborn and Child Health Week
NSPAN	National Strategic Plan of Action for Nigeria
OPM	Oxford Policy Management
ORIE	Operations Research and Impact Evaluation

OTP	Outpatient Therapeutic Programme
PHC	Primary Health Care
PNC	Post-Natal Care
QALY	Quality-Adjusted Life Year
RUTF	Ready-to-Use Therapeutic Food
SAM	Severe Acute Malnutrition
SC	Stabilisation Care
SCI	Save the Children International
SNO	State Nutrition Officer
UNICEF	UN Children's Fund
VfM	Value for Money
WHO	World Health Organization
WINNN	Working to Improve Nutrition in Northern Nigeria

1 Introduction

This report presents the findings of the ORIE economic evaluation on the costs of the WINNN programme.

1.1 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: SCI, ACF, and UNICEF.

WINNN is designed to deliver three nutrition-specific interventions (micronutrient supplementation, IYCF interventions and the 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 logical framework, 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 of micronutrient interventions to pregnant women and children under five and their integration 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 years of age and pregnant women, to improve IYCF practices through EBF, weaning and complementary feeding.

Output 3: Delivery of effective treatment for 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 levels. 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: The fifth output, ORIE, is a consortium that is independent of the three IPs, managed by OPM. ORIE is responsible for undertaking operations research and assessing the impact and effectiveness of the WINNN programme.

In the interests of simplicity, throughout the report we refer to the first four WINNN outputs as micronutrient supplementation (Output 1), IYCF interventions (Output 2), the CMAM programme (Output 3) and government coordination and planning (Output 4). More detail on each of them is presented in Section 3.2 to help put the programme costing results in context.

The ORIE project consists of the following five workstreams:

1. operations research;

2. impact evaluation;

3. economic evaluation;

4. evidence dissemination and uptake; and

5. supporting national researchers in nutrition.

This report is a deliverable of the third workstream—the economic evaluation.

Additionally, note that the IYCF interventions consist of two component parts: one at the facility level- the f-IYCF component and one at the community level-the c-IYCF component. Similarly, the CMAM programme also consists of two component parts: the treatment received at OTP facilities and treatment received at SC facilities. Throughout this report, the narrative refers to both the interventions as a whole or to its component parts as appropriate.

1.2   Aims of the ORIE economic evaluation

The overall aim of the ORIE economic evaluation is to assess the costs and cost-effectiveness of the WINNN programme. **This report covers the assessment of the costs of the WINNN programme. The CEA has been delivered as a separate report.** In addition, although not the primary objective of the ORIE Economic Evaluation, a VfM analysis of the WINNN programme will also be presented as a separate brief.

The aim of the work is to assess the costs of delivering the WINNN outputs over the programme duration (2011–2017). The WINNN outputs can be divided into two 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 scope of the costing.

All outputs are costed from a programme perspective (Section 3), which considers the expenditure of the WINNN programme. The IYCF interventions (Output 2) and the CMAM programme (Output 3) are additionally costed from a societal perspective (Section 4 and Section 5, respectively). In addition to the expenditure of the WINNN programme, a societal perspective includes costs incurred by health service providers in providing the intervention and costs incurred by health service users.

A societal perspective was adopted for the IYCF interventions and the CMAM programme in order to determine more fully who incurs the costs of these interventions and also to allow for the cost-effectiveness analyses of these interventions from a societal perspective. There are, of course, societal costs to the other two WINNN outputs (micronutrient supplementation and government coordination and planning) but these interventions, focused as they are at the state and federal levels, involve many other partners, beyond the government and WINNN, in their delivery, from which expenditure data would have been very difficult to obtain. Also, it was agreed that a costing of these two outputs beyond the programme perspective would be outside the scope of the ORIE economic evaluation.

The costing is retrospective and is primarily for accountability purposes, though the costing may also support the design of future nutrition interventions in Nigeria and elsewhere. The costing of the IYCF interventions and the CMAM programme will also be used to assess their cost-effectiveness.

1.3   Departures from the inception report

The inception report, which was produced at the beginning of this evaluation, in consultation with various stakeholders, constitutes the key document of reference for this analysis (see Annex A for excerpts of Volume I and Volume II of the inception report which relate to the economic evaluation). The inception report was written following consultations with DFID, academics, and Nigerian counterparts to ensure that the goals of this evaluation reflect the interests of different stakeholders.

There has not been any major departure from the original inception plan. As stated in the inception report (Annex A), the costing study aims to estimate (i) direct provider-related costs associated with WINNN Outputs 1 (micronutrient supplementation) and 4 (government coordination and planning), and (ii) direct and indirect costs and outcomes associated with the implementation of WINNN-supported CMAM and IYCF interventions, which this report has done. As explained in Section 2.2 and Section 2.3, this report assesses the cost of all outputs from a programme perspective, i.e., considering the expenditure of the direct provider, which is the WINNN programme. For Outputs 2 (IYCF interventions) and 3 (the CMAM programme), this report estimates cost-efficiency indicators from a societal perspective, which considers direct and indirect costs.

The full economic evaluation also aims to evaluate the cost-effectiveness of the CMAM and IYCF interventions compared to routine care. This study has been delivered as a separate report. In addition, although not the primary objective of the ORIE economic evaluation, a VfM analysis of the WINNN programme will also be presented as a separate brief.

The inception report also outlined the possibility of undertaking full costing studies for WINNN Outputs 1 and 4. However, this was not implemented in the end due to limitations in assessing WINNN's contribution to those interventions using a quantitative approach. This is because these interventions are delivered state-wide and nationally (there is no WINNN LGA focus, as there is for the IYCF and CMAM interventions) and involve many other IPs and donors, from which expenditure data would have been very difficult to obtain. Thus, it was agreed that this would be outside the scope of the ORIE economic evaluation.

Finally, this costing analysis has some limitations in terms of the disaggregation of our costing estimates. Even though we collected the WINNN expenditure disaggregated by many cost categories, we were not able to disaggregate this further by fixed or variable costs – as envisaged in the inception report. This was due to lack of availability of programme information at this level of disaggregation.

1.4   Intended audience for this report

The first audience for this full WINNN costing report is **DFID**. The report provides DFID with an independent assessment of the costs of delivering the WINNN outputs over the programme duration. This responds primarily to accountability requirements. However, it should be noted that this is not an auditing exercise: we rely on data from the programme that we have not inspected from an accounting perspective. In regard to learning, the costing may also support the design of future DFID nutrition programmes in Nigeria and elsewhere.

The second audience for this full WINNN costing report is **WINNN**. The report provides WINNN with an independent analysis of its expenditure over the programme duration, as well as an analysis of the costs incurred by those key players involved in delivering the IYCF interventions and the CMAM programme—namely the programme itself, the government and CVs—and

households, in accessing these interventions. The latter should be useful in understanding the full, current costs, as well as potential future costs, of delivering IYCF and CMAM interventions in northern Nigeria.

The third audience is the **Nigerian government**. This includes key stakeholders at federal, state and LGA levels—especially officers responsible for planning nutrition interventions. The fourth audience of the report are **civil society stakeholders**, including the research and professional community in Nigeria working in nutrition or nutrition-sensitive areas in northern Nigeria.

1.5   Organisation of the report

The report is structured as follows:

Section 2 describes the costing methodology, focusing on the main elements. Further detail on the data and assumptions used in the costing are available in the report's Annex C and Annex D.

Section 3 reports on WINNN expenditure for all four outputs (micronutrient supplementation, IYCF interventions, CMAM programme, and government coordination and planning) over 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. The section first reports on overall programme expenditure over Years 1–5, and then breaks this total down by WINNN output, and then further by different cost categories, states and years. The analysis aims to understand the cost drivers of the programme.

Section 4 presents our findings on the costs of the IYCF interventions from a societal perspective. It first gives some background on the design and context of the IYCF interventions. It then gives our estimates of the cost per mother reached of the various IYCF cost centres, before bringing them together to provide an overall cost per mother reached estimate. Finally, it discusses how our results compare to IYCF cost estimates from other IYCF programmes.

Section 5 presents our findings on the costs of the CMAM programme from a societal perspective. It first gives some background on the design and context of the CMAM intervention. It then gives our estimates of the cost per child treated of the various cost at the centres where the CMAM programme is being operated, before bringing them together to provide an overall cost per child treated estimate. Finally, it discusses how our results compare to cost estimates from other CMAM programmes.

Section 6 concludes.

2 Costing methodology

This section describes the costing methodology. Our methodology is comprehensive and relies on best practice costing principles applied to the study's aims and context. It goes beyond many costing studies by bringing a society perspective to the costing of the IYCF interventions and the CMAM programme. Nonetheless, as with all studies, it does have limitations, which are highlighted here and further discussed in light of the findings in the discussion in each result section. We focus on the main elements here. Further detail on the data and assumptions used in the costing is available in the report's annexes.

2.1 Study design and context

The costing study was designed to respond to the primary aim of assessing the costs of delivering the WINNN outputs over the programme duration, from a programme perspective for all four outputs and also from a societal perspective for the IYCF interventions and the CMAM programme. The methodology was developed in ORIE's inception phase and informed by a mapping of the intervention cost items and a focused literature review.

- We mapped the intervention cost items and contributing stakeholders, using programme documentation and discussions with WINNN. This mapping formed the framework for the study in terms of how data were collected, analysed and presented. Further detail is available in Annex B (for the costing of all WINNN outputs from a programme perspective), Annex C (for the costing of the IYCF interventions from a societal perspective) and Annex D (for the costing of the CMAM programme from a societal perspective).
- We identified published economic evaluations of IYCF interventions and CMAM programmes through a focused literature search to inform the methods and data sources for the current study. We primarily searched for studies published in peer-reviewed academic journals but also reviewed relevant 'grey' (non-peer-reviewed) literature from Nigeria. Annex A presents summary findings from this focused literature review.

The context of the study is five states in northern Nigeria—Jigawa, Katsina, Kebbi, Yobe and Zamfara. WINNN supports the delivery of three nutrition-specific interventions—micronutrient supplementation, the IYCF interventions and the CMAM programme—through the government PHC system. In addition, it supports government coordination and planning for nutrition. This means, for example, that the programme design is for government health workers to directly deliver the interventions, with WINNN providing training to state and LGA officials for them in turn to provide step-down training to health workers. The programme also relies on CVs to help deliver the interventions. These individuals are provided with training, non-financial incentives (e.g. a hijab) and stipends to cover travel costs to meetings. They are not remunerated for their time or other work-related expenses.

The context for the WINNN programme has changed over its duration. Extensive further detail is available in the ORIE qualitative impact evaluation reports (2017, 2015), which focus on the evolving governance context for nutrition and WINNN's contribution to this federally and through its focal states. In summary, there have been both changes that have been influenced by the programme and those influenced by external shocks—including the security situation in the five northern Nigerian states (particularly Yobe), a presidential election resulting in a transfer of power, and a drop in the price of oil, which has negatively affected the country's economic situation.

2.2 Objective

The primary objectives of the costing are:

- to report WINNN programme expenditure overall and analyse this broken down by WINNN output, cost category, state and year; and
- to estimate the cost-efficiency of the IYCF and CMAM interventions, which is the cost per beneficiary from a societal perspective defined as:
  - ο IYCF: This is the **cost per woman reached** through the WINNN-supported IYCF interventions from September 2012 to August 2016 from a societal perspective;[9]
  - ο CMAM: This is the **cost per child treated** by the WINNN-supported CMAM programme, including OTP and SC components, from September 2012 to August 2016 from a societal perspective.

Assessing the VfM of the WINNN programme and its component interventions is not a primary objective of the ORIE economic evaluation. However, the full economic evaluation approach (e.g. a CEA) is one standard and popular approach for assessing VfM, particularly in health.[10] Using the '3E' VfM framework, as commonly applied by DFID to assess the VfM of its aid programmes, a CEA helps answer the overall VfM question of whether the best possible outcome was obtained with a given budget. Figure 1 illustrates this VfM framework, using the CMAM programme as an example.

Figure 1:   VfM for the WINNN programme
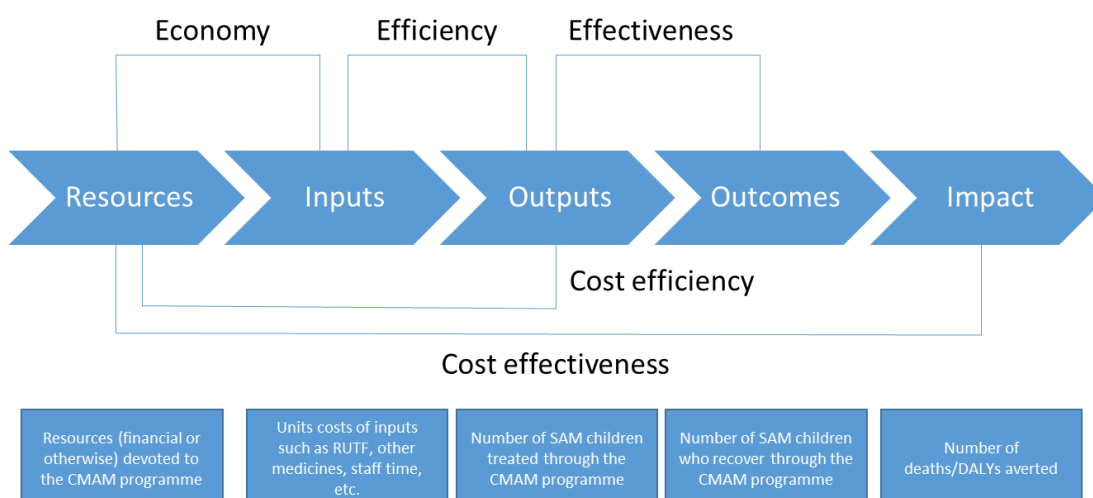
Source: Authors

As also illustrated in Figure 1, the cost per beneficiary indicators are cost-efficiency ones that do not necessarily indicate the cost-effectiveness of the interventions. A cost-efficiency indicator tells you how much it costs to deliver a unit of output (e.g. treatment received at a CMAM facility for a child), it does not tell you what outcome was achieved through this. The forthcoming ORIE CEA report will evaluate the impact of the WINNN-supported IYCF and CMAM interventions on both costs and outcomes. This type of analysis allows decision-makers to compare interventions in

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[9] Although the IYCF interventions also target husbands and mothers-in-law through counselling and community mobilisation, we necessarily use women for the unit cost calculation because the other beneficiaries are not recorded consistently in IYCF beneficiary monitoring statistics for all years and states.

[10] OPM (2014) 'Consultancy for literature review for measuring value for money in health'.

terms of their VfM so as to achieve maximum health gains for the population within limited resources. Therefore the costing and cost-efficiency analysis in this report provides only a partial story of the VfM of the programme at this stage, but this will be complemented with the findings in the CEA report (Cost-effectiveness of the WINNN programme, 2017).

In addition, a more overarching analysis of VfM for the WINNN programme (including all its outputs), which also takes into consideration measures of equity, will be presented as a separate brief. The inclusion of distributive fairness as another dimension of VfM that ties the '3Es' (Economy, Efficiency, and Effectiveness) together is particularly important, as acknowledged by DFID (2011): it indicates that VfM of development aid depends not just on cost-efficient delivery and cost-effective outcomes, but on delivering improvements in equity as efficiently and cost-effectively as possible.

Finally, this report has limited evidence on the domains of economy and efficiency—for example, we do not include an analysis to assess whether inputs were of appropriate quality and bought at the right price, or a disaggregation of our costing estimates into fixed and variable costs or planned and actual expenditure. This is mainly due to availability of programme information at those levels of disaggregation, but also because it is outside the scope of this report.

2.3 The main elements of the costing methodology

We provide only a short overview of the main elements of the costing methodology here. Further detail on the data and assumptions used in the costing is available in the report Annex C and Annex D.

2.3.1 Perspective

The perspective that is adopted in an economic evaluation is important as regards determining who incurs the costs. Two commonly used perspectives in economic evaluations are the health services perspective and the societal perspective. The former perspective evaluates the costs incurred by health service providers in providing the intervention. The latter perspective also includes costs incurred by health service users (i.e. patients and carers) and other members of the society who may be directly or indirectly affected by the intervention (or no intervention).

Figure 2 illustrates these perspectives in the context of the WINNN programme. Health services, including micronutrient supplementation, the IYCF interventions and the CMAM programme, are provided by state and LGA governments, with support from WINNN. WINNN is the only partner supporting the government to provide the IYCF interventions and the CMAM programme in its focal LGAs, although other partners support these interventions in other areas of the WINNN states. Micronutrient supplementation, which is primarily delivered through routine PHC services at health facilities and consolidated by biannual events called MNCHWs is a state-wide intervention that involves other partners. The societal perspective is inclusive of these health services providers, but also considers health service users, such as CVs, who help deliver the WINNN interventions, and households, who access the interventions. A third, narrower perspective, considers the expenditure of the WINNN programme.

Figure 2: **Perspectives in economic evaluation**
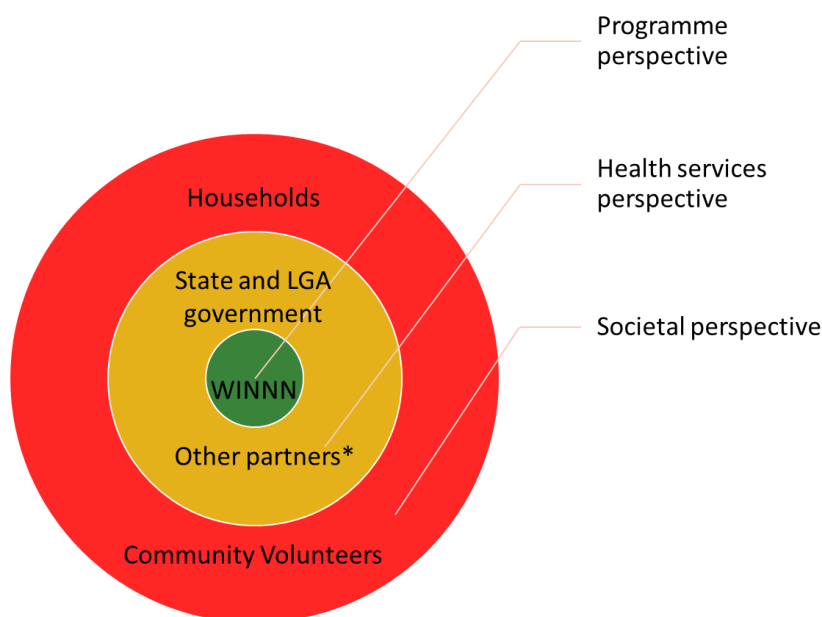
Source: Authors

In the case of developing countries, the perspective adopted in an economic evaluation can be crucial. This is because the costs (direct and indirect) incurred by patients and their family members can be significant compared to the costs incurred by the health care system.

We first assess the costs of delivering all WINNN outputs from a programme perspective (Section 3). We then cost the IYCF interventions and the CMAM programme from a societal perspective (Section 4 and Section 5), which allows us to present these results from both a health services perspective and societal perspective, keeping in mind that the health services is a subset of the societal perspective. Previously published studies of the costs and cost-effectiveness of CMAM programmes have used both a health services perspective (e.g. Wilford *et al.*, 2011; Bachmann, 2009) and a societal perspective (e.g. Ashworth and Khanum, 1997). Our focused literature review found very few published studies of IYCF interventions' costs and cost-effectiveness: the two identified studies on promotion of EBF used a health services perspective.

There are of course wider health service provider and user costs for the other WINNN outputs (micronutrient supplementation and government coordination and planning) but it was agreed that this was outside the scope of the ORIE economic evaluation. This is because these interventions are delivered state-wide and nationally (there is no WINNN LGA focus, as there is for the IYCF interventions and the CMAM programme) and involve many other partners, from which expenditure data would have been very difficult to obtain.

2.3.2 Time horizon

The time horizon for the costing is 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.

2.3.3 Unit of analysis

The WINNN programme expenditure analysis disaggregates data by WINNN output, state, year and cost category. The costing of the IYCF interventions and the CMAM programme from a

societal perspective constructs indicators at the beneficiary level—i.e. woman reached through WINNN-supported IYCF interventions and child treated through WINNN-supported CMAM facilities.

2.3.4 Combination of bottom-up and top-down

A top-down approach is based on a simple calculation: total expenditure for a given output is divided by total units of output (e.g. patients treated). A bottom-up approach identifies all of the resources that are used to provide an output and assigns a value to each of those resources. These values are summed and linked to a unit of output to derive a total unit cost.

The WINNN programme expenditure analysis takes a top-down approach. The costing of the IYCF interventions and the CMAM programme uses a mix of bottom-up and top-down approaches to estimate unit costs. That is, for each cost item it uses the better approach given the availability and quality of the data. Our combined approach allows us to make the most of the available data.

2.3.5 Currency

The data used in the costing analysis come from various primary and secondary sources with different currencies and years. Thus, we convert every cost at every year to United States dollars (USD/$) using International Monetary Fund exchange rates for conversion, before bringing all costs together in a single calculation. Costs calculations are done in USD given that this is the best practice in the international literature of costing and CEA.

However, final calculations in this report have been converted to GBP/£ using an exchange rate USD/GBP of 1.56 (average USD/GBP exchange rate for the period between Year 1 to Year 5 – September 2011 to August 2016[11]) to facilitate reporting using DFID's official currency. In the main calculations we still present both GBP and USD figures, in order to facilitate comparison with cost-efficiency measures from other studies, which are usually presented in USD.

2.4 Measurement of cost items

2.4.1 Data sources and collection

A number of data sources were used in the costing, as follows:

WINNN expenditure data: Every year WINNN partners submitted their annual programme expenditure data to ORIE according to a pre-agreed expenditure tracing template, with data disaggregated as much as possible by cost category[12], WINNN output and state (see Figure 15 in Annex B). Any shared personnel or overhead costs that were not pre-allocated to WINNN outputs were allocated by ORIE using an activity-based apportioning methodology. This is a standard costing approach for allocating shared costs across outputs. Activity-based costing uses the distribution of staff time inputs (in this report we use the time distribution of WINNN staff across WINNN outputs, as reported by IPs) as a basis for apportioning staff wage expenditures or other non-staff shared costs. Thus, this approach is based on the assumption that staff time usage

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[11] Average of representative rates for the period September 2011 to August 2016 from International Monetary Fund.
[12] The expenditure template for WINNN partners included the following categories: staff personnel; non-staff personnel; medical commodities (excluding RUTF and therapeutic foods); RUTF and therapeutic foods; operations and maintenance; training (including capacity development); M&E (including supervision and assessments); goods and services for CVs and support groups; other goods and services (including programme management meetings and stakeholder sensitisation); and capital expenditure, such as vehicles, medical and other equipment.

provides a close reflection of how those shared costs inputs are effectively allocated to different outputs. Further detail on this approach is available in Annex B.1.

Health Facility Survey: In August 2015, ORIE conducted a Health Facility Survey (HFS) to collect primary data to feed into the work of two of ORIE's workstreams: the economic evaluation and the impact evaluation. For the economic evaluation, the purpose of the HFS was to collect data on time use in relation to the CMAM programme for health workers, CVs and caregivers of SAM patients. The HFS was representative of WINNN facilities in WINNN LGAs in Jigawa, Katsina, Kebbi and Zamfara, at a sample of 24 OTP facilities selected by stratified random sampling (which represented 37% of all WINNN-supported OTP facilities in those four states) and 12 SC facilities (which is all SC facilities given the small number of SC facilities in which WINNN operates). Data collection involved observation of the facilities and the conducting of questionnaires with staff members, CVs, and caregivers of patients receiving services at the facilities.

Patient Registration Cards: As part of the HFS data collection, ORIE also collected a sample of CMAM Patient Registration Cards. The purpose of this data collection was to collect data on the resource use at the patient level of RUTF, F75/F100 and other routine medicines for the CMAM programme. Patient Registration Cards with start dates of June 2014 and May 2015 were collected from OTP and SC facilities. At OTP facilities, eight cards (two per quarter) were randomly selected for each OTP exit category: recovered, died, defaulted, not recovered and transferred to a SC facility. At SC facilities, the same procedure was used for each SC exit category: recovered, died, defaulted, and not recovered. The number of cards was chosen to be a representative sample of patient cards during June 2014 and May 2015. Results were weighted using the distribution of children in each exit category over the data collection period for each LGA, reported in the WINNN service data. This was done to avoid bias in our estimates coming from the selection of a fixed number of cards per exit category.

Higher-level data collection. In February 2016, ORIE conducted interviews with SNOs, LNOs and WINNN Local Technical Assistants (LTAs) in Jigawa, Katsina, Kebbi and Zamfara. One LGA was chosen per state. These interviews aimed to collect information on the state/LGA contribution to CMAM and IYCF activities (in terms of time and economic resources) regarding supervision, training and monitoring, and information about the programme. Health workers' salary scales were also collected at the state level, which we use to calculate the value of their time spent on CMAM and IYCF activities. Information was collected for the three months preceding the interviews: November 2015 to January 2016.

2.4.2   Data analysis

Analysis of the HFS, Patient Registration Card and endline survey was conducted first in Stata. Indicators were then imported into the Excel-based costing models for the comprehensive analysis.

2.5   Limitations

There are some important limitations related to the internal and external validity of our data sources for the cost estimates. The four main limitations are as follows:

1.   Sampling for the HFS, Patient Registration Card data and interviews with the SNOs and LNOs is not representative over the time period August 2011–September 2016. For example, this means that the quantity of RUTF administered per child treated is from a sample of children treated by the programme in Year 4. In the absence of alternative data sources, these estimates are extrapolated from this time period to the programme duration.

Moreover, the context in which the interventions are being implemented changed throughout the programme duration. This is documented much more fully through the ORIE qualitative impact evaluation reports, but key points to note here include the following:

- the governance context has influenced variations across programme areas in key government inputs to the implementation of the WINNN interventions (for example, the provision of routine medicines);
- these have been changes to which WINNN has contributed through its remit to support effective government planning and coordination for nutrition (e.g. the establishment of CMAM activities monthly meetings at LGA and state levels). This has altered the level and mix of inputs of various stakeholders, most notably WINNN and the government, over time; and;
- these have also been external shocks to the system, including the political transition following the election of a new president in March 2015, the adverse national economic situation following the drop in the oil price and the adverse security situation in northern Nigeria. These also altered the level and mix of inputs: for example, the government did not pay health workers' salaries for much of 2015, in all of the WINNN states except for Jigawa.

2. Asking people to estimate the time spent on an activity, even if the recall period is short, is notoriously difficult. This issue affects our estimates of WINNN programme expenditure through the time spent by WINNN personnel and health workers on WINNN activities, as well as the CVs and caregiver opportunity costs of their time spent on WINNN activities. It also affects the estimates of state/LGA personnel time on CMAM- and IYCF-related supervision and monitoring.

3. There is a key limitation with regard to interpreting the disaggregation by WINNN outputs. The apportioning of staff and other common costs to different WINNN outputs was not done in a standardised way in the case of UNICEF, due to the change in the agency's global financial system data capturing coding in the course of the project. In Year 1 a survey was undertaken to assess the staff time allocation to WINNN outputs. In Year 6 UNICEF estimated the time allocation to WINNN outputs of their current staff by states. These shares were applied to Years 2 to 5, assuming that it was a good reflection of the staff time distribution over the programme years.

4. WINNN is not the only nutrition programme in Nigeria. Other donor-funded programmes, some also implemented by the WINNN partners, also contribute to the progress on the WINNN programme outputs. For example, government planning and coordination activities are increasingly being harmonised across partners and donors. This means it is quite hard to segregate those costs that are attributable to WINNN alone. Thus, costing findings for micronutrient supplementation and government planning and coordination should be interpreted as the DFID contribution to these activities. It is for this reason that cost-efficiency or cost-effectiveness analyses for these outputs would be problematic.

3 The costs of WINNN from a programme perspective

This section reports on WINNN expenditure over 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. The section first reports on overall programme expenditure over Years 1–5, and then breaks this total down by WINNN output, cost categories, years and states. The analysis aims to understand the cost drivers of the programme.

3.1 Overall programme costs

Overall WINNN expenditure for Years 1–5 of the programme (September 2011 to August 2016) totalled £33.6 million. Of this, £13.9 million (41%) was spent on the CMAM programme, £10.8 million (32%) on micronutrient supplementation, £5.0 million (15%) on the IYCF interventions and £3.9 million (12%) on government coordination and planning. This is shown in Figure 3.

Figure 3:   Total programme expenditure by WINNN output, 2011/12 to 2015/16
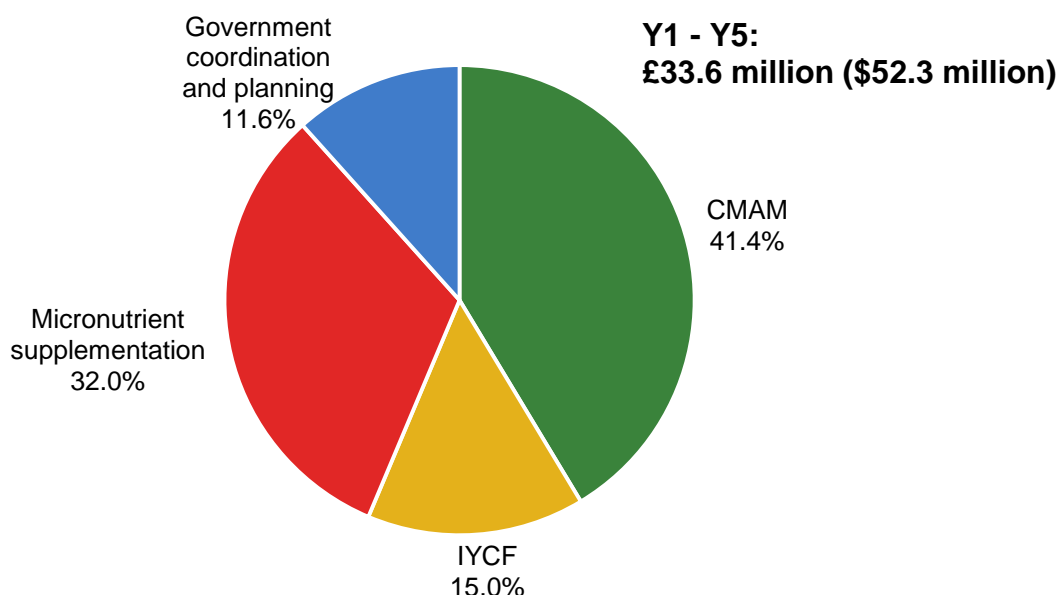
3.2 WINNN costs by cost categories

Table 1 further breaks down total programme expenditure by WINNN output by different cost categories. We discuss the cost categories overall first and then the expenditure by each WINNN output in turn.

Table 1:   Programme expenditure by cost category and WINNN output, 2011/12 to 2015/16

Cost category	Output 1: Micronutrient supplementation		Output 2: IYCF		Output 3: CMAM		Output 4: Government coordination and planning		Total	
	GBP	%	GBP	%	GBP	%	GBP	%	GBP	%
Capital expenditure	**467,189**	**4%**	**409,050**	**8%**	**507,093**	**4%**	**292,212**	**7%**	**1,675,544**	**5%**
Equipment	467,189	**4%**	409,050	**8%**	507,093	4%	292,212	7%	1,675,544	5%
Recurrent expenditure	**10,304,008**	**96%**	**4,628,925**	**92%**	**13,409,669**	**96%**	**3,624,420**	**93%**	**31,967,021**	**95%**
RUTF and F75/F100	0	**0%**	0	**0%**	7,656,228	**55%**	0	**0%**	7,656,228	23%
Other medical commodities	4,486,353	**42%**	0	**0%**	26,073	**0%**	0	**0%**	4,512,427	13%
Human resources	2,774,481	**26%**	2,607,708	**52%**	3,445,533	**25%**	2,239,176	**57%**	11,066,899	33%
Operations and maintenance	340,449	**3%**	383,737	**8%**	394,907	3%	377,031	10%	1,496,125	4%
Training expenses	368,820	**3%**	426,783	**8%**	423,909	3%	107,196	3%	1,326,709	4%
M&E expenses	1,770,754	**16%**	345,069	**7%**	705,433	5%	438,999	11%	3,260,255	10%
Goods and services	563,150	**5%**	865,627	**17%**	757,584	5%	462,017	12%	2,648,378	8%
Total	**10,771,197**	**100%**	**5,037,975**	**100%**	**13,916,761**	**100%**	**3,916,631**	**100%**	**33,642,564**	**100%**

3.2.1 WINNN overall

Out of a total expenditure of £33.6 million, recurrent expenditures constituted approximately £32.0 million, or 95%. Capital costs accounted for 5% of the total expenditure, including costs of vehicles, medical equipment (such as anthropometric scales), and other equipment (such as computers, phones, furniture, and generators). In this analysis, we have annualised all capital expenditures across years in order to spread the value of lumpy expenditure in initial years across the useful life period for the equipment[13].

Among recurrent items, human resources constituted the largest expenditure category, at £11.1 million, or 33% of total expenditure. The majority of this category (79%) corresponded to expenses on WINNN staff working at the federal, state and local levels, and staff shared with other programmes (accounting only for the salary attributed to their time spent on WINNN). The remaining 21% corresponded to expenses on non-staff items, such as technical assistance or stipends for health workers (excluding per diems for training or M&E activities).

RUTF and F75/F100 constituted the next largest cost category overall, at £7.7 million, or 23% of total expenditure. Medical commodities other than RUTF and F75/F100 (which included micronutrient supplements, deworming pills, and some routine medicines distributed as part of the CMAM programme, and expenditure on M&E, were next, with shares of 13% and 10% of total expenditure, respectively. M&E expenses included venue hire, M&E materials, per diems, travel, and other costs for supervision and programme assessments.

The smallest categories of expenditure were goods and services (8%), operations and maintenance (4%), and training (4%). Goods and services included costs incurred in relation to CVs, support groups, and programme management meetings. Operations and maintenance included programme expenses, such as rent, fuel for, and maintenance of, vehicles, utilities and communications. Training expenses included venue hire, training materials, per diems, travel, and other training costs.

3.2.2 WINNN Output 1: Micronutrient supplementation

Output 1 is concerned with the delivery of micronutrient interventions to pregnant women and children under the age of five, which is primarily delivered through routine PHC services at health facilities and consolidated by MNCHW events. MNCHW events are state-wide biannual events provided at specified health facilities. MNCHW events are a multi-donor effort and their implementation involves multiple partners, including WINNN. UNICEF has a coordinating role at the federal and state levels, and provides support across all LGAs in WINNN's five focal states.

WINNN expenditure reflects the following activities carried out under the programme for this output:

- Procurement and delivery of iron folate (for pregnant women), deworming, oral rehydration solution and zinc (for under-five children) to the UNICEF zonal stores for routine PHC services and MNCHW events. States and LGAs are responsible for collection and distribution to the

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[13] We have carried out this exercise by assuming an annual interest rate of 3% and an average lifespan for each aggregated capital expenditure category reported by IPs: 15 years for 'vehicles', 10 years for 'medical equipment', and five years for 'other equipment', based on the standard practice in health accounting models (Drummond *et al.*, 2015; Formson *et al.*, 2010). For any given financial capital expenditure reported every year, we calculated the annualised costs using the assumptions regarding interest rates and asset life-periods described above. Given that the life-period for all assets considered is equal or surpasses our analysis timeframe (five years), we assigned the calculated annualised cost to the year in which that asset was bought and each subsequent year.

health facilities as part of their contribution to the WINNN programme. WINNN also supports the distribution of Vitamin A. **This constituted the largest cost category for Output 1, at £4.5 million, or 42% of WINNN expenditure on micronutrient supplementation.**

- Strengthening capacity, coordination and micro-planning of micronutrient supplementation at state and LGA levels, focusing on: planning, logistics, supportive supervision, and monitoring. Key activities for the programme were strengthening the capacity of health workers, strengthening the monitoring system, and leveraging of government funding for MNCHW events. WINNN also engaged in social mobilisation activities for MNCHW events, including engaging community influencers and town announcers, media work and disseminating public education messages/ merchandising. **Strengthening capacity, coordination and micro-planning of micronutrient supplementation, together with social mobilisation activities, constituted a large part of the expenditure on human resources (at £2.8 million, or 26%) and M&E expenses (at £1.8 million, or 16%) for this output.**

- The remainder, 16%, of expenditure on this output was on equipment (4.3%), operations and maintenance expenses (3.2%), training expenses (3.4%) and goods and services (5.2%).

It is important to emphasise that WINNN works with government and numerous other development partners to plan and implement micronutrient supplementation, at both national level and in the focal states. Therefore the expenditure of GBP 10.8 million should be interpreted as WINNN's contribution to MNCHW events in the focal states and at national level, plus the support it provides to iron folate supplementation, deworming and medication for diarrhoea treatment through routine PHC services.

3.2.3   WINNN Output 2: IYCF interventions

Output 2 is concerned with IYCF interventions. This is focused largely on caregivers (female and male) who have children under the age of two, or women who are pregnant. The IYCF interventions are focused in the communities around the five health facilities per WINNN LGA which provide CMAM services, as well as a number of non-CMAM facilities in the focal LGAs.

WINNN expenditure reflects the following activities by the programme for this output:

- supporting IYCF training for state and LGA officers, who then provide step-down training to health workers and CVs;

- supporting the establishment of the **f-IYCF component**, designed to be provided by trained health workers. The health workers are tasked with providing IYCF counselling as part of the CMAM programme, routine PHC services, such as ANC and PNC care, and health events, such as MNCHW events. This includes IYCF-focused counselling to small groups of mothers and also one-to-one counselling;

- supporting the establishment of the **c-IYCF component**, which is provided by trained CVs. CVs are tasked with establishing and facilitating 'mothers' support groups', as well as broader IYCF promotion in communities. There was an expansion of the c-IYCF component at the end of 2015;

- providing ongoing supportive supervision and monitoring of the IYCF interventions in partnership with the state and LGA health teams; and

- advocacy to promote adequate public funding for IYCF practices, development of the IYCF policy agenda and legislation related to IYCF practices. 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 c-IYCF training package developed by the Nigerian Federal Government (adapted from the generic UNICEF c-IYCF package), and the f-IYCF training package, also developed by the Nigerian Federal

Government (based on manuals developed by UNICEF and the World Health Organization (WHO)).

In line with these activities, which are labour intensive, expenditure on human resources constituted the largest cost category for Output 2, at £2.6 million, or 52% of WINNN expenditure on the IYCF interventions.

Goods and services constituted the next largest cost category for Output 2, at £0.9 million, or 17% of WINNN expenditure on the IYCF interventions. Costs incurred on CVs and support groups, including per diems for CVs for training or meetings, constituted a large component of this cost category. The remainder, 31%, of expenditure on this output was on shares of equipment (8%), operations and maintenance expenses (8%), training expenses (8%) and M&E (7%).

3.2.4   WINNN Output 3: CMAM programme

Output 3 is concerned with the provision of CMAM services. The intended beneficiaries are children under five with SAM in the WINNN focal LGAs. WINNN supports OTP facilities in five PHC facilities in each of its three focal LGAs, per state. WINNN also supports SC facilities in at least one referral centre per focal LGA.

WINNN support includes:

- funding of therapeutic commodities provided through the CMAM programme, such as 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 funding and procurement of other routine drugs. **This constituted the largest cost category for Output 3, at £7.7 million, or 55% of WINNN expenditure on the CMAM programme, of which 99.2% (£7.6 million, or 54.8% of WINNN expenditure on the CMAM programme) corresponded to RUTF expenses only;**
- supporting CMAM training for state and LGA officers, who then provide step-down training to health workers and CVs;
- supporting mobilisation of CVs for SAM detection and community sensitisation;
- providing ongoing supportive supervision and monitoring of CMAM programme services, in partnership with the state and LGA health teams; and
- advocacy and technical support to promote CMAM systems reform and public funding, including support in the development of technical guidelines and to the Federal Ministry of Health.

In line with these last four activities, which are labour intensive, expenditure on human resources constituted the next largest cost category for Output 3, at £3.4 million, or 25% of WINNN expenditure on the CMAM programme. The remainder, 20%, of expenditure on this output was on shares of equipment (4%), operations and maintenance expenses (3%), training expenses (3%), M&E (5%), and good and services (5%).

While WINNN is the only development partner supporting the CMAM programme in its focal LGAs, various partners support these interventions in other LGAs in the WINNN focal states and at federal level. These include the European Union's European Civil Protection and Humanitarian Aid Operations (ECHO) (implemented by SCI and ACF), and a large CMAM programme funded by CIFF, which operates at federal level and across the northern states, including all five WINNN

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

3.2.5   WINNN Output 4: Government coordination and planning

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 malnutrition and its underlying causes. **This, again, is a people-intensive activity, and it is not surprising that expenditure on human resources constituted the largest cost category for Output 4, at £2.2 million, or 57% of WINNN expenditure on government coordination and planning.**

Again, various development partners support nutrition sector governance. Most notably, UNICEF's CIFF-funded programme has recently introduced a matched funding mechanism to complement WINNN (in the case of WINNN states) to promote state financing for nutrition (particularly the CMAM programme), which is being implemented through to 2018. The Gates Advocacy project (funded by the Gates Foundation, and implemented by SCI) also works in close partnership with WINNN to achieve common advocacy goals, at federal level and in three of the WINNN states.

3.3   WINNN costs by year

Figure 4 breaks down total programme expenditure by WINNN output and year—defined as running from September to August. WINNN expenditure has generally increased over time, as the programme has rolled out all of the interventions to all states. In Year 1 the programme spent £4.4 million, whereas it was spending between £7.3 million and £8.3 million a year over Years 3–5.

Over the years, WINNN has spent increasing amounts on the IYCF interventions and government coordination and planning, as the programme has expanded its scope both geographically and in terms of beneficiaries reached. The 47% increase in expenditure on the IYCF interventions from Year 4 (£1.1 million) to Year 5 (£1.6 million) can be explained by the expansion of the c-IYCF component to additional wards in the beginning of Year 5. Annual spend on the CMAM programme and micronutrient supplementation over the years has varied a bit more. Expenditure on the CMAM programme in Year 3 was the largest, with the roll-out to the remaining states (Katsina, Kebbi and Yobe) taking place that year (WINNN rolled out the CMAM programme in Zamfara and Jigawa in Year 2). The decrease in the expenditure on the CMAM programme in Year 4 and Year 5 was also a result of lower set-up costs but also 'lumpy' procurement of RUTF in the first three years of the programme—i.e. bulk procurement of RUTF in one year but use over subsequent years: thus, annual procurement expenditure does not necessarily reflect actual use in that year. Expenditure on micronutrient supplementation also varied across the years. This could also reflect

the gradual expansion of the programme to all states[14], the possibly lumpy procurement of some medical commodities and the varying contributions from states and LGAs to this output across the years.

Figure 4:   Programme expenditure by WINNN output and year, 2011/12 to 2015/16
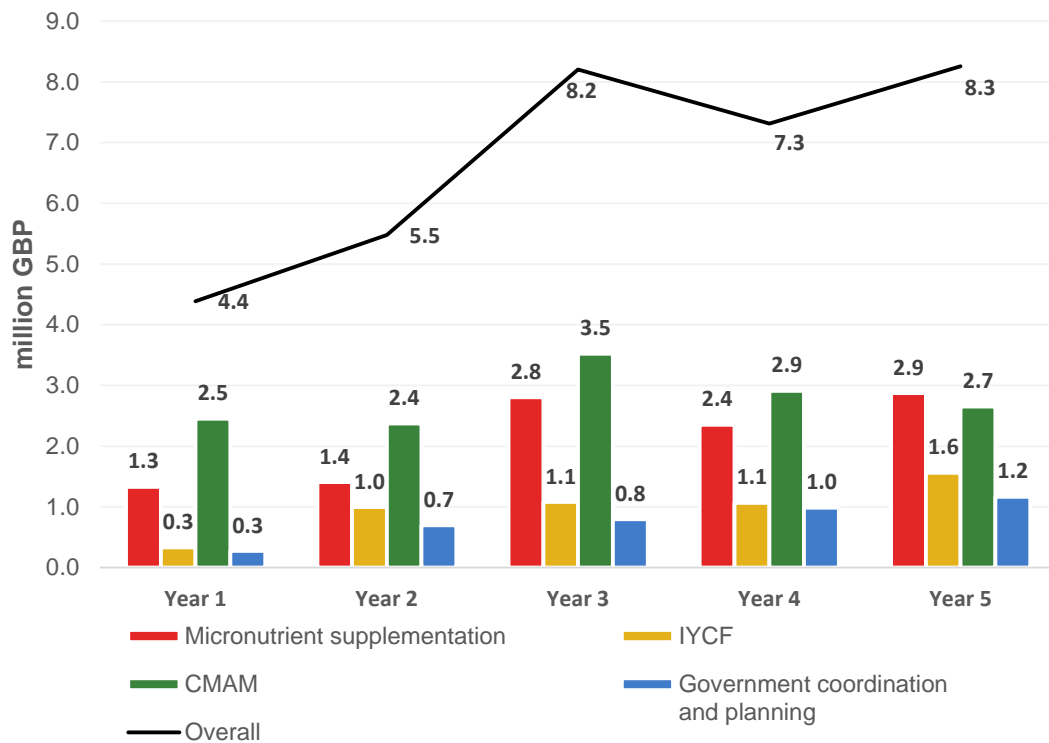
Figure 5 shows the percentage distribution of WINNN expenditure by outputs for each year. Over Year 1 to Year 4, the CMAM programme constituted the largest expenditure share of WINNN total expenditure, ranging from 40% to 56%. This was generally followed by micronutrient supplementation—although in Year 5 this output had a larger share than the CMAM programme (35% versus 32%, respectively) driven by the decrease in the expenditure on the CMAM programme in the last years of the programme—then the IYCF interventions, and finally government coordination and planning.

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[14] WINNN rolled out MNCHW events in Zamfara and Jigawa in Year 1, followed by Katsina and Yobe in Year 2. In Kebbi, WINNN supported the platform of the Immunisation Plus Days in Year 2 and Year 3, until MNCHW events were first implemented in Year 4.

Figure 5: Programme expenditure distribution by WINNN output and year, 2011/12 to 2015/16
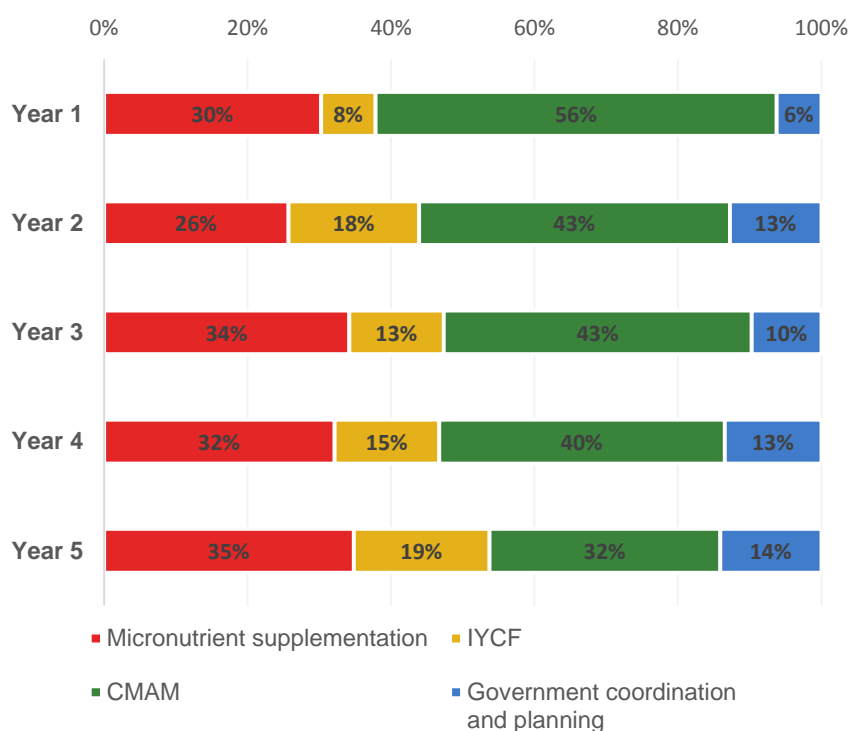
3.4   WINNN costs by state

Figure 6 and Figure 7 break down total programme expenditure and its distribution by WINNN output and state. After central programme spending in Abuja (£8.6), Jigawa and Zamfara were the states with the largest programme expenditure, at £6.6 million and £6.4 million, respectively. Expenditure across WINNN outputs varied absolutely and relatively by states: Jigawa and Zamfara were the states with the largest expenditure on the CMAM programme (£3.6 and £3.4, respectively), corresponding to their larger targets of children with SAM admitted into the CMAM programme[15]. Katsina and Kebbi spent proportionally more on micronutrient supplementation (41% and 36%) than the other three states (Jigawa (27%), Yobe (25%) and Zamfara (26%)), which spent proportionally more on the CMAM programme. One explanatory factor for these differences is the various state and LGA-level commitments to support and co-fund some components of the WINNN programme.

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[15] According to the WINNN logframe, the target by Year 5 for the cumulative number of children admitted in target LGAs (Output 3.1) was 40, 800 in Jigawa and Zamfara, and 30, 800 in Katsina, Kebbi and Yobe.

Figure 6: Programme expenditure by WINNN output and state, 2011/12 to 2015/16
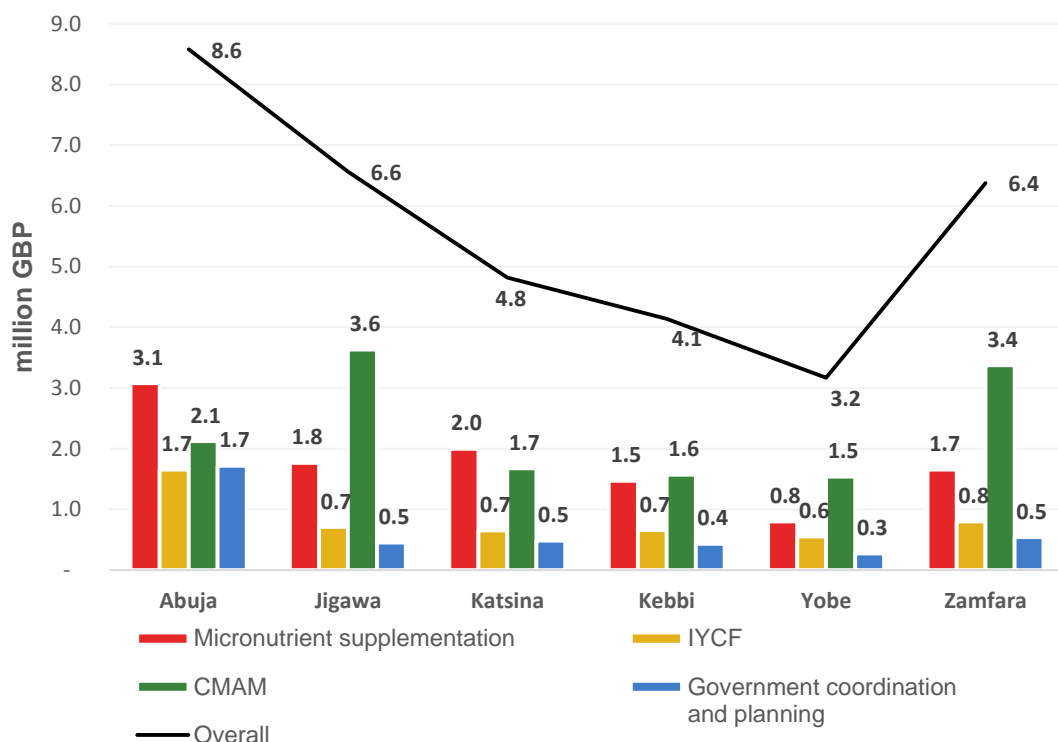
Figure 7: Programme expenditure distribution by WINNN output and state, 2011/12 to 2015/16
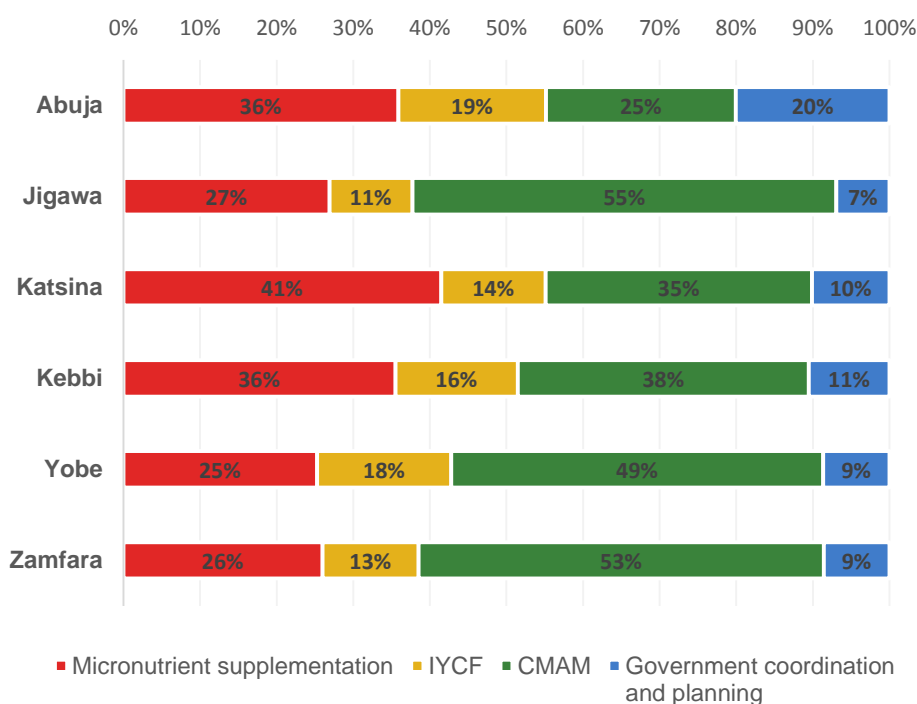
3.5   WINNN costs summary findings

The largest share of the WINNN programme expenditure was on the CMAM programme (41%), with expenditure on RUTF being the main cost driver of this output (54.8% of WINNN expenditure on the CMAM programme). The CMAM intervention, a lifesaving intervention which is

on the treatment end of the spectrum for malnutrition, compared to the more preventative interventions of micronutrient supplementation and the IYCF interventions, has proved to be more resource intensive for the WINNN programme, in regard to supporting the government to implement this intervention—not only in terms of the medicines required (primarily, RUTF) but also in terms of the human resource requirements. However, CMAM programmes save the lives of children who otherwise would have died without the interventions.

As anticipated, the main cost drivers for each WINNN output resemble the main components of that specific intervention. For instance, RUTF provision is the largest cost category for the CMAM programme (54.8%). WINNN expenditure on micronutrient supplementation is driven by the cost of medical commodities (42%) delivered through routine primary health services and MNCHW events. While the IYCF interventions and government coordination and planning are relatively more people-intensive than other WINNN outputs, with human resources constituting the largest cost category, at 52% and 57%, respectively.

WINNN is not a capital-intensive programme in the standard sense but it has made significant investments in strengthening the government capacity to implement nutrition interventions. Only 5% of WINNN programme expenditure has been on traditional capital items, such as vehicles, medical equipment and other equipment (e.g. computers). Expenditure on human resources, however, has constituted 33% of overall expenditure. This represent the cost of WINNN staff (and consultants) at the national, state and local levels supporting the delivery of the three key comprehensive nutrition-specific interventions through the public health system and the effective planning and coordination of nutrition interventions more generally.

The government and other development partners work in coordination with WINNN on the achievement of micronutrient supplementation and government coordination and planning outputs. Thus, **the WINNN expenditure on those outputs—£10.8 million on micronutrient supplementation and £3.9 million on government coordination and planning—represents the DFID-funded contribution to those activities in the focal states and nationally.** Specifically for micronutrient supplementation, DFID funds activities in the focal states and contributes to national-level policy activities, which are also complemented by funding from other donors. For the advocacy output, a mix of funds at the state and national level are used, depending on donors' priorities. WINNN expenditure on the IYCF interventions and the CMAM programme can be allocated more easily to expenditure on specific interventions in WINNN focal states: this is one reason why these outputs are costed from a societal perspective in the subsequent sections.

Compared to the original DFID Business Case (2011), WINNN has spent proportionally more on the CMAM programme and less on micronutrient supplementation and the IYCF interventions. In the business case, 33% of the WINNN budget was allocated to the CMAM programme, whereas in fact 41% of WINNN expenditure has been on the CMAM programme.[16] Some 41% of the budget was allocated to micronutrient supplementation and 19% to the IYCF interventions in the business case. In reality, 32% of WINNN expenditure has been on micronutrient supplementation and 15% on the IYCF interventions.

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[16] These estimates exclude the cost of ORIE, which was budgeted at £6.5 million of the total £50 million WINNN budget.

4 The costs of IYCF interventions from a societal perspective

This section presents our findings on the costs of the IYCF interventions, as supported by WINNN, from a societal perspective. It first gives some background on the design and context of the IYCF interventions. It then gives our estimates of the cost per woman reached of the various IYCF cost centres, before bringing them together to establish an estimate of the overall cost per woman reached. Finally, it discusses how our results compare to IYCF cost estimates from other IYCF interventions.

4.1 Background to the WINNN IYCF interventions

The IYCF interventions are focused on improving the feeding practices of under-two children—i.e. promoting adequate maternal nutrition (for pregnant and lactating women), early initiation to breastfeeding and EBF during the first six months, continued breastfeeding up to at least two years of age and complementary feeding of nutritionally adequate foods for older children. It also includes appropriate hygiene behaviours. The IYCF interventions are therefore targeted primarily at mothers of under-two children and pregnant women.

WINNN supports the delivery of the IYCF interventions through its three focal LGAs per state within five states in northern Nigeria. More specifically, it supports the establishment of the following:

- f-IYCF counselling as part of routine PHC services – such as ANC services and the CMAM programme – as well as at health events such as MNCHW events. The f-IYCF component is designed to be provided by trained health workers, although, in practice, CVs also support the f-IYCF approach in many facilities due to inadequate human resources for health (Qualitative Evaluation of the WINNN Programme, 2017). The f-IYCF component includes counselling to groups of mothers and also one-to-one counselling.
- The c-IYCF component is provided by trained female and male CVs. Female CVs facilitate 'mothers' support groups', and provide one-to-one counselling. Male CVs reach out to fathers, local and religious leaders, while both male and female CVs provide broader IYCF sensitisation in communities. WINNN supported the significant expansion of the c-IYCF component to additional wards from August 2015 to February 2016.

As shown in Figure 8, WINNN-supported IYCF interventions started in the beginning of 2013. The IYCF interventions work in Kebbi and Katsina started in March 2013, before the CMAM programme started in those states. IYCF-related activities started in Zamfara in May 2013, followed by Jigawa and Yobe in July 2013. In Zamfara and Jigawa, the IYCF interventions were the last WINNN component to be rolled out, while in Yobe the IYCF interventions started a couple of months before the CMAM programme's implementation. Before the expansion, c-IYCF components took place in 15 health facilities through the provision of ANC services per WINNN LGA. Each health facility had three mothers' support groups attached to it. The expansion at the beginning of Year 5 extended c-IYCF interventions to 10 wards per LGA, increasing the total number of support groups by more than double (WINNN quarterly reports estimate an increase from 669 in Year 2 to 1,558 in Year 5).

Figure 8: **WINNN IYCF interventions roll-out, September 2011–August 2017**

State	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Zamfara						
Jigawa						
Katsina						
Kebbi						
Yobe						

Source: WINNN service data

WINNN supports the government to integrate f-IYCF services into routine PHC services in target facilities in the WINNN focal LGAs. This includes training and ongoing technical support for health workers and LGA staff. WINNN also supports capacities of federal and state governments and the development and adoption (in WINNN states) of national guidelines and legislation related to the IYCF interventions. WINNN is the only programme supporting the IYCF interventions in its focal LGAs. However, other development partners support the IYCF intervention in other LGAs in the WINNN states.

In regard to the c-IYCF component, WINNN undertakes community engagement work, and supports training and meetings for CVs and 'IYCF Ward Focal Supervisors'. The CVs receive travel allowances for meetings and training, but are not generally remunerated for their time.

4.2 Findings

This section gives our estimates of the average cost per mother reached of the various IYCF cost centres, before bringing them together to establish an overall average cost per mother reached.

Our estimates do not include husbands or mothers-in-law reached through counselling or community mobilisation since there are no monitoring records across all years and states for those beneficiaries reached. There are also some costs to the mother of accessing IYCF services— mainly in terms of her time and expenses in travelling to a health facility and the opportunity costs to her time spent in counselling. These costs are not included in the costing because the proportion of these costs attributed to IYCF activities is expected to be negligible given that women receive f-IYCF counselling integrated into other PHC services (i.e. ANC, PNC, the CMAM programme or MNCHW events), and the c-IYCF component does not represent a significant burden in terms of time and expenses, since mothers attend support groups in their own or neighbouring communities.

Using the societal perspective as explained in Section 2.3.1, there are three levels at which costs are incurred:

1. health facility;

2. community; and

3. higher-level programme.

Each cost level is explained in turn. Further detail on the IYCF interventions in northern Nigeria, as supported by WINNN, is also presented in this section to put the findings in context.

4.2.1   Health facility-level costs

Health facility-level costs are all costs that are directly incurred in delivering an intervention to an individual in the health facility—in this case, counselling mothers as part of ANC and PNC services, on CMAM days, as well as during health events, such as MNCHW events. These are sometimes referred to as treatment costs. Such costs comprise: 1) health worker inputs—the time spent by different cadres of health workers on delivering the intervention; and 2) a proportion of overhead costs attributable to the IYCF-related services delivered within the health facility.

Health worker time

The f-IYCF component's design is for trained health workers to provide both group and one-to-one counselling to pregnant women at routine services such as ANC, mothers of children attending CMAM days (including mothers of children who are moderately acutely malnourished, not those with SAM, and who are therefore not enrolled in the CMAM programme) and during health events, such as MNCHW events. The health worker uses IYCF counselling cards, which pictorially demonstrate key IYCF messages relevant to that particular woman—e.g. the importance of iron folate supplementation and early initiation to breastfeeding and EBF.

As the cost of health worker time spent on delivering the f-IYCF component on CMAM days is costed as part of that intervention (see Section 5.2.1), here we estimate the cost of the f-IYCF component as part of ANC and other points of contact at the facility for other PHC services. We necessarily take a partly normative approach to estimating the cost per mother reached through the f-IYCF component. A normative approach estimates costs on the basis of what resource requirements *should* be, rather than what they actually are in reality. This is because it is very difficult to collect accurate data on the amount of time spent on interventions such as the IYCF interventions, which is added on to, or integrated into, another service (i.e. ANC, PNC, the CMAM programme or MNCHW events), and it often does not take that much time in reality. This estimate therefore represents an upper bound, ideal cost of health worker time per mother reached.

We estimate an average **health worker cost per mother reached of £0.8** across both the group and one-to-one f-IYCF approaches. This is estimated using the following data and assumptions:

- WINNN LTAs report that, ideally, the health workers delivering the f-IYCF component should be the Junior Community Health Extension Worker (J-CHEW) cadre. In practice, CVs do also provide support delivering f-IYCF-related services; however, we exclude them from our analysis since we do not have information on the extent of their support. We assume that J-CHEWs providing f-IYCF-related services are equally distributed across Grades 5–8. Nigeria has a consolidated health salary structure that specifies the range for basic salary at each grade and also the various allowances to which a health worker may be entitled. The average hourly salary plus relevant allowances of a J-CHEW is £1.18 an hour.
- WINNN LTAs report that the average length of group counselling is 30 minutes and the average length of an individual session is 20 minutes. This means that it costs the government £0.59 to employ the average J-CHEW for a 30-minute group session and £0.39 for a 20-minute one-to-one session. We assume that group or individual sessions are facilitated by one CHEW.
- WINNN LTAs report that there are, on average, 32 mothers per f-IYCF group session, and of course by design there is one mother at each one-to-one f-IYCF session. This means that the health worker cost per mother of a group session is £0.02 ($0.03) and for a one-to-one session it is £0.39 ($0.62).
- Unfortunately, WINNN monitoring data do not track the number of times that mothers attend f-IYCF activities. We therefore necessarily make the normative assumption, based on the WHO recommendation for IYCF counselling during ANC, of two individual sessions per mother. Also,

we assume that, in addition to these, mothers also receive one group session at any other point of contact at the facility, which can include PNC or MNCHW events. This therefore implies a health worker cost per mother of £0.02 ($0.03) for group f-IYCF and £0.79 ($1.23) for one-to-one f-IYCF activities. This results in an overall estimate for average health worker cost per mother reached of £0.81 ($1.26).

Table 2: **Inputs to f-IYCF cost calculation**

Cost item	Source	Individual counselling at health facility	Group counselling at health facility
Average hourly salary of a health worker delivering f-IYCF activities	Higher-level data collection: salary scales	£1.181/ ($1.85)	£1.181/ ($1.85)
Average length of a session	Higher-level data collection: WINNN LTAs interviews	20 minutes	30 minutes
Average number of mothers per session	Higher-level data collection: WINNN LTAs interviews	1 mother	32 mothers
Average number of sessions per mother	ORIE assumption	2 sessions as part of ANC based on WHO recommendation for IYCF counselling	1 session (at any other point of contact besides through the CMAM programme)
Cost per mother counselled	ORIE calculation	£0.791/ ($1.23)	£0.021/ ($0.03)
Cost per mother reached for f-IYCF activities overall	ORIE calculation	£0.811/ ($1.26)	
1/ Using an exchange rate of 1.56, calculated as the average of representative rates for the period September 2011 to August 2016 (Source: International Monetary Fund (IMF))			

Facility overheads

We estimate a proportion of **overhead costs attributable to the f-IYCF component of £0.49 ($0.76) per mother reached.** For a complete costing it is important to include a share of health facility overheads to the direct costs of delivering the f-IYCF component. In the absence of primary data from the WINNN programme, we use standard WHO-CHOICE estimates of health facility overheads. These are typically used in costing studies.

This is estimated by taking the WHO-CHOICE estimate of £1.22 ($1.91) in overhead costs per outpatient visit to a rural public health facility with no beds in Nigeria and adjusting for the fact that WHO-CHOICE estimates already include health worker costs. We have already accounted for these, and so we scale the cost to count only infrastructure—building rent and utility costs. We then further adjust for the IYCF interventions not taking a full outpatient visit worth of time, given that it is additional to, for example, an ANC visit.

4.2.2 CV costs

The c-IYCF component's design is primarily for trained CVs to establish and facilitate mothers' support groups, as well as broader IYCF promotion in communities. The support group approach is intended to allow for peer support among pregnant women and mothers of under-two children. Female CVs use the IYCF counselling cards also used in the f-IYCF component of the IYCF interventions.

We estimate **CVs costs per mother reached through the support groups of between £1.95 ($3.05) and £2.45 ($3.83)** on average across the programme duration (i.e. taking into account the expansion of the c-IYCF model in late 2015). We also take a partly normative approach to calculating the CV cost per mother reached, given that some of the cost inputs used are difficult to estimate accurately with the available information and data sources collected.

The CV cost per mother reached is estimated using the following data:

- A recently conducted CV motivation study reports that IYCF-related CVs work on average between six and nine hours a week. We apply these lower and upper limits in our calculation. An estimate of 8.3 hours worked a week from ORIE's operations research with such CVs in Jigawa fits within this range.

- Since CVs are not generally remunerated for their working time, we calculate the opportunity cost to the CV's time. On average, according to the ORIE HFS, a CMAM programme CV gives up £0.24 of income an hour to work on a CMAM day (ORIE Health Facility Survey-final report, 2016). In the absence of data on the opportunity cost of an IYCF CV's time, we use this CMAM programme CV opportunity cost. This hourly opportunity cost multiplied by the number of hours an IYCF CV works in a week equates to an opportunity cost per CV of between £1.44 and £2.16 a week.

- There are also expenses that CVs would not otherwise incur which they incur in establishing and facilitating IYCF support groups, and for which they are not compensated. ORIE's operations research with IYCF CVs in Jigawa found IYCF CVs incur expenses of £1.40 a week, on average, in costs such as transportation, food, water, etc. Any other stipends or per diems for volunteers for training or meetings are costed as part of the WINNN programme costs (see Section 4.2.4). We assume that an IYCF CV spends both time and expenses only during the week in which the monthly support group meetings take place, i.e. once a month.

- The CV motivation study reports that each support group is facilitated by five CVs. Each support group should also meet once a month. We were not able to validate if these requirements were *actually* satisfied in a real implementation setting; we therefore used a normative approach for these assumptions.

- WINNN monitoring data show that the number of support groups increased from 669 in Year 2 to 1,558 support groups in Year 5. We aggregate the yearly number of support groups between Year 2 and Year 5 (since there were no support groups in Year 1), resulting in a total of 3,619.

- We use the inputs above to calculate the total CVs costs across the programme duration, which approximate to the costs incurred in terms of CVs' time and expenses to form and facilitate the WINNN support groups over time. These total CVs costs are then divided by the first-contact c-IYCF beneficiaries across the programme duration to arrive at CVs costs per mother reached for the c-IYCF component. The first-contact c-IYCF beneficiaries' indicator in the WINNN monitoring data capture the number of pregnant women and mothers of children less than 24 months reached through community counselling for the first time.

Table 3:   Inputs to c-IYCF component cost calculation

	Source	Group counselling in the community
Average number of hours spent by a CV on c-IYCF activities a week	WINNN CV motivation study	6–9
Average hourly opportunity costs of a CV delivering c-IYCF activities	HFS	£0.241/ ($0.38)
Average weekly expenses of a CV delivering c-IYCF activities	ORIE operations research in Jigawa	£1.401/ ($2.18)
Number of CVs per support group session	WINNN CV motivation study	5
Number of support group sessions in a year	ORIE assumption	12
Number of active support groups across the programme duration	WINNN monitoring data	3,619
Number of first-contact c-IYCF beneficiaries across the programme duration	WINNN monitoring data	317,293
CV costs per mother reached for the c-IYCF component	ORIE calculation	£1.95 to £2.451/ ($3.05 to $3.83)
1/ Using an exchange rate of 1.56, calculated as the average of representative rates for the period September 2011 to August 2016 (Source: IMF)		

In order to estimate the costs under the expanded c-IYCF model, we also calculate the CV costs per mother reached using the number of active support groups and first-contact c-IYCF beneficiaries only in Year 5 when the expansion took place. This produces a larger relative increase in the number of support groups (part of the numerator) than in the first-contact c-IYCF beneficiaries (part of the denominator), resulting in a larger estimate for **CVs costs per mother reached of between £2.79 ($4.35) and £3.50 ($5.46) under the expanded c-IYCF model.**

4.2.3   Beneficiary costs

Mothers or caregivers receiving the IYCF interventions also incur costs in accessing IYCF services, in terms of time and expenses. However, these costs are very difficult to assess and estimate, given that IYCF services are integrated into other services, such as the CMAM programme, MNCHW events and other routine PHC services, such as ANC or PNC. The time mothers spend on a CMAM day, including the IYCF interventions, is already costed as part of the costing of the CMAM programme (see Section 5.2.1). Thus, the only costs for caregivers that are excluded from our analysis are those related to the time and expenses spent on the c-IYCF and f-IYCF components as part of ANC or other facility services, such as PNC or MNCHW events. However, as mentioned earlier, we expect this cost to be marginal given the time IYCF services take in reality.

4.2.4   Higher-level programme costs

Higher-level programme costs are those incurred at a 'higher level' than the health facility or patient: that is, money that funds activities at the national, state and LGA levels that enable the effective implementation of the IYCF interventions. Two broad groups incur these costs: 1) the WINNN programme; and 2) state and LGA government. Broad categories of activities include:

- training;
- social mobilisation;

- M&E; and
- planning and coordination.

Table 4 shows how these activities map to different costs incurred by WINNN and the government.

Table 4:   IYCF interventions activities

	Training		Social mobilisation	M&E	Planning and coordination
Human resources[1/]	WINNN: time training state and LGA officers Government: time step-down training health workers and CVs		WINNN: time for mobilisation of CVs CVs: non-reimbursed time (approximated in Section 4.2.2)	WINNN: time doing M&E for programme reporting and supervision. Payment of ward focal supervisors and independent monitors Government: time doing M&E for government reporting and supervision	WINNN: time for the IYCF interventions management meetings and stakeholder sensitisation at federal, state and LGA levels Government: time for the IYCF interventions management meetings and stakeholder sensitisation at federal, state and LGA levels
Materials, allowances and meeting expenses[2/]	WINNN: materials, per diems, travel allowances, venue hire for training of health workers, state and LGA officers		WINNN: materials, per diems for trainings or meetings, travel allowances, venue hire for mobilisation of CVs	WINNN: Materials, per diems, travel allowances, venue hire for programme reporting and supervision	WINNN: Materials, per diems, travel allowances, venue hire for the IYCF interventions management meetings and stakeholder sensitisation at federal, state and LGA levels
Equipment		WINNN: vehicles and other equipment (computers, phones, furniture, generator)			
Operations and maintenance		WINNN: rent, transport (fuel, maintenance), utilities (electricity, water), communications, and other operating expenses			
1/ WINNN expenditure on human resources include payments to staff and non-staff (e.g. technical assistance, stipends for health workers excluding stipends for training). 2/ This category corresponds to the sum of the following WINNN cost categories presented in Table 1: Training expenses, M&E expenses, and goods and services.					

WINNN programme

Table 5 shows WINNN IYCF interventions expenditure over the first five years of the programme. This money funded WINNN activities at the national, state and LGA levels that enabled the effective implementation of the IYCF interventions. For example, at the state and LGA level, WINNN provided supportive supervision and monitoring of IYCF services in partnership with the state and LGA health teams. At the national level, WINNN engaged in advocacy to promote adequate public funding for the IYCF interventions; development of the IYCF policy agenda; and

legislation related to IYCF interventions. Money spent on IYCF interventions at the national level is considered a capital investment cost and thus is included in the calculation of the cost of the IYCF interventions per mother reached.

Table 5: **WINNN IYCF interventions expenditure, 2011/12 to 2014/16**

Cost item	Source	Total (million)	%
Human resources	WINNN expenditure data	£2.6 ($4.1)	52%
Materials, allowances and meeting expenses	WINNN expenditure data	£1.6 ($2.5)	33%
Equipment	WINNN expenditure data	£0.4 ($0.6)	8%
Operations and maintenance	WINNN expenditure data	£0.4 ($0.6)	8%
Total WINNN expenditure on IYCF interventions	WINNN expenditure data	£5.0 ($7.8)	100%
Number of first-contact c-IYCF and f-IYCF beneficiaries	WINNN monitoring data	575,142	
Average WINNN cost per mother reached	ORIE calculation	£8.7 ($ 13.6)	
Estimates in GBP were calculated using an exchange rate of 1.56 (average of representative rates for the period September 2011 to August 2016, source: IMF)			

Human resources is the largest cost item across all the states, comprising 52% of WINNN IYCF interventions expenditure overall. Altogether, £2.6 million worth of WINNN staff and non-staff personnel time at central, state and LGA levels was spent across the first five years of the programme in designing and implementing the IYCF interventions. Expenditure on **materials, allowances and meeting expenses (for training, social mobilisation, M&E and planning and coordination)** is the next largest cost, comprising 33% of WINNN the IYCF interventions expenditure overall. Altogether £1.6 million was spent in Years 1–5. In the context of the IYCF interventions, equipment costs of £0.4 million and operations and maintenance costs of £0.4 million represent general WINNN overhead costs allocated to the IYCF part of the WINNN programme.

The **WINNN programme expenditure of £8.7 ($13.6) per mother reached** is calculated by dividing the overall WINNN programme expenditure on the IYCF interventions of £5 million by the number of first-contact c-IYCF plus f-IYCF beneficiaries across the first five years of the programme (575, 142). First-contact c-IYCF and f-IYCF beneficiaries in the WINNN monitoring data are beneficiaries receiving any type of IYCF counselling for the first time. These two indicators in the WINNN monitoring data are added up to calculate the total number of unique mothers reached by WINNN-supported IYCF services, which is then used to estimate the cost-efficiency of WINNN costs on the IYCF interventions as a cost per beneficiary indicator, i.e. cost per mother reached. Note that beneficiaries could have attended IYCF services a number of times.

As explained in Section 3.2.3, WINNN expenditure on the IYCF interventions relates to the supporting of IYCF activities at both the facility and the community. However, we are not able to estimate WINNN costs per mother reached at the facility and at the community separately, given that WINNN IPs' expenditure data are not available at that level of disaggregation. Hence, we assume that **WINNN costs per mother reached are £8.7 ($13.6), whether the mother is reached by IYCF interventions at the facility or at the community.**

State and LGA

Expenditure by WINNN states and LGAs that enable the effective implementation of the IYCF interventions includes time spent by SNOs, LNOs, and other state/LGA-paid staff, such as assistants, nutrition coordinators and drivers on training, supportive supervision, M&E, programme reporting and planning of IYCF activities. State- and LGA-level staff mainly provide this support for activities concerned with the c-IYCF component.

We estimate an average **state/LGA human resources cost per mother reached of £1.19 ($1.85) on the c-IYCF component**. This is estimated using the following information:

- We collected information on grade levels and time allocated to WINNN IYCF activities of state- and LGA-level staff in Jigawa, Katsina, Kebbi and Zamfara. The average state-level staff member spends 20 hours a month on IYCF activities, while the average LGA-level staff member spends 31 hours.

- Nigeria has a consolidated health salary structure that specifies the range for basic salary at each grade level, and also the various allowances to which a health worker may be entitled. Given that the salaries of state-/LGA-level staff were unavailable, the health salary structure collected for each state was used. Based on this and the grade levels of the state-/LGA-level staff working on the IYCF interventions, we estimate that the hourly salary of an average state-level staff member is £3.80 ($5.93) an hour, and that of an average LGA-level staff member is £2.59 ($4.04) an hour. This means it costs the government £75 a month to employ an average state-level staff member for 20 hours of work on IYCF activities, and £80 a month to employ an average LGA-level staff member for 31 hours.

- With an average of three members of staff per state and 4.3 per LGA, the government spends a monthly average of £1,242 on personnel costs per WINNN state (assuming three LGAs per state).

- Over the course of the first five years of the programme we estimate, according to the WINNN monitoring data, a monthly average of 1,046 first-contact c-IYCF beneficiaries. This means the government spent £1.19 ($1.85) worth of state-/LGA-level personnel time per mother reached on the c-IYCF component.

Table 6:   State and LGA human resources expenditure on the c-IYCF component

Cost item	Total
State and LGA human resources cost per mother reached	£1.19[1/] ($ 1.85)
Note: OPM calculation based on higher-level data collection in Jigawa, Katsina, Kebbi and Zamfara. SNOs and LNOs reported grade levels and time allocation to WINNN activities of their state-/LGA-level personnel. Health workers' salary structures were also collected at each state. WINNN monitoring data were used for the number of first-contact c-IYCF beneficiaries.	
1/ Using an exchange rate of 1.56, calculated as the average of representative rates for the period September 2011 to August 2016 (Source: IMF)	

4.2.5   Overall

Table 7 and Figure 9 bring together the estimates of the cost per mother counselled of various IYCF cost centres.

Table 7:   IYCF costs per mother reached by type of service and cost centre

Cost centre	f-IYCF component			c-IYCF component		
	GBP[1/]	USD	%	GBP[1/]	USD	%
Higher-level costs	**8.7**	**13.6**	**87%**	**9.9**	**15.4**	**80%**
WINNN programme	8.7	13.6	87%	8.7	13.6	70%
Human resources	4.5	7.1	45%	4.5	7.1	37%
Materials, allowances and meeting expenses	2.8	4.4	28%	2.8	4.4	23%
Operations and maintenance	0.7	1.0	7%	0.7	1.0	5%
Equipment	0.7	1.1	7%	0.7	1.1	6%
State and LGA	-	-	-	1.2	1.9	10%
Health facility-level costs	**1.3**	**2.0**	**13%**	**-**	**-**	**-**
Health workers' time	0.8	1.3	8%	-	-	-
Facility overheads	0.5	0.8	5%	-	-	-
CV costs	**-**	**-**	**-**	**2.5**	**3.8**	**20%**
Total: Health services perspective	*10.0*	*15.6*	*100%*	*9.9*	*15.4*	*80%*
Total: Societal perspective	*10.0*	*15.6*	*100%*	*12.3*	*19.2*	*100%*

1/ Using an exchange rate of 1.56, calculated as the average of representative rates for the period September 2011 to August 2016 (Source: IMF)

Figure 9:   IYCF interventions costs per mother reached by type of service and cost centre
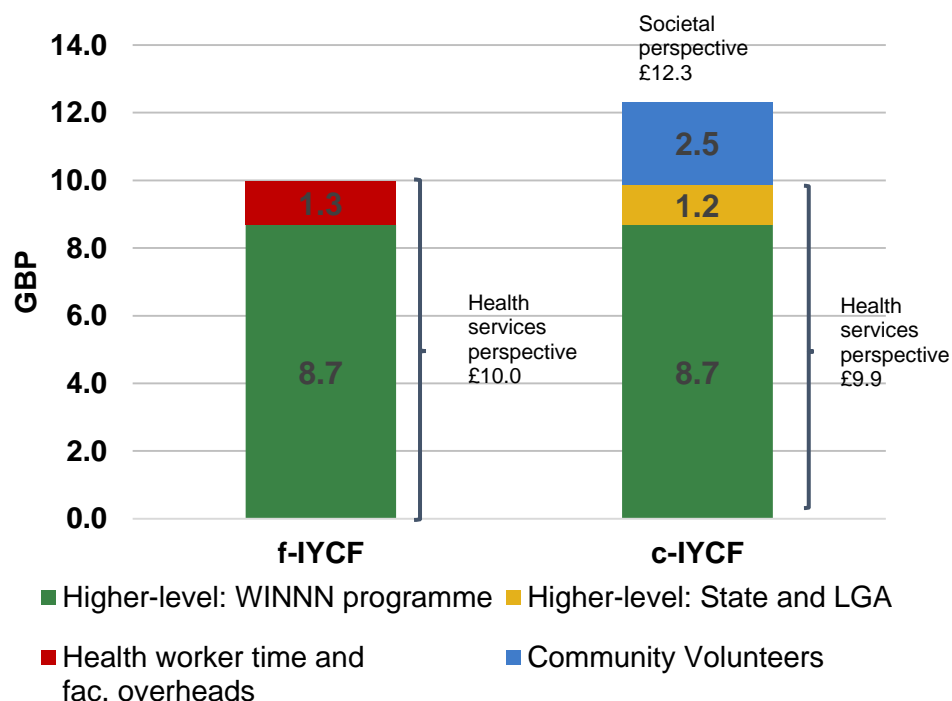
4.3   IYCF interventions costs summary findings

WINNN programme costs are the main cost driver of the IYCF interventions. From a societal perspective, 87% of the cost per mother reached through the f-IYCF component and 70% of the cost per mother reached through the c-IYCF component is expenditure by the WINNN programme.

Overall, WINNN expenditure on the IYCF interventions is primarily spent on human resources (52%) to support the delivery of the intervention in three focal LGAs in the five WINNN states, including expenditure at the state and national levels for this delivery to be effective. Other substantial areas of WINNN programme costs on the IYCF interventions include expenditure on materials, allowances and meeting expenses (33%), such as for mobilisation of CVs, M&E, and training of health workers, state and LGA officers. The remaining WINNN costs are spent on general WINNN overhead costs allocated to the IYCF interventions, such as equipment and operations and maintenance (16%).

WINNN expenditure on the IYCF interventions is large in proportion to the current programme expenditure incurred by state and LGA governments. WINNN programme costs per mother reached are 3.5 times larger (£8.68) than the total cost per mother reached currently incurred by the government in health worker inputs, facility overheads, and state-/LGA-level supervision and planning of activities (£0.81, £0.49, and £1.19, respectively).

Heath worker costs are not a large component of the costs of the f-IYCF component. We estimate that health worker costs are £0.81 per mother reached, or 8% of the total cost per mother reached through f-IYCF counselling. This is indicative of the IYCF interventions not being very demanding on the health system as it is a service that is easily integrated into other PHC services, such as ANC, PNC, or MNCHW events, and thus it does not need a bespoke day or independent infrastructure. However, even this may be a stretch for the current cadre of health workers, with CVs stepping in to deliver the f-IYCF component.

Health worker costs in the f-IYCF model, at £0.8 ($1.3) per mother reached, are less costly than CVs costs in the c-IYCF model, at £2.5 ($3.8) per mother reached. Social costs per hour of CVs are much cheaper than those of health workers[17]. Thus, the larger costs of CVs can be explained by the fact that the c-IYCF component is more of a standalone intervention compared to the f-IYCF component, which is more integrated into existing PHC services, the costs of which are not accounted for as part of our modelling. CVs will spend more time organising and facilitating IYCF activities in the community, while health workers will only spend a relatively small portion of their time delivering counselling sessions at the facility.

We estimate a similar cost per mother reached for the c-IYCF component compared to the f-IYCF component from a health systems perspective (£9.9 ($15.4) versus £10.0 ($15.6), respectively), but a higher cost per mother reached for the c-IYCF component, at £12.3 ($19.2) from a societal perspective. This is explained by the inclusion of CVs costs to establish and facilitate mothers' support groups in the c-IYCF model. The additional expenditure on the c-IYCF component might be justified as it targets women that the f-IYCF component sometimes cannot reach. For example, the Quantitative Impact Evaluation of the WINNN Programme, 2017 found that, at endline, 20% of mothers in treatment areas had received f-IYCF and c-IYCF counselling at least once, while 39% received either one or the other.

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[17] We estimate an hourly salary of £1.18 ($1.85) of an average health worker implementing f-IYCF component, versus an hourly opportunity cost of £0.24 ($0.38) of a CV. See Section 4.2.1 and Section 4.2.2 for further details on the assumptions in relation to health workers and CVs costs, respectively.

5 The costs of the CMAM programme from a societal perspective

This section presents our findings on the costs of the CMAM programme, as supported by WINNN, from a societal perspective. It first gives some background on the design and context of the CMAM programme. It then gives our estimates of the cost per child treated at the various CMAM facilities, before bringing them together to provide an overall cost per child treated estimate. Finally, it discusses how our results compare to the cost estimates from other CMAM programmes.

5.1 Background to the WINNN CMAM programme

CMAM is an approach to managing SAM in under-five children that has been designed to address the disadvantages—many of them cost-related—of traditional inpatient treatment. It aims to maximise access to quality care through a triaging system, community workers and use of RUTF. The WINNN CMAM programme has two main components: OTP facilities for SAM cases without medical complications, and SC facilities for SAM cases with complications, including lack of appetite, or among children under six months of age.

WINNN supports the delivery of the CMAM model in three focal LGAs per state within five states in northern Nigeria. More specifically, it provides support to around five OTP facilities per LGA and one SC facility per LGA, as well as the mobilisation of CVs to provide support at CMAM days. As shown in Figure 10, WINNN rolled out the CMAM programme gradually across its focal states, beginning in Zamfara and Jigawa in September 2012, followed by Yobe in September 2013, then Katsina in December 2013, and finally Kebbi in May 2014.

Figure 10:   WINNN CMAM programme roll-out, September 2011–August 2017

State	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17
Zamfara		�				
Jigawa						
Katsina						
Kebbi						
Yobe						
Source: WINNN service data						

CMAM services are delivered by the local health system with WINNN support, and they therefore depend on different levels of operation and responsibility within health facilities and local, state and federal governments. While WINNN is the only programme providing CMAM services in its focal LGAs, other CMAM programmes operate in the WINNN focal states and also aim to strengthen capacity for CMAM services.

WINNN also relies on two other key groups to provide inputs to implement CMAM services successfully. The first group are CVs, who are recruited, trained and supervised by WINNN to support at OTP facilities. CVs receive stipends to cover trainings and meetings but are not generally remunerated for their time. The second group are the caregivers of children with SAM, who incur costs in accessing CMAM services in terms of their time and expenses spent travelling to and from and waiting at the health facilities.

These four groups – WINNN, government, CVs and caregivers – therefore all contribute important inputs to the CMAM programme. This is why we take a societal perspective to the costing.

However, we also present results from a health services perspective, given that this is more useful for government in terms of understanding the budgetary costs of the programme.

5.2   Findings

This section gives our estimates of the cost per child treated at various CMAM programme centres before bringing them together to provide an overall cost per child treated estimate. Using the societal perspective, as explained in Section 2.3.1, and similarly to IYCF cost centres, there are three levels at which costs are incurred:

1. health facility;

2. community; and

3. higher-level programme.

Each cost level is explained in turn. Further detail on the CMAM programme in northern Nigeria, as supported by WINNN, is also included in this section to put the findings in context.

5.2.1   Health facility-level costs

Health facility-level costs are all costs that are directly incurred in delivering an intervention to an individual in the health facility—in this case, treating under-five children with SAM through OTP and SC facilities. These are sometimes referred to as treatment costs. Such costs comprise: 1) medicines including RUTF and F75/F100; 2) health worker inputs—the time spent by different cadres of health workers on delivering the intervention; and 3) a proportion of overhead costs attributable to CMAM programme delivered within the health facility.

OTP

SAM cases among children under six months without complications and having good appetite are treated at OTP facilities. OTP services are provided at PHC facilities on a weekly basis on CMAM days. On these days, new children with SAM are admitted to the programme and follow-up clients also attend for an assessment of their recovery status. Patients receive clinical care, nutrition counselling, and home-based treatment with RUTF. On non-CMAM days, OTP facilities usually provide the existing standard health services, which do not include the standardised CMAM services provided on CMAM days.

There are four cost items associated with the treatment received at OTP facilities: RUTF, other routine medicines, health worker costs and health facility overhead costs. Table 8 reports the average cost per child treated for every item.

Table 8: OTP health facility-level cost

Cost item	Total
RUTF cost per treated child[1]	£28.55[5] ($44.58)
Other routine medicines cost per treated child[2]	£0.54[5] ($0.84)
Health worker cost per treated child[3]	£2.81[5] ($4.39)
Health facility overhead cost per treated child[4]	£3.14[5] ($4.91)
Total	**£35.05[5] ($54.73)**

All of the above are OPM calculations using the following sources:
1/ Patient Registration Cards, UNICEF procurement data, LGA-/state-level data collection;
2/ Patient Registration Cards, UNICEF procurement data, UNICEF procurement data from the One Health Tool;
3/ Patient Registration Cards, HFS, LGA-/state-level data collection;
4/ WHO-CHOICE estimates; and
5/ using an exchange rate of 1.56, calculated as the average of representative rates for the period September 2011 to August 2016 (Source: IMF)

RUTF is the most expensive element of the costs of treatment received at OTP facilities, at **£28.55 ($44.58) per child treated on average**. It is procured by UNICEF and delivered to the UNICEF zonal store. States and LGAs then have responsibility for transporting the RUTF from the UNICEF zonal store to the state medical stores, and from state medical stores to the health facilities, respectively, although ACF and SCI sometimes provide *ad hoc* support in both cases. UNICEF procured RUTF at an average cost of £32.23 ($50.32) a carton (or £0.21 a sachet, as each carton contains 150 sachets) over the first five years of the WINNN programme. Storage and transportation of RUTF, from the port to the health facility, cost £5.81 ($9.07) a carton (or £0.04 a sachet), of which UNICEF spent £2.59 a carton and the state and LGA spent £3.22 a carton. This means that of the £0.25 RUTF costs per sachet, 92% (£0.23) is incurred by WINNN (UNICEF) in procurement, storage and distribution costs, and 8% (£0.02) is incurred by the government in the supply chain expenditure between UNICEF zonal stores and health facilities.

At each CMAM day children with SAM are prescribed the amount of RUTF that is appropriate to their weight for a week, until the next CMAM day. Based on our sample of Patient Registration Cards, each SAM case received on average 113 sachets of RUTF through the course of the treatment received at OTP facilities. At a unit cost of £0.25, this equates to £28.55 ($44.58) per child treated.

Other routine medicines are given to **SAM cases at OTP facilities, at £0.54 ($0.84) per child treated on average**. In addition to RUTF, there are certain other medicines that are routinely prescribed, as appropriate to the child's age, weight and medical history, during SAM treatment. These medicines help prevent and treat childhood illnesses associated with SAM that can compromise a child's nutritional progress. The Nigerian CMAM protocol recommends that children be routinely given antibiotics, Vitamin A, anti-malarials, measles vaccination and deworming tablets.[18] Table 9 shows the schedule for each routine medication (except for measles vaccination[19]), responsibility for procurement and unit cost of the medicine. It also shows the

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[18] Federal Ministry of Health (2011) 'National Guidelines for Community Management of Acute Malnutrition'.
[19] We do not include measles vaccination, though it is part of the routine protocol for treatment at OTP facilities, because this is more an example of how the CMAM programme integrates with other services, rather than a direct part of SAM treatment.

proportion of SAM cases that receive each routine medicine, and the quantity received through the course of treatment, to show how the £0.54 ($0.84) per child treated on average is calculated.

Table 9:   OTP routine medicines

Medicine	Further information	Unit	Procured by	Given to	% receiving this medicine[1]	Number of units received[2]	Unit cost[3,4]
Amoxicillin	Antibiotic	Bottle	WINNN and government	All children at admission	Children aged 6–59 months: 59%	1	£0.56 ($0.88)
Vitamin A	Essential to support rapid growth and to help combat infections	Tablet	Government	All children at admission if no oedema and not already given in past one month	Children aged 6–12 months: 12% Children aged 13–59 months: 16%	Children aged 6–12 months: 100,000 IU tablet Children age 13–59 months: 200,000 IU tablet	100,000 IU tablet: £0.02 ($0.03) 200,000 IU tablet: £0.03 ($0.05)
Artemether and Lumefantrine	Anti-malarial	Tablet	Government	All children 6–59 who test positive for malaria at admission	Children aged 6–59 months: 32%	1 tablet twice a day for three days: 6 tablets	£0.10 ($0.16)
Albendazole	Deworming	Tablet	WINNN and government	All children 12–59 months at second visit	Children aged 12–23 months: 10% Children aged 24–59 months: 5%	Children aged 12–23 months: 0.5 400 mg tablet Children aged 24–59 months: 1 400 mg tablet	400 mg tablet: £0.01 ($0.02)

1/ Percentage of children under five who are of the specified age range and received that medicine at OTP care. OPM calculation using Patient Registration Cards
2/ OPM assumptions based on Federal Ministry of Health (2011) 'National Guidelines for Community Management of Acute Malnutrition'
3/ Unit costs of Amoxicillin and Albendazole are estimated using UNICEF procurement data. For non-WINNN procured commodities (Vitamin A, anti-malarials) estimates from UNICEF procurement data from the One Health Tool
4/ Estimates in GBP were calculated using an exchange rate of 1.56 (average of representative rates for the period September 2011 to August 2016, source: IMF)

The health worker cost is £2.81 ($4.39) per child treated on average. Health workers have many duties on CMAM days, from conducting a medical examination and appetite test to indicate if the child meets OTP admission criteria, through prescribing and giving RUTF and routine medicines, to filling in Patient Registration Cards and other records. The ORIE HFS found that health workers spend on average 6.4 hours at the OTP facility working on a CMAM day. This also includes the time spent providing IYCF counselling on a CMAM day (ORIE Health Facility Survey-final report, 2016).

Some health workers also have CMAM-related duties on non-CMAM days as well, which include tasks to prepare for and wrap up a CMAM day. About 54% of health workers reported in the ORIE HFS that they spend any time on CMAM-related activities on non-CMAM days—4.1 hours per week on average (ORIE Health Facility Survey-final report, 2016). This means that the average health worker spends 8.5 hours a week on CMAM activities.

Health workers of various grade levels work on the CMAM programme. Nigeria has a consolidated health salary structure that specifies the range for the basic salary at each grade and also the various allowances to which a health worker may be entitled. Based on the sample of health workers working at OTP facilities during the ORIE HFS, the average hourly salary plus relevant allowances of a health worker at an OTP facility is £1.42 an hour (ORIE Health Facility Survey-final report, 2016). This means that it costs the government £12.10 a week to employ the average health worker for 8.5 hours of CMAM activities.

With an average of 5.5 health workers and 153 patients at each health facility, according to the ORIE HFS, this means that each patient receives £0.44 worth of health worker time per visit (ORIE Health Facility Survey-final report, 2016). Each child on average makes 6.4 visits per episode of SAM, according to our sample of Patient Registration Cards, which means that over the course of their treatment they receive £2.81 worth of health worker time.

Facility overheads

For a complete costing, it is important to include a share of health facility overheads to the direct costs of delivering the OTP in a health facility. In the absence of primary data from the WINNN programme, we use standard WHO-CHOICE estimates of health facility overheads. These are typically used in costing studies. We estimate that the **OTP has overhead costs per child treated of £3.14 ($4.91) on average**. This is estimated by taking the WHO-CHOICE estimate of £1.22 ($1.91) in overhead costs per outpatient visit to a rural public health facility with no beds in Nigeria and adjusting for the fact that the WHO-CHOICE estimates already include health worker costs. We have already accounted for these, and so we scale the cost to count only infrastructure—building rent and utility costs. This is then multiplied by the average number of outpatient visits per child with SAM for the treatment received at the CMAM facility (6.4 visits) to arrive at the total overhead cost per child treated.

SC

SAM cases with complications or among children under six months are referred to SC facilities. These centres are usually based within the paediatric services of state hospitals, and in some cases at the comprehensive health centre at the LGA level. Given their critical condition, children receiving the treatment given at SC facilities are hospitalised in order for them to receive the various kinds of clinical treatment and stabilisation with therapeutic milk. Caregivers often stay with their child at the facility while the treatment takes place. When the child's condition improves, the child is normally transferred from SC sites to the nearest OTP site, in order to complete their rehabilitation.

There are five cost items associated with service delivery at SC facilities: RUTF, therapeutic milks F75 and F100, other routine medicines, health worker time and facility overheads. Table 10 reports the average cost per child treated for every item.

Table 10:   SC health facility-level cost

Cost item	Total[6/]
RUTF cost per treated child[1/]	£1.41 ($2.21)
F75 and F100 cost per treated child[2/]	£3.12 ($4.87)
Other routine medicine cost per treated child[3/]	£0.37 ($0.58)
Health worker cost per treated child[4/]	£32.89 ($51.35)
Facility overheads[5/]	£24.04 ($37.54)
Total	**£61.84 ($96.55)**

All of the above are OPM calculations using the following sources:
1/ Patient Registration Cards, UNICEF procurement data, higher-level data collection (interviews with SNOs and LNOs);
2/ Patient Registration Cards, UNICEF procurement data;
3/ Patient Registration Cards, UNICEF procurement data, UNICEF procurement data from the One Health Tool;
4/ Patient Registration Cards, HFS, higher-level data collection;
5/ WHO-CHOICE estimates; and
6/ estimates in GBP were calculated using an exchange rate of 1.56 (average of representative rates for the period September 2011 to August 2016, source: IMF).

RUTF costs £1.42 (**$2.21) per average child treated at SC facilities**. This is much less than at an OTP facility (where it is £28.55 ($44.58) per child treated) but this is not surprising, given that children over six months only receive RUTF at SC facilities once they have been stabilised—their appetite has recovered and medical complications and/or oedema are being resolved. That is, they receive RUTF in the transition phase, when they are out of the emergency period and are being prepared for discharge to an OTP facility, and at the time of discharge. Children under six months do not receive RUTF. Based on our sample of health facility Patient Registration Cards, each SAM case received on average 5.6 sachets of RUTF in total, through the course of the treatment at a SC facility and at discharge. At a unit cost of £0.25 per sachet (including procurement, distribution and transportation costs incurred by WINNN, states, and LGAs), this equates to £1.41 ($2.21) per child treated.

F75 and F100 cost £3.12 ($4.87) per child treated at SC facilities. F75 is a crucial medicine in the SC component as it is used for the initial feeding of the child in the stabilisation phase until the appetite has recovered and medical complications and/or oedema are resolved. F100 is used in the transition phase if RUTF is not available, the child is refusing RUTF or cannot consume the required daily ration. The Nigerian protocol for SC facilities[20] suggests it is preferable to use RUTF in the transition phase, although the two diets (F100 and RUTF) are nutritionally equivalent[21]. SAM children under six months are breastfed and given supplementary diet with F75 if they are oedematous, and F100 dilute or generic infant formula if they are not. Similarly to RUTF, these therapeutic milks are procured by UNICEF, and the storage and distribution responsibilities are shared between UNICEF, the states and LGAs, with *ad hoc* support from ACF and SCI. However, we are only able to capture the storage and distribution costs incurred by UNICEF and not that incurred by the states or LGAs.

Each sachet of F75 costs £0.31 ($0.48) to procure and £0.02 ($0.04) to store and distribute; each sachet of F100 costs £0.40 ($0.63) to procure and £0.04 ($0.06) to store and distribute. Based on our sample of health facility Patient Registration Cards, each SAM case received on average 8.8

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[20] Federal Ministry of Health (2016) 'National Guidelines for Inpatient Management of Severe Acute Malnutrition in Infants and Young Children in Nigeria'.
[21] RUTF is preferable in the transition phase since children should get habituated to being fed with RUTF so they can continue treatment with it as outpatients in their homes. Another advantage is that feeding with RUTF does not require surveillance during the night, reducing the need for night staff (Federal Ministry of Health, 2016).

sachets of F75 and 0.4 sachets of F100 through the course of the treatment at a SC facility. At unit costs of £0.33 and £0.44, respectively, this equates to £3.12 ($4.87) per child treated.

Other routine medicines are given to SAM cases at SC facilities, **at £0.37 ($0.58) per child treated on average**. The Nigerian protocol for SC facilities[22] considers antibiotics, anti-malarials, measles vaccine and specific medicines for complications, such as Vitamin A, ReSoMal and anti-fungal, as routine first-line medicines at SC facilities.

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[22] Federal Ministry of Health (2016) 'National Guidelines for Inpatient Management of Severe Acute Malnutrition in Infants and Young Children in Nigeria'.

Table 11 shows the schedule for these medicines (except for measles, anti-malarials and anti-fungal[23]), responsibility for procurement and unit cost of the medicine at SC facilities. We also include the cost of deworming pills given to children who stay at the inpatient facility for the rehabilitation period.

[23] Similarly to routine medicines for treatment at OTP facilities, we do not include measles vaccination because this is more an example of how the CMAM programme integrates with other services, rather than a direct part of SAM treatment. Anti-malarials and anti-fungal are not included due to data limitations in the patient cards collected at SC.

Table 11:   SC routine medicines

Medicine	Further information	Unit	Procured by	Given to	% receiving this medicine[1]	Number of units received[2]	Unit cost[3,4]
Amoxicillin	Antibiotic	Bottle	WINNN and government	All children 6–59 months at admission All children under 6 months greater than 2 kg at admission	Children 6–59 months: 63% Children < 6 months: 1%	1	£0.56 ($0.88)
Vitamin A	Essential to support rapid growth and to help combat infections	Tablet	Government	Children with eye signs of Vitamin A deficiency or history of measles	Children under 6 months: 0% Children age 6–12 months: 0% Children age 13–59 months: 7%	Children under 6 months: 50,000 IU tablet Children 6–12 months: 100,000 IU tablet Children 13–59 months: 200,000 IU tablet	50,000 IU tablet: £0.03 ($0.04) 100,000 IU tablet: £0.02 ($0.03) 200,000 IU tablet: £0.03 ($0.05)
ReSoMal	Oral rehydration salts for children with SAM	Sachet	WINNN	Children presenting dehydration	Children under 6 months: 4% Children 6–59 months: 6%	0.4 of a 42 g sachet	£0.16 ($0.25) per sachet
Albendazole	Deworming	Tablet	WINNN and government	All children 12–59 months	Children 12–23 months: 11% Children 24–59 months: 12%	Children 12–23 months: 0.5 400 mg tablet Children 24–59 months: 1 400 mg tablet	400 mg tablet: £0.01 ($0.02)

1/ Percentage of children under five who are of the specified age range and received that medicine during treatment at SC facilities. OPM calculation using Patient Registration Cards

2/ OPM assumptions based on Federal Ministry of Health (2016) 'National Guidelines for Community Management of Acute Malnutrition'

3/ Unit costs of Amoxicillin, Albendazole and ReSoMal are estimated using UNICEF procurement data. Unit costs of non-WINNN procured commodities, such as Vitamin A, are based on UNICEF procurement data from the One Health Tool

4/ Estimates in GBP were calculated using an exchange rate of 1.56 (average of representative rates for the period September 2011 to August 2016, source: IMF)

Health worker cost is £32.89 ($51.35) per average child treated at SC facilities. This is far more than at OTP facilities (where it is £2.81 ($4.39) per child treated) but this is not surprising, given that the human resources model is very different for the provision of the OTP component compared to the provision of the SC component. As SC facilities are based within the paediatric services of state hospitals or LGA-level comprehensive health centres, health workers tasks are shared among different paediatric services. SC facilities are open all day, seven days a week, compared to OTP facilities which only operate on CMAM days and take over the PHC facility on that day. The ORIE HFS found that health workers at SC facilities spent on average three hours the previous day on SAM care-related activities (ORIE Health Facility Survey-final report, 2016). This equated to 39%[24] of their total work time (7.6 hours), with significant proportions of the remainder being spent on non-SAM patient care (29%), general admin, cleaning, preparation of medicines, supplies and equipment (20%), and work outside the SC facility (12%).

The health worker–patient ratio is very different for the treatment received at SC facilities compared to the treatment received at OTP facilities, and, as befitting the level of care being provided, health workers at SC facilities have on average a marginally higher grade and are therefore slightly better paid. Whereas at OTP facilities the ORIE HFS found a ratio of 28 patients to every health worker, at SC facilities it found a ratio of just over one patient to every health worker (ORIE Health Facility Survey-final report, 2016). Based on the sample of health workers working at SC facilities during the ORIE HFS, the average hourly salary plus relevant allowances of a health worker is £1.75 an hour. This means that the government spends £5.25 to employ an average health worker for their three-hour work time per day at a SC facility. With 4.6 health workers and 5.9 patients on average at each health facility, according to the ORIE HFS, this means that each patient receives £4.09 worth of health worker time per day at a SC facility (ORIE Health Facility Survey-final report, 2016). Each child on average stays at the SC facility for eight days, according to our sample of Patient Registration Cards, which means that over the course of their treatment each child treated receives £32.89 ($51.35) worth of health worker time.

Facility overheads

For a complete costing, it is important to include a share of health facility overheads to the direct costs of delivering the SC component. In the absence of primary data from the WINNN programme, we use standard WHO-CHOICE estimates of health facility overheads. These are typically used in costing studies. We estimate that provision of the **SC component has overhead costs per child treated of £24.04 ($37.54) on average**. This is estimated by taking the WHO-CHOICE estimate of £7.49 ($11.69) in overhead costs per inpatient visit to a rural primary-level hospital in Nigeria and adjusting for the fact that WHO-CHOICE estimates already include health worker costs. We have already accounted for these, and so we scale the cost to count only infrastructure—building rent and utility costs. This is then multiplied by the average number of inpatient days per SAM child for the SC facility (eight days) to arrive at the total overhead cost per child treated.

5.2.2   CV costs

CMAM CVs are both men and women who work at health facilities on CMAM days as well as in their catchment communities for the rest of the week.

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[24] This includes SAM patient care (28% of their total work time) and a SAM-attributed share of general activities, such as admin, cleaning and preparation of medicines, supplies and equipment (11% of their total work time).

At OTP facilities

Some of the CVs' duties at the health facility on a CMAM day include counselling mothers on feeding practices, ensuring caregivers understand how to use RUTF and assisting health workers in attending caregivers. In spending time doing so, they incur costs, such as travel expenses. The ORIE HFS found that CVs incur expenses of an average of £0.46 on a CMAM day (ORIE Health Facility Survey-final report, 2016). With 153 SAM patients and 13 CVs present on the CMAM day, this equates to £0.04 per child per visit. Each child on average makes 6.4 visits per episode of SAM, according to our sample of Patient Registration Cards, which means that over the course of their treatment CVs spend £0.24 to work on CMAM days per child treated.

There is also an opportunity cost of the CVs' time spent working on the CMAM day. On average, according to the ORIE HFS, a CMAM CV gives up £1.63 of income to work on a CMAM day (ORIE Health Facility Survey-final report, 2016). With 153 SAM patients and 13 CVs present on the CMAM day, this equates to £0.13 per child per visit, or £0.86 CV costs per child treated, given that a child makes on average 6.4 visits per episode.

On average, **CV costs (expenses and opportunity costs) at OTP facilities are £1.11 ($1.73) per child treated.**

At the community

Activities in CVs' communities mostly include community mobilisation, screening and tracking of defaulters. Again, there are costs to doing this, including the CVs' expenses and the opportunity cost of their time. Using a similar approach to that described above, we estimate that CVs spend £0.31 on expenses per child treated and have an opportunity cost of £0.48 per child treated for their work in the community, outside of CMAM days.

On average, **CV costs (expenses and opportunity costs) in the community are £0.79 ($1.24) per child treated**.

Overall, we estimate a total cost of CV work at both OTP facilities and the community of £1.90 ($2.97) per child treated.

5.2.3   Caregiver costs

Caregivers (the majority of whom are women) of children with SAM incur costs in accessing CMAM services, in terms of their time and expenses spent travelling to and from and waiting at the health facilities. Caregivers' expenses can be directly estimated since they refer to explicit cash costs. The opportunity cost of caregivers' time is intrinsically related to the time caregivers spend at facilities—longer travel times and more hours spent at the facility mean caregivers have greater opportunity costs. We estimate opportunity costs as forgone income: that is, money given up to be at the facility by caregivers who do some income-generating activity.

OTP

For treatment received at OTP facilities, caregivers must travel back and forth to the health facility every week for the child's course of treatment. They must also spend time at the facility, being seen by the health workers and CVs and waiting to see them. All this involves costs that they would not otherwise incur. Using data from the ORIE HFS (ORIE Health Facility Survey--final report, 2016), we estimate that caregivers spend on average £0.54 in expenses and £0.19 in the opportunity cost of their time for each visit to the OTP facility. With each child making on average

6.4 visits per episode, this equates to £3.51 in expenses and £1.22 in opportunity costs per episode. Thus, **caregivers spend £4.73 ($7.39) per child treated at OTP facilities, on average.**

Table 12:   OTP caregiver expenditure

Cost item	Total
Caregivers' expenses per child treated	£3.51[1/] ($5.48)
Caregivers' opportunity costs per child treated	£1.22[1/] ($1.91)
Caregivers' total costs per child treated	**£4.73[1/] ($7.39)**
OPM calculations using the HFS and Patient Registration Cards 1/ Using an exchange rate of 1.56, calculated as the average of representative rates for the period September 2011 to August 2016 (Source: IMF)	

SC

At SC facilities, caregivers and other adult companions[25] (we estimate 1.4 carers per child for each day at the SC facility, on average) stay with the child at the inpatient facility for the duration of their stay, which is eight days on average. Caregivers must also, of course, travel with the child to the SC facility, which is typically farther away from their home than the OTP facility. All this involves costs that they would not otherwise incur.

We estimate that on average caregivers spend £0.85 in expenses and £1.09 in the opportunity cost of their time (and of their adult companions) on each day at the SC facility. With each child spending on average eight days per episode, this equates to £6.80 in expenses and £8.77 in opportunity costs per episode. Thus, **caregivers spend £15.58 ($24.33) per child treated through SC facility treatment.**

Caregiver costs for the SC component are higher than for the OTP component since the associated level of child care for the SC component is more intense than for the OTP one. This affects the resources caregivers incur, in terms of time and expenses. For example, average expenses and opportunity costs are relatively higher per one day at SC facilities than per visit to OTP facilities, since the time spent on an OTP visit (including travel back and forth to the health facility) is around five times shorter[26] than a full day of stay at the SC facility. In addition, the course of treatment is longer in SC facilities than OTP facilities (8 vs 6.4 days), and at SC facilities, caregivers stay with other adult companions at the facility (whose expenses and opportunity costs are also accounted for) while at OTP facilities, on average, only one caregiver (with no adult companions) goes with her child to a CMAM day.

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[25] Adult companions cover people over 15 years of age.

[26] Using data from the ORIE HFS, we estimate that caregivers spend on average 2.9 hours at the health facility on a CMAM day and spend approximately 1.6 hours traveling back and forth to the health facility, totalling an average of 4.5 hours spent per OTP facility visit.

Table 13:   SC caregiver expenditure

Cost item	Total
Caregivers' expenses per treated child	£6.80[1/] ($10.62)
Caregivers' opportunity costs per child treated	£8.77[1/] ($13.70)
Caregivers' total costs per child treated	**£15.58[1/] ($24.33)**
OPM calculations using the HFS and Patient Registration Cards **1/ Using an exchange rate of 1.56, calculated as the average of representative rates for the period September 2011 to August 2016 (Source: IMF)**	

5.2.4   Higher-level programme costs

Higher-level programme costs are those incurred at a 'higher level' than the health facility or patient: that is, money that funds activities at the national, state and LGA levels that enable the effective implementation of the CMAM programme. Two broad groups incur these costs: 1) the WINNN programme; and 2) state and LGA government. Broad categories of activities include:

- training;
- social mobilisation;
- M&E; and
- planning and coordination.

Table 14 shows how these activities map to different costs incurred by WINNN and the government.

Table 14:   CMAM programme activities

	Training	Social mobilisation	M&E	Planning and coordination
Human resources[1]	WINNN: time training state and LGA officers Gov't: time step-down training health workers and CVs	WINNN: time for mobilisation of CVs CVs: non-reimbursed time (approximated in Section 5.2.2)	WINNN: time doing M&E for programme reporting and supervision. Payment of ward focal supervisors and independent monitors Gov't: time doing M&E for government reporting and supervision	WINNN: time for CMAM coordination meetings at federal, state and LGA levels Gov't: time for CMAM coordination meetings at federal, state and LGA levels
Materials, allowances and meeting expenses[2]	WINNN: Materials, per diems, travel allowances, venue hire for training of health workers, state and LGA officers	WINNN: Materials, per diems for trainings or meetings, travel allowances, venue hire for mobilisation of CVs	WINNN: Materials, per diems, travel allowances, venue hire for programme reporting and supervision	WINNN: Materials, per diems, travel allowances, venue hire for CMAM coordination meetings at federal, state and LGA levels
Equipment	WINNN: vehicles and other equipment (anthropometric scales, computers, phones, furniture, generator)			
Operations and maintenance	WINNN: rent, transport (fuel, maintenance), utilities (electricity, gas, water), communications, other operating expenses			

1/ WINNN expenditure on human resources include payments to staff and non-staff (e.g. technical assistance, stipends for health workers excluding stipends for training).

2/ This category corresponds to the sum of the following WINNN cost categories presented in Table 1: training expenses, M&E expenses, and goods and services.

WINNN programme

Table 15 shows WINNN CMAM programme expenditure over the first five years of the programme. This money funds WINNN activities at the national, state and LGA levels that enable the effective implementation of the CMAM programme. Therefore, RUTF and other medicines are excluded from this cost centre and included in the health facility level cost centre (Section 5.2.1). Money spent on the CMAM programme at the national level is allocated proportionally across the states.

Table 15:   WINNN CMAM programme expenditure, 2011/12 to 2014/16

Cost item	Sources	Total (million)	%
Human resources	WINNN expenditure data	£3.4 ($5.3)	55%
Materials, allowances and meeting expenses	WINNN expenditure data	£1.9 ($2.9)	30%
Equipment	WINNN expenditure data	£0.5 ($0.8)	8%
Operations and maintenance	WINNN expenditure data	£0.4 ($0.6)	6%
Total WINNN expenditure on the CMAM programme	WINNN expenditure data	**£6.2 ($9.6)**	**100%**
Number of children treated (unique CMAM programme beneficiaries)	WINNN monitoring data	225,743	
Average WINNN CMAM programme cost per child treated	ORIE calculation	**£27.2 ($42.5)**	
Estimates in GBP were calculated using an exchange rate of 1.56 (average of representative rates for the period September 2011 to August 2016, source: IMF)			

Human resources is the largest cost item across all the states, comprising 55% of WINNN CMAM programme expenditure overall (note that this excludes RUTF and other medicines, which are captured in Section 5.2.1). Altogether, £3.4 million worth of WINNN personnel time at central, state and LGA levels was spent across the first five years of the programme in designing and implementing the CMAM intervention. Expenditure on **materials and meeting expenses (for training, social mobilisation, M&E and planning and coordination)** is the next largest cost, comprising 30% of WINNN CMAM programme expenditure overall. Altogether, £1.9 million was spent in Years 1–5.

WINNN is not a very capital-intensive programme. Altogether, 8% (£0.5 million) of WINNN programme expenditure was on capital cost items, such as vehicles, medical equipment and other equipment. These capital costs have been annualised across the average lifespan for the associated category. Operations and maintenance costs of £0.4 million, or 6%, represent general WINNN overhead costs allocated to the CMAM programme.

We calculate a **WINNN CMAM programme expenditure cost of £27.23 per child treated**, which is calculated by dividing WINNN programme expenditure on the CMAM programme of £6.2 million by the number of unique CMAM beneficiaries across Year 1 to Year 5: 225,743.

State and LGA

Expenditure by the WINNN states and LGAs that enable the effective implementation of the CMAM programme includes time spent by SNOs, LNOs and other state-/LGA-paid staff on training, supportive supervision, M&E, programme reporting and planning of CMAM activities both at OTP and SC facilities. Note that contributions from states and LGAs for the procurement and distribution of medicines used in the treatment received at CMAM facilities are accounted for in the cost items above (Section 5.2.1).

We estimate an average **state/LGA human resources cost per child treated of £3.11 ($4.86) at OTP facilities and £0.62 ($0.97) at SC facilities**. These costs are estimated using the following information:

- We collected information on grade levels and time allocated to WINNN CMAM activities of state- and LGA-level staff in Jigawa, Katsina, Kebbi and Zamfara. The average state-level staff member spends 44 hours a month on CMAM activities, while the average LGA-level staff member spends 61 hours. This is double the time state-/LGA-level staff reported spending on WINNN IYCF activities (Section 4.2.4).

- Nigeria has a consolidated health salary structure that specifies the range for the basic salary at each grade and also the various allowances to which a health worker may be entitled. Given that the salaries of state-/LGA-level staff were not provided, the health salary structure collected for each state was used. Based on this and the grade levels of the state-/LGA-level staff working on the CMAM programme, we estimate the hourly salary of an average state-level staff member is £3.56 an hour, and that of an average LGA-level staff member is £2.77 an hour. This means it costs the government £156 a month to employ an average state-level staff member for 44 hours of work on CMAM activities (at both OTP and SC facilities), and £170 a month to employ an average LGA-level staff for 61 hours.

- With an average of 3.3 staff per state and 5 per LGA, the government spends on personnel costs a monthly average of £3,047 per WINNN state (assuming three LGAs per state). Using the shares of OTP and SC facilities in the four states in which we collected state-/LGA-level data[27], we estimate monthly personnel costs per WINNN state of £2,552 for activities concerning OTP care, and £495 for SC activities.

- Over the course of the first five years of the programme we estimate, according to the WINNN monitoring data, a monthly average of 817 unique CMAM beneficiaries. This means the government spent £3.11 ($4.86) worth of state-/LGA-level personnel time per child treated at OTP facilities, and £0.62 ($0.97) worth of state/LGA-level personnel time per child treated at SC facilities.

Table 16: State and LGA human resources expenditure on the CMAM programme

Cost item	Total
State and LGA human resources cost per child treated at OTP facilities	£3.11[1/] ($4.86)
State and LGA human resources cost per child treated at SC facilities	£0.62[1/] ($0.97)
Note: OPM calculation based on higher-level data collection in Jigawa, Katsina, Kebbi and Zamfara. SNOs and LNOs reported grade levels and time allocation to WINNN activities of their state-/LGA-level personnel. Data on health workers' salary structures were also collected at each state. WINNN monitoring data were used for the number of CMAM programme beneficiaries.	
1/ Using an exchange rate of 1.56, calculated as the average of representative rates for the period September 2011 to August 2016 (Source: IMF)	

5.2.5 Overall

Table 17 and Figure 11 bring together the estimates of the cost per child treated of various CMAM cost centres at the OTP and the SC facilities, and also show the cost per child treated through the CMAM programme overall. This table also shows the percentage composition of the cost per child treated for the various higher-level, health facility, and society cost items.

The cost per child treated through the CMAM programme overall is calculated as follows: SAM cases without complications are treated at OTP facilities only. In the absence of data from the WINNN programme, we assume that this applies to 85% of cases. Evidence from other programmes suggests that, typically, 15% of SAM cases need inpatient care (i.e. the children have complications or are under six months).[28] Once stabilised, these cases are then referred back to

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[27] Of all WINNN facilities in Jigawa, Katsina, Kebbi and Zamfara, 16% are SC facilities and 84% are OTP facilities.
[28] fhi360 (2012) CMAM Costing Tool. Version 1.1.

OTP facilities to complete their treatment. The cost per child treated overall is therefore calculated using the following formula:

Cost per child treated overall = 85% * cost per child treated at OTP facility + 15% * (cost per child treated at SC + cost per child treated at OTP facility)

Table 17:   CMAM programme cost per child treated by type of service and cost centre

Cost centre	OTP		SC		CMAM programme overall		
	GBP[1/]	%	GBP[1/]	%	GBP[1/]	USD	%
Higher-level costs	**26.8**	**39%**	**24.3**	**24%**	**30.4**	**47.5**	**36%**
WINNN programme	23.7	35%	23.7	23%	27.2	42.5	33%
Human resources	13.1	19%	13.1	13%	15.0	23.5	18%
Materials, allowances and meeting expenses	7.2	11%	7.2	7%	8.3	13.0	10%
Operations and maintenance	1.5	2%	1.5	1%	1.7	2.7	2%
Equipment	1.9	3%	1.9	2%	2.2	3.4	3%
State and LGA	3.1	5%	0.6	1%	3.2	5.0	4%
Health facility-level costs	**35.1**	**51%**	**61.8**	**61%**	**44.3**	**69.2**	**53%**
RUTF and F75/F100	28.6	42%	4.5	4%	29.2	45.6	35%
RUTF	28.6	42%	1.4	1%	28.8	44.9	34%
F75/F100 therapeutic milks	-	0%	3.1	3%	0.5	0.7	1%
Other medicines	0.5	1%	0.4	0%	0.6	0.9	1%
Health worker time	2.8	4%	32.9	32%	7.7	12.1	9%
Facility overheads	3.1	5%	24.0	24%	6.8	10.5	8%
CV costs	**1.9**	**3%**	**-**	**-**	**1.9**	**3.0**	**2%**
Expenses	0.6	1%	-	-	0.6	0.9	1%
Opportunity cost	1.3	2%	-	-	1.3	2.1	2%
Caregiver costs	**4.7**	**7%**	**15.6**	**15%**	**7.1**	**11.0**	**8%**
Expenses	3.5	5%	6.8	7%	4.5	7.1	5%
Opportunity cost	1.2	2%	8.8	9%	2.5	4.0	3%
Total: Health services perspective	*61.8*	*90%*	*86.1*	*85%*	*74.8*	*116.7*	*89%*
Total: Societal perspective	*68.5*	*100%*	*101.7*	*100%*	*83.7*	*130.7*	*100%*
1/ Using an exchange rate of 1.56, calculated as the average of representative rates for the period September 2011 to August 2016 (Source: IMF)							

Figure 11: **CMAM programme cost per child treated by type of service and cost centre**
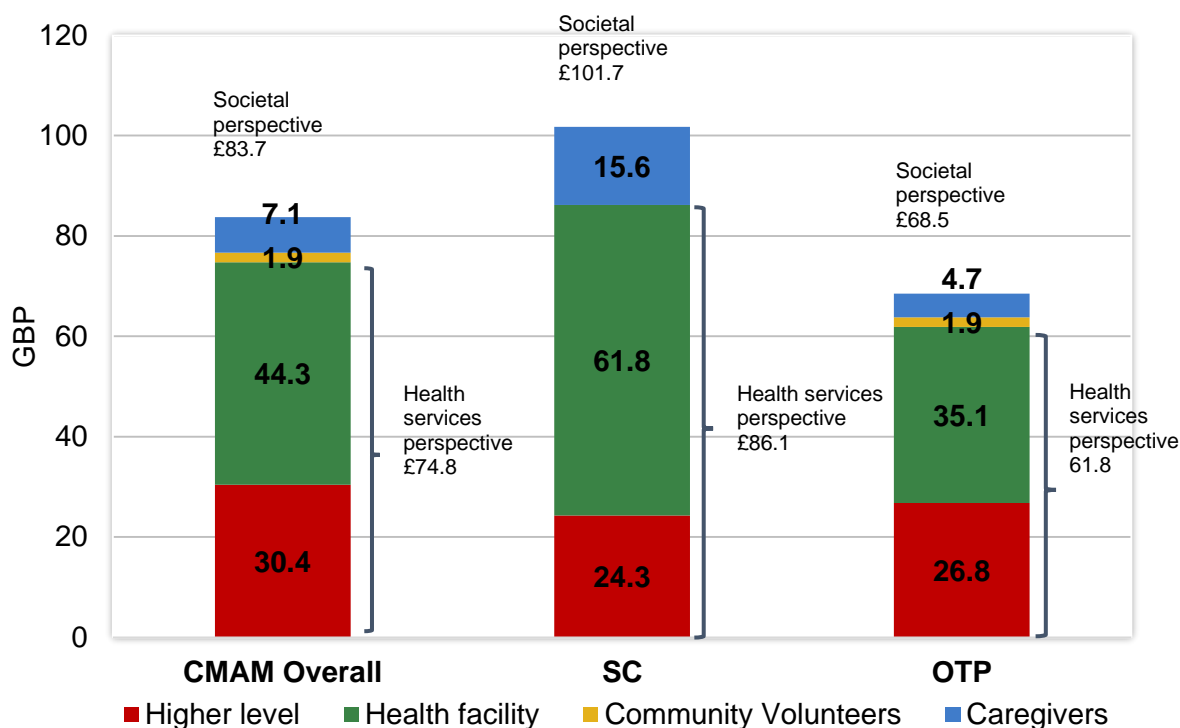
5.3   CMAM programme costs – summary findings

The main cost drivers of the CMAM programme are RUTF and WINNN higher-level programme costs. Our estimates show that they constitute 34% and 33%, respectively, of the overall the CMAM programme costs per child treated. In the case of the OTP component, RUTF and WINNN higher-level programme also constitute the largest elements (42% and 35%, respectively) of programme costs per child. For the SC component, the figure is quite different, given that the level of care provided is more intense, in terms of human resources and infrastructure. In this case, the costs incurred by the government in health worker inputs and facility overheads constitute the largest elements, at 56% of the costs of the SC component per child, followed by WINNN higher-level programme costs, at 23%.

The CMAM programme is not very capital-intensive. Our estimates show that 2.6% of the overall cost per child treated relates to capital expenditure. However, further investments in health facility and supply chain infrastructure would need to be considered more holistically for future implementation and sustainability, as evidenced by the current limitations of some facilities lacking enough supplies to provide the full set of CMAM services (ORIE Health Facility Survey-final report, 2016).

The cost per child treated is found to be higher for the SC component than for the OTP component, at £86 ($134), versus £62 ($97), respectively, from a health services perspective. Again, this is not surprising, given the original motivation for the introduction of the CMAM programme—to treat children with SAM earlier, and to prevent as many of the complications (and associated costs) of later treatment in an inpatient facility. Also, the human resource model at SC facilities is very different to that at OTP facilities. SC facilities usually operate seven days a week, with relatively more qualified staff, given the level of care required, which also has implications in terms of costs.

Introducing the societal costs of CVs and caregivers increases the cost burden of CMAM care per child treated, and not by a negligible amount. The societal perspective also considers the costs incurred by health service users, such as caregivers, and other members of the society implementing the programme, such as CVs, even if they are not fully financially compensated. We estimate that CVs incur costs per child treated, in terms of their time and expenses, of £1.90, and caregivers incur costs of £4.73 at the OTP facilities and £15.58 at the SC facilities. These costs combined constitute 11% of the overall CMAM programme cost per child treated from a societal perspective. These may be smaller relative to other costs from an overall perspective, but they represent a large burden for the CVs and caregivers themselves, and thus a scale-up model should evaluate whether some compensation should be offered.

6   Conclusions and discussion

An investment of £33.6 ($52.3) million over five years in five states in northern Nigeria represents a significant contribution to funding three nutrition-specific interventions in those states, and, moreover, to more generally supporting effective government planning and coordination for nutrition. However, this level of investment still represents a financial gap when compared to the NSPAN (2014–2019) or, more ambitiously, the Scaling Up Nutrition full coverage targets.[29][30]

WINNN is a people-intensive programme. 33% of overall WINNN expenditure is on human resources. This is understandable given the objective of the WINNN programme and the nature of its activities. However, the scale of expenditure by a donor-funded programme on human resources to support the delivery of these nutrition-specific interventions does call into question how far government can take over this commitment, even if some of the expenditure is the initial investment and/or is complementary to government expenditure.

The CMAM programme output has the largest expenditure share of the WINNN programme. 41% of WINNN programme expenditure between Year 1 to Year 5 was on the CMAM programme. Moreover, the cost per child estimates from a societal perspective indicate that other actors, including the government, CVs and caregivers, are also incurring a significant cost to deliver and access the CMAM programme. Of course, the costs are just one side of the story—the Cost-effectivess of the WINNN programme report, 2017 combines these cost estimates with effect data to understand whether this investment is justified, given the improvements in mortality likely to be achieved, compared to the alternative of existing health services for children with SAM with no CMAM programme.

WINNN higher-level programme costs constitute a significant component of the cost per beneficiary of the IYCF and the CMAM interventions. These costs continue to be large even though WINNN has a delivery model which is integrated into existing health systems. There are possible programmatic and methodological reasons for these findings. Programmatic reasons include the relatively high salaries of WINNN personnel, and capacity building for the CMAM and the IYCF interventions being personnel intensive. WINNN has trialled supporting an integrated programme, which by design always envisaged some trial and error and parallel systems with government. However, as evidenced by the still large WINNN higher-level costs per beneficiary, not as much has been handed over to the government during the programme as was originally envisaged. Methodological reasons for WINNN's large costs include our method for allocating WINNN personnel and other shared costs to WINNN outputs. Although this is a standard approach, this method will be less precise than directly coded costs (i.e. if WINNN staff kept timesheets by output). It is also difficult methodologically to draw the line between which WINNN support costs are necessary for the successful implementation of the current IYCF and CMAM interventions and which are more related to future implementation. Although the purpose of this report is not to suggest the cost model for the government taking over these interventions, these findings do raise questions as to how government would take over the WINNN programme costs. Some of these costs will likely be initial investment, complementary to the government expenditure, or will be reduced, given the less expensive salary structure of government human resources.

The RUTF cost estimate of £29 ($45) per child treated is not surprising given it is a high cost input with a price that is set in the international marketplace, and UNICEF is playing a

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[29] Federal Republic of Nigeria (2014) 'National Strategic Plan of Action for Nutrition'.
[30] World Bank (2014) 'Costed Plan for Scaling Up Nutrition: Nigeria'.

significant role in its procurement, both for Nigeria and internationally. There are no real economies of scale for this cost item, other than perhaps slight improvements in purchasing power for a larger order or in transportation costs. However, future reductions in the unit price of RUTF are expected to be crucial to determine sustainability for scaling up and the possibility of the government taking over this cost. For example, even over the course of the WINNN programme the unit cost of procurement of RUTF (excluding distribution, storage and transportations costs) declined from £35 per carton in Year 1 to £30 in Year 4, and £32 in Year 5.

The IYCF interventions comes at a much lower cost per beneficiary than the CMAM programme. We estimate a cost per child treated through the CMAM programme of £84 ($131) from a societal perspective and a cost per mother reached through the f-IYCF component of £10 ($16), and through the c-IYCF component of £12 ($19). Again, costs are just one side of the story—the cost-effectiveness analyses of these two interventions will be important in order to understand more fully how resources should be prioritised for health gain.

6.1 How our efficiency measurements compare to other studies

There is a lack of existing estimates in the global literature, and in particular for Nigeria, of the cost per mother reached of other IYCF interventions that are similar to the IYCF interventions of the WINNN programme, making comparisons difficult. Our focused literature search identified two costing studies of breastfeeding promotion programmes piloted in Uganda (Chola *et al.*, 2011) and South Africa (Nkonki *et al.*, 2014) using an intense peer support model. These interventions were much more expensive, at a cost per mother counselled of $139 in Uganda and $228 in South Africa. However, these are not directly comparable to the WINNN-supported IYCF interventions, which uses a different human resource structure and support model, and includes more than just breastfeeding promotion. In addition, NSPAN (2014–2019) uses a cost for community nutrition programmes for behaviour change communication of $5 per child. The source of this estimate is not clear, but it appears to be based on a study in 1999 related to a community nutrition programme in Asia (Mason *et al.*, 1999). There are many methodological differences in the approach used in Mason *et al.* (1999), compared to ours. First, our cost of the IYCF interventions estimation is per mother reached, not per child. A conservative assumption of two children under two per mother reached would give an estimate of $10 per mother reached, which is not too different from our estimates. Second, Mason *et al.* (1999) consider a support structure of one volunteer per 20 families, which is different to the WINNN-supported IYCF interventions, which aims to have five CVs per support group, with a maximum of 20 participants[31], i.e. equivalent to one CV per four participants. Third, although the methodology used in Mason *et al.* (1999) is not very clear it seems to be based on an estimation of the required investment over a 10-year period to bring about a substantial impact in regard to the prevalence of malnutrition for the countries under study[32]. This is very different to our methodology, which calculates the average cost per beneficiary of an intervention implemented over five years. Lastly, the context of Asian countries in 1999 considered in that study is very different to the current context in northern Nigeria.

Our estimate of CMAM programme cost per child is broadly similar to another recent societal estimate from northern Nigeria, and to other estimates of cost per child in similar contexts and settings. Variations in programme costs arise from different costing perspective used (health services vs. societal), assumptions regarding the coverage and

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[31] The WINNN IYCF behaviour change communication strategy establishes a maximum of 20 participants at each support group session (WINNN, 2015).

[32] Mason *et al.* (1999) cost calculations were estimated for eight Asian countries: Bangladesh, India, Cambodia, Vietnam, Pakistan, Sri Lanka, Philippines, and the People's Republic of China.

scale of the programme, and the human resource model of service delivery. Frankel, S., Roland, M. and M. Makinen (2015), in costing the CMAM programme supported by UNICEF through CIFF funding, estimate an overall societal cost per child treated of $123, which is slightly lower than our overall estimate of $131. Bachmann (2009), which is the study used in the DFID Business Case (2011), estimates an overall cost per child cured of $203 in Zambia from a health services perspective. The five-year (2014–2019) strategic plan for nutrition in Nigeria, NSPAN, estimates a much lower cost per child, at $80. The lower cost might be explained by the different methodology used,[33] which might not accurately reflect actual programmatic experience under WINNN and which does not include the full societal costs incurred by beneficiaries accessing the services. Also, that estimate assumes coverage of 35% of the target population (children 6–59 months of age), which might be different to those reached in WINNN-supported LGAs, given that the WINNN-supported CMAM programme was piloted in a limited number of facilities in each focal LGA and the supply of RUTF was also limited. **Interestingly, despite the differences in methodologies, the comparison with other CMAM programme cost estimates also show that RUTF and higher-level programme costs comprising the largest shares of the overall cost is a consistent finding across studies with different settings and delivery models.**

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[33] NSPAN 2014–2019 costing employed the 'program experience' methodology. This approach generates unit cost data that capture all aspects of service delivery, such as costs of commodities, transportation and storage, personnel, training, supervision, M&E, relevant overhead, wastage etc., for each intervention from actual programmes that are in operation in Nigeria, and considers the context in which they are delivered. Whenever possible, the unit costs of the nutrition-specific interventions in NSPAN were estimated using programmatic data that were provided by local IPs, the Federal Ministry of Health, and state governments based on programme experience. In cases where the intervention was not yet being implemented or local data were not available, global unit cost estimates from the World Bank were used (NSPAN, 2014).

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Annex A   Inception report

A.1   Volume I (excerpts)

A.1.1 Economic evaluation

A.1.1.1   Rationale and objectives of the economic evaluation workstream

The World Bank estimates that malnutrition is costing poor countries up to 3% of their yearly GDP. Moreover, malnourished children are at risk of losing more than 10% of their lifetime earnings potential. In resource-constrained health systems, the prioritisation of resource allocation across competing interventions requires evidence not only on effectiveness but also on cost-effectiveness. Such analysis is vital to the efficient allocation of resources to maximise health gains.

The objectives of the economic study include:

a) To estimate the direct and indirect costs and health-related outcomes associated with implementation of CMAM and IYCF interventions in northern Nigeria (WINNN Outputs 1 and 2);

b) To evaluate the cost-effectiveness of CMAM and IYCF interventions compared to routine care; and

c) To evaluate the direct provider-related costs associated with WINNN outputs 3 and 4.

A.1.1.2   Approach and methods

We propose to conduct separate economic evaluations of each WINNN programme output, primarily because the outputs have different objectives, target health conditions, health outcomes and population groups. A full economic evaluation of the CMAM programme will be based on the cost-utility approach. The cost-utility approach uses a generic outcome, in this case the DALY that allows comparison of cost-effectiveness across programmes. Primary studies will be conducted to evaluate programme effectiveness, service delivery costs, health service utilisation costs and household costs. Based on this, a decision tree model (or an alternative Markov model) will be developed to evaluate patient treatment pathways (from identification of malnutrition to treatment to health outcomes) using costs and outcomes in CMAM and non-CMAM care to estimate the incremental cost per DALY averted.

The economic evaluation of the IYCF interventions will compare programme delivery costs and health services costs against health outcomes that are directly influenced by the IYCF interventions. Based on primary data from the impact evaluation survey in intervention and control areas, the CEA will estimate the cost per unit of effectiveness outcomes such as the proportion of infants aged 0–6 months who are EBF and the proportion of children aged 6–23 months receiving foods from four or more groups (and if feasible, cost per DALY averted). Programme-related costs will be obtained in a primary costing exercise.

The economic evaluation of outputs 3 and 4 will be take the form of a programme-based cost analysis, as no direct outcome data will be collected/available for these outputs. These costing studies are important for understanding the budgetary and economic implications of the programmes for health services and the funder.

A.1.1.3   Key deliverables
CMAM programme and IYCF interventions:

- results of the primary data analysis for costs and outcomes of the CMAM programme;
- a fully functional economic model and cost per DALY analysis; and
- a detailed report outlining and explaining findings.

Outputs 3 and 4:

- analysis of programme-related costs; and
- a detailed report outlining and explaining findings.

A.1.1.4 Key activities by year

- 2012: Key decision-making on primary data collection and the approach to analyses.
- 2013: Planning and organisation of primary data collection activities for all four outputs (first half of 2013); data collection initiated during second half of the year.
- 2014: Primary data collection of economic data completed by the end of 2014; report on findings. Structure of the economic models completed in 2014.
- 2016: Data from the impact evaluation exercise will be available. Analysis of primary economic data for all outputs will be conducted. Economic models and cost analysis will be completed. Report writing and dissemination.

A.2 Volume II (excerpts)

A.2.1 ORIE economic evaluation

A.2.1.1 Introduction

Childhood malnutrition remains an important public health and development problem in low- and middle-income countries, especially in sub-Saharan Africa. The World Bank estimates that malnutrition is costing poor countries up to 3% of their yearly GDP. Moreover, malnourished children are at risk of losing more than 10% of their lifetime earnings potential (Bachmann, 2009). This can have a devastating economic impact on households. Caulfield *et al.* (2004) conducted a pooled analysis using 10 studies to estimate that 53% of child mortality is attributable to being underweight. Causes of death in malnourished children ranged from 44.8% for deaths due to measles to 60.7% for deaths attributable to dehydration as a result of diarrhoea.

Prevalence of malnutrition in Nigeria has been found to be consistently high in most national and international studies. The **Nigeria demographic and health survey 2008** suggests that **26.7%** of children under five are moderately or severely underweight; of these, **12.7%** were found to be severely underweight. More important, compared to previous surveys, the prevalence of malnutrition has not improved (27.3% in 1999 and 27.2% in 2003). Therefore, tackling malnutrition is one of the public health priorities for Nigeria.

DFID Nigeria is rolling out an ambitious £50 million, six-year programme to improve maternal, newborn and child nutrition which will reach 6.2 million under-fives in five states of northern Nigeria. The programme has five outputs that are listed below:

- Output 1: treatment of SAM via **CMAM** interventions through integrated services in primary health facilities;
- Output 2: community-based interventions to improve **IYCF practices** through EBF, weaning and complementary feeding;

- Output 3: the integration of **micronutrient interventions and deworming** into routine primary health services (Vitamin A supplementation for children, iron and folic acid for pregnant women);
- Output 4: more effective government planning and coordination in nutrition and related sectors at the national and state levels, and a stronger health system, through the **integration of direct nutrition interventions into routine health services** funded by the government;
- Output 5: improved knowledge of what works to tackle child undernutrition in northern Nigeria via **ORIE**, which will be conducted by independent researchers and evaluation experts (output 5).

The economic evaluation workstream will concentrate primarily on outputs 1 and 2 for full economic evaluation, i.e. the CMAM programme and the IYCF interventions under the WINN programme. However, we will also discuss the scope of conducting costing studies (not full economic evaluations) for workstreams 3 and 4, i.e. the institutional implementation cost of the integration of micronutrient interventions and deworming (workstream 3) and integration of direct nutrition interventions into routine health services (workstream 4).

A.2.1.2   Economic evaluation of CMAM programme/IYCF interventions: rationale and approaches

In resource-constrained health systems across the world, and in particular in developing countries, the prioritisation of healthcare resource allocation across competing interventions requires evidence not only on effectiveness but also on cost-effectiveness. The CEA involves evaluating the impact of interventions on both costs and health outcomes. Such analysis is vital to the efficient allocation of resources to maximise health gains.

There are primarily three potential approaches to full economic evaluation that can be used for the evaluation of the CMAM programme and the IYCF interventions (we have ignored cost–benefit analysis and cost-minimisation analysis as they are not relevant to the context of evaluation of the CMAM programme/IYCF interventions). These are CEA, cost-utility analysis and cost-consequence analysis. The three approaches differ in terms of how the outcome is measured against the costs. All three approaches are described below and their usefulness in the context of the current study is discussed.

A.2.1.3   Approaches to economic evaluation

Cost-effectiveness approach

In a CEA, the outcome is programme-specific, such as the reduction in blood pressure (Logan, 1981), number of positive cases detected (Hull *et al.*, 1981), change in asthma episode days (Sculpher *et al.*, 1994) and gain in life years (Mark *et al.*, 1995). In the particular case of the CMAM programme, such outcomes may be related to indicators of nutritional status such as anthropometric indicators based on body size and composition. In the case of the IYCF interventions, the relevant indicators may be the proportion of infants aged 0–6 months who are EBF and/or proportion of children aged 6–23 months receiving foods from four or more food groups. The CEA will produce estimates of VfM in terms of cost per unit of outcome measure.

CEA is an incremental analysis, i.e. it evaluates the difference in costs and difference in outcomes between the interventions being evaluated. The resulting ICER of the CMAM programme/IYCF interventions will reveal the optimal alternative (compared to the control intervention), which may be: i) same cost but more effective than the alternative; ii) less expensive and at least as effective as the alternative; or iii) more expensive while providing additional benefit that is worth the cost.

This last scenario is the most common likely outcome of CEA. The incremental cost per unit of outcome is then evaluated against the willingness to pay for gain in one unit of the outcome.

CEA can be useful when the decision-maker is interested in comparing alternatives within a particular field, for instance the CMAM programme against other interventions targeting malnutrition. However, the government or international funding organisations (i.e. a decision-maker with a broad health sector mandate) with priorities across all health conditions need to use outcome measures that are directly comparable across several health conditions to evaluate the maximum VfM in terms of health gain. As a result, generic measures of health, such as DALYs or quality-adjusted life years (QALYs) are frequently employed.

On the other hand, CEA's outcome (such as reduced incidence of malnutrition) can be easier to understand and communicate, especially when the focus of health gain is restricted to malnutrition. Moreover, the CEA approach is also useful in situations when converting specific outcomes to generic outcomes is not straightforward. This is likely to be the case when evaluating interventions that aim to promote breastfeeding and weaning (such as the case in the IYCF interventions). However, as we will discuss in the literature review section, only a limited number of economic studies have achieved this using modelling approaches.

Cost-utility approach

The cost-utility analysis is the most common method of economic evaluation in the literature. It uses a generic measure of health outcome that can be compared across programmes. The most commonly used outcome measure in the economic literature related to developing countries is the DALY. An alternative to DALYs is the QALY outcome, which values health outcomes based on public preferences. QALYs have been more commonly used in the literature related to developed countries, where country-specific value weights (or utility weights) are available for specific population groups. Both outcomes combine survival and health-related quality of life. We will discuss the DALY in detail below as it relates directly to the evaluation of CMAM programmes in the literature.

The DALY is primarily a measure of disease burden and has been used frequently in economic evaluations. DALY incorporates an age-weighting function assigning different weights to life years lived at difference ages. The calculation of DALYs is relatively simple as constant disability is often assumed. The formula to calculate DALYs averted is (Cairncross *et al.*, 2003):

DALYs averted= no. of deaths averted * YLL + no. of cases of illness averted * YLD

YLL = years of life lost due to premature mortality

YLD = year of life spent with disability

As discussed above, the advantage of using a generic measure like DALYs is that a decision-maker with a broad health sector mandate can compare VfM across several health programmes. For instance, Wilford *et al.* (2012) compared the cost per DALY averted of the CMAM programme in Malawi against other interventions such as the iron fortification programme in Malawi, with a cost per DALY of $66–70/DALY compared to the treatment of SAM with A cost per DALY of $41/DALY. Such an analysis puts the value of the intervention into perspective and allows decision-makers to prioritise healthcare financing.

It should be noted that the two terms 'cost-effectiveness' and 'cost-utility' are often used interchangeably in the literature. **This is because cost-utility analysis can be understood as a**

specific type of CEA where the outcome of interest is a generic measure. Cost-consequence analysis

While it is common practice in the health economics literature to take the cost-effectiveness or cost-utility approach based on short- or long-term outcomes (Briggs *et al.*, 2006; Drummond *et al.*, 2005), these approaches rely on translating the process or intermediate outcomes into a common outcome denominator, such as DALYs or QALYs. However, for interventions that have a diverse range of short-term outcome measures, a cost-consequence analysis is also appropriate. This approach is defined as an analysis 'in which costs and effects are calculated but not aggregated into quality-adjusted life-years or cost-effectiveness ratios' (Russell *et al.*, 1996). This method is used to display all the key costs and consequences associated with the intervention for the purpose of comparison; the consequences are expressed in the most appropriate natural units for each outcome measure. This approach is particularly relevant when a wide range of multidimensional process outcomes are of interest for a particular intervention (Godber, Robinson and Steiner, 1997). The information presented in this format is understandable and usable for non-health economists (Mauskopf *et al.*, 1998), and it also overcomes the need for complex economic modelling to estimate the long-term effects expressed in terms of a single common outcome. This approach has been used in many studies in recent years (e.g. Burger, 2010; Ritchie *et al.*, 2005; Bergmo, 2009; Barnett *et al.*, 2009).

However, the primary limitation of this approach is that it does not produce cost-effectiveness estimates in terms of cost per unit of outcome. Moreover, there is no generic measure of outcome to allow comparison across several conditions. Hence, cost-consequence analysis has limited application to situations where a single index cannot be used or is not meaningful.

Costing study

A costing study evaluates the costs associated with the delivery of an intervention; hence, a costing study should consider all relevant costs, depending on the perspective of the cost analysis (perspective is discussed in detail later). A costing study is a form of partial economic evaluation because only the costs are examined without reference to outcomes. However, this does not imply that a costing study is unimportant, as such studies are crucial for examining the budgetary implications of health services (Drummond, 2005) and represent an important stage in our understanding of the economic consequences of the workstreams for the health services and the funding bodies. Moreover, a costing study represents an important intermediate stage for future CEAs.

Costing studies may use either a top-down or bottom-up data registration approach, and may be prospective or retrospective in relation to time. Cost-related data for costing studies may be obtained from accounting systems, budgets (allocated or spent), billing histories, accounting and statistical reports and other information systems.

A.2.1.4   Perspective of the economic evaluation

The perspective of an evaluation is important to the decision-maker, in order to determine to whom the costs incur. This matters because an intervention might be cost-effective from one point of view (e.g. a societal one) but not from another (e.g. a health care provider view). Hence, stating the perspective adopted is therefore an essential task for researchers and is consistently recommended in guidelines for economic evaluations. The two commonly used perspectives in economic evaluations are the health services perspective and the societal perspective. The former evaluates only the costs incurred by health service providers and associated organisations directly or indirectly engaged in providing care, such as the IPs in the case of the CMAM programme and the IYCF interventions. However, the societal perspective also includes 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).

In the case of developing countries, the perspective of an economic evaluation can be crucial. This is because the costs (direct and indirect) incurred by patients and their family members can be significant compared to the actual health-related costs incurred by the health care systems. For example, out-of-pocket payments for medication, food, transportation and informal payments can amount to significant sums. Moreover, the opportunity cost of visiting health facilities can be huge due to wage loss. If such matters are taken into account, these costs can potentially make up a significant amount of the total societal cost of interventions.

There is no consensus on which perspective should be used in an economic evaluation. In developing countries, there are no guidelines for such evaluations. Some reimbursement agencies in more developed countries, such as England and Wales' National Institute of Clinical Excellence, recommend that cost should be adapted from the National Health Service and Personal Social Services perspective. The National Health Service perspective determines the mix of interventions that would maximise health outcomes within the limited health care budget.

The advantage of using the societal perspective in economic evaluation is that it provides an estimate of the value of the societal return of health services investments. However, estimating societal costs may be time-consuming and resource-intensive and is therefore not always included in economic analyses. Moreover, in some cases the decision-maker is not interested in the opportunity cost and out-of-pocket expenditures of the beneficiaries of health services.

Below we present a summary of cost elements that are included or excluded based on the perspectives of economic evaluation.

Table 18: Inclusion and exclusion of costs by perspectives

Cost elements	Perspectives			
	Societal	Public purchaser	Private purchaser	Provider
Health service costs	All	Covered expenses	Covered expenses	Expenses of provided services
Productivity costs	Included	Excluded	Excluded	None
Informal carers	Included	Excluded	Excluded	Excluded
Transportation	All	If any paid	If any paid	Excluded
Other non-health service costs	All	If any paid	If any paid	Excluded

Source: Luce (1996)

A.2.1.5 Focused review of economic evaluations of nutrition interventions

We undertook a focused literature review to identify previous economic evaluations in CMAM and IYCF programmes to review the evaluation approaches used in the economic analyses, outcomes evaluated, data sources used and types of costs considered. The literature search was targeted to assist with the current study and was not intended to be a systematic review.

We identified three relevant studies that reported full economic evaluations of interventions aimed at reducing severe malnutrition in children. One of these studies was an evaluation of the CMAM programme in Malawi (Wilford *et al.*, 2011). We did not find any economic studies that evaluated the cost-effectiveness/cost-utility of any IYCF programmes. However, we found a health

technology assessment report that evaluated the economic impact of interventions promoting breastfeeding. We will summarise all four studies below. Lessons drawn from these studies have been used directly to inform the design methodology proposed in this document.

Wilford *et al.* (2011)

Wilford *et al.* (2011) evaluated the cost effectiveness of a CMAM programme among children under five in Dowa district, Malawi.

A decision tree model was used to evaluate the cost-effectiveness of CMAM integrated into existing health services compared with the *status quo* (existing health services without CMAM) in Dowa district. Hence, the first two branches of the decision tree represented areas where CMAM was implemented against non-programme areas. Each malnourished child may be treated by the CMAM programme or the alternative programme or may go untreated. Each scenario was further divided into additional decision nodes, i.e. children in the CMAM programme exit the OTP facility in one of four possible ways: cured, died, non-recovered, or referred to the inpatient therapeutic programme due to complications. A child is assumed to be non-recovered after missing two consecutive fortnightly visits. These nodes are further divided until a terminal node of alive or death is reached. The proportion of malnutrition cases assigned to each node and its respective mortality was based on the data collected from the Dowa CMAM programme.

The study was based on a health services perspective. The outcome (effect) was based on the DALY, which was estimated using the decision tree model for each treatment pathway (scenario). The incremental cost and effect of the two scenarios was used to estimate the incremental cost per DALY averted. This decision tree is an extension to the original Bachmann (2009) study; however, this present study includes an option of non-CMAM care alongside CMAM care and no treatment.

The cost of the CMAM programme was broadly separated between capital cost (cars, motorbikes and computers, which amounted to 3% of the total cost of the programme) and recurrent cost (97% of the total cost). Recurrent cost included: RUTF (32%), administration (24%), direct staff (19%), transport (8%), others (surveys/reviews, HIV and AIDS mainstreaming, upgrading storage – 5%), clinic staff (5%), training (2%), medical supplies (1%), and inpatient costs for referrals to OTP facilities (1%). All costs were converted into 2007 USD for the purpose of analysis.

The cost-effectiveness results showed that the ICER of implementing CMAM integrated into existing health services was $42 per DALY averted (or $1,365 per life saved), which is well within the Gross National Income *per capita* threshold of $250 (World Bank, 2008).

We identified a few limitations of the Wilford *et al.* (2011) study. First, the perspective was limited to health services. Hence, patient-related resource use (e.g. time taken off work, health-related expenses, etc.) was not considered in this study. Second, the capital costs did not include the cost of new building work, renovation of office premises and the depreciation cost of existing facilities. Moreover, the cost of inpatient stays appears to be very small in comparison to other cost elements (i.e. 1% of the total cost), which would need to be further investigated. Further limitations are identified in the paper itself.

Bachmann (2009)

Bachmann (2009) assessed the cost-effectiveness of community-based therapeutic care (CTC) against no treatment for children with SAM in Lusaka, Zambia. This study later served as a precursor for the Wilford *et al.* (2011) study.

The CEA was based on a decision tree model and the health services perspective was used for cost and effectiveness. Two scenarios were considered: CTC or no treatment. Children receiving CTC could have one of four possible outcomes: referred to hospital, defaulted, died, or recovered. For the no treatment group, mortality was based on children's HIV status. This option was not considered for the CTC group because the HIV status was not known for most children and also some of the symptoms would already be incorporated into CTC outcomes.

The probability for each option was used in the model to estimate the expected rate of outcome (i.e. recovery or death). Relevant costs were also added into the model with the exception of the no treatment option. Effectiveness was measured in terms of DALYs. Mortality rates were based on a community-based cohort study conducted in Malawi and Uganda.

The relevant cost components used in the model included: health centre visits, RUTF, hospital admissions, community mobilisation, and technical support. All costs were converted to 2008 USD.

The cost-effectiveness results showed that the cost of CTC was $1,760 per life saved and $53 per DALY gained. The cost-effectiveness acceptability curve showed that, at a willingness to pay of at least $88 per DALY gained, CTC was more than 80% likely to be cost-effective.

Ashworth and Khanum (1997)

Ashworth and Khanum (1997) assessed three alternative cost-effective approaches for treating severely malnourished children in Bangladesh. The study was based on a longitudinal, prospective controlled trial conducted to evaluate the most cost-effective treatment for severe malnutrition. In total, 573 children were sequentially allocated to three treatment groups. The three main treatment options evaluated were: inpatient management, day care, and domiciliary care.

The cost component was categorised into institutional cost and parental cost. Institutional cost comprised capital cost, salary cost, utilities, laboratory tests, medical supplies and food costs. Parental cost comprised transport costs, wage loss of working mother and child food cost (day care). The cost-effectiveness was evaluated as the total cost (institutional and parental cost) to achieve 80% weight-for-height. All costs were reported in USD.

The study showed that the institutional cost of inpatient treatment was 2.6 times more than for day care, and 5.3 times higher than domiciliary care. When combined institutional and parental costs were considered, domiciliary care was 1.6 times more cost-effective than day care and 4.1 times more cost-effective than inpatient care.

This study is more comprehensive in terms of collection of cost data than the earlier studies. However, the study did not use a generic measure of effectiveness that can be compared across health programmes.

Renfrew *et al.* (2009)

The objective of this study was to estimate the long-term costs and benefits of enhanced staff contact in promoting breastfeeding to mothers whose infants were admitted to neonatal units.

The rationale of the model structure was that enhanced staff contact increases milk expression; in turn, it was assumed that this would lead to increased milk consumption by the infant. Milk consumption was then assumed to reduce the incidence of illness episodes, thereby improving long-term health outcomes. The health benefits evaluated were in the form of QALYs.

Population: All mothers with infants (<2500g) in neonatal units. Weight-based subgroups were developed with the rationale that the incidence of diseases increases greatly as the birth weight decreases: 500–999g, 1,000–1,749g, 1,750–2,500g. A health care perspective was used, and costs and benefits were discounted at the annual rate of 3.5%.

Intervention: In the base case model two interventions were evaluated: enhanced staff contact – the addition of specially trained staff, which would be available to advise and support mothers on milk expression and breastfeeding – compared with normal staff contact, i.e. no addition of specially trained staff.

Model: The model divides the population into those women who intend to breastfeed and those who do not intend to breastfeed prior to their infant's birth. The model was designed to capture the health effects for three different levels of milk consumption: all own mother's milk, some mother's milk (supplemented by formula in the base case) and formula alone. The literature suggests that there are potential cost and benefit differences in the different levels of mother's milk consumption.

Clinical outcomes: In hospital clinical outcomes were sepsis and mortality. Sepsis was further divided into Gram-negative, Gram-positive and fungal infection. Resource use and utility outcomes were captured by these subdivisions of clinical outcomes.

Long-term outcomes: QALYs were used as a long-term outcome. The outcome was linked to disability by mean of neurodevelopment impairment, which is a composite measure that captures many elements of disability including visual, hearing and mobility impairments. The neurodevelopment impairment scores were divided into four categories: no, mild, moderate, and severe disability. The utility values for each of the health states were then used to quality weight life expectancy. Life expectancy for infants in each of the four disability states were taken from Colbourn *et al.* (2007). A combination of life expectancy and utilities were used to derive QALYs for each of the disability states.

A.2.1.6 Aim of the economic evaluation

The aim of this ORIE study is to evaluate the incremental cost-effectiveness (or cost-utility) of the CMAM programme (workstream 1) and the IYCF interventions (workstream 2) compared to routine care, and to evaluate the costs associated with delivery of the micronutrients and deworming programme (workstream 3) and integration of direct nutrition interventions into routine health services (workstream 4) in northern Nigeria.

Specific objectives of the study include:

a. To estimate the direct and indirect costs associated with implementation of the CMAM and IYCF interventions;

b. To evaluate the health-related outcomes associated with the CMAM and IYCF interventions for the purpose of economic evaluation;

c. To evaluate the cost-effectiveness of the CMAM and IYCF interventions compared to routine care in northern Nigeria; and

d. To evaluate the direct provider-related costs associated with the implementation of workstreams 3 and 4.

A.2.1.7 Study methodology

Overall approach of the economic evaluation of the CMAM programme and the IYCF interventions

Separate workstream-specific evaluation or joint evaluation?

For the purposes of an economic evaluation, it is important that the interventions being compared are targeted toward the same condition, such as severe malnutrition. Since the two interventions being evaluated in this study (i.e. CMAM programme and IYCF interventions) have different objectives and different target health conditions, health outcomes and even population groups, we propose that, for the purposes of the economic evaluation, the CMAM programme and the IYCF interventions are evaluated and reported on separately. Moreover, the two programmes work or can work independently of each other. For instance, the CMAM programme is operational in several countries as an independent programme in itself. The programme has been evaluated and published as such in the following four countries: Zambia, Ethiopia, Malawi and Bangladesh. We strongly believe that, besides the technical reasons outlined above, a separate economic evaluation to determine the VfM of each workstream can be crucial for decision-makers.

However, we acknowledge that DFID as the funding institution may require that the two workstreams are evaluated together as one programme. Hence, although we do not recommend that the workstreams are evaluated jointly, one such potential joint approach is discussed later on.

CMAM programme (Workstream 1)

We propose to conduct a full economic evaluation of the CMAM programme based on a cost-utility approach (i.e. cost per DALY method) outlined above. Following Wilford *et al.* (2011) and Bachman *et al.* (2009), we propose that a decision tree model (or an alternative Markov model based on the same principles) is developed for the evaluation of the CMAM programme to evaluate the cost per DALY of the intervention compared to non-CMAM care. The decision model (discussed below) evaluates patient treatment pathways (from identification of malnutrition to treatment to health outcomes) based on the probability of different outcomes along the pathway for the alternative interventions being compared. Costs and health outcomes along the pathway are evaluated and aggregated. Health outcomes (i.e. malnutrition-related health state) are converted into DALYs (as discussed in the cost-utility section above). Costs and outcomes are subsequently evaluated together to estimate the incremental cost per DALY for the intervention (i.e. CMAM programme) compared to routine care. This approach is summarised in the figure below. The detailed decision tree approach will be discussed in the following sections.

Figure 12: **Proposed approach for the economic evaluation of the CMAM programme**
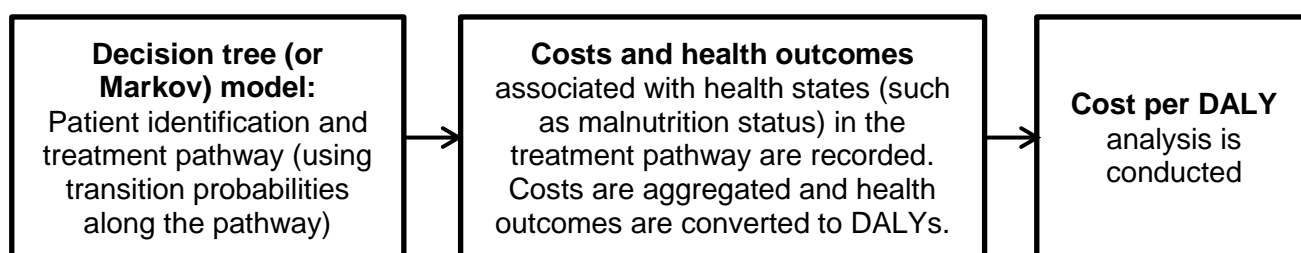
IYCF interventions (Workstream 2)

For our evaluation of the IYCF interventions, we propose two alternative options:
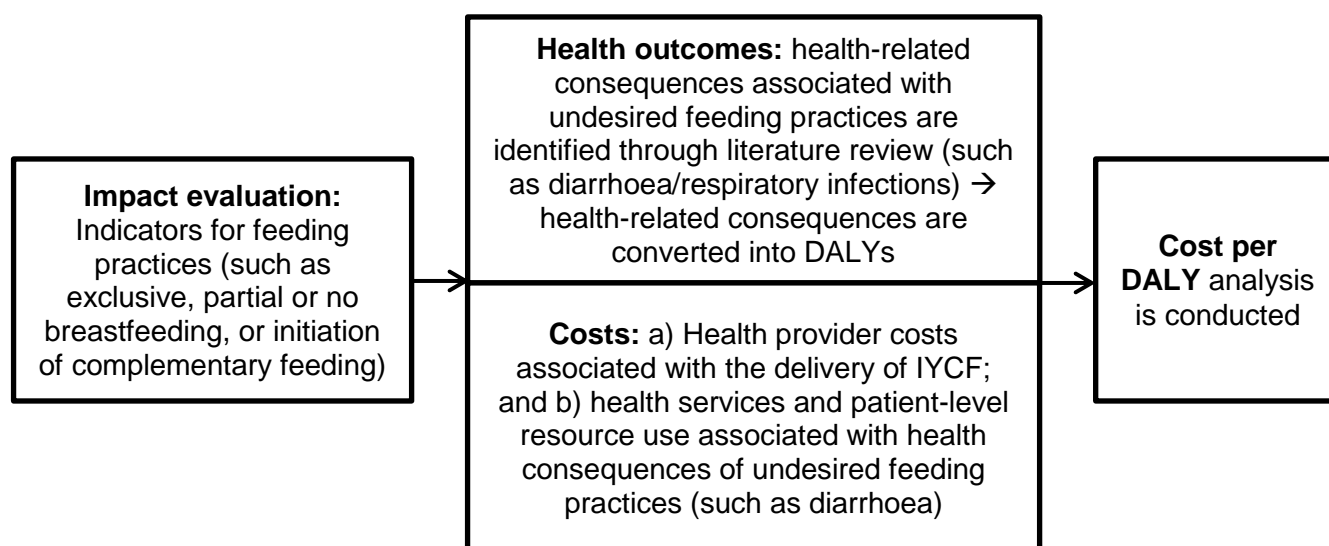
- A model-based cost-utility analysis where the intermediate outcomes of breastfeeding (and possibly weaning and complementary feeding) can be converted into a generic utility-based measure of DALY or QALY as presented in the literature review above (see Health Technology Assessment report);
- Cost-consequence analysis (discussed above);

The cost-consequence analysis is relatively straightforward as it does not require the aggregation of multiple outcomes to generate a single outcome. However, for decision-makers intending to compare across programmes, such an approach may have limited application. The other alternative, i.e. the cost per DALY approach, is similar to the approach proposed for the CMAM programme; however, unlike malnutrition, it is not straightforward to derive disability-weighted outcome measures for breastfeeding, weaning and complementary feeding outcomes. Nevertheless, an indirect approach has been used in the literature. In this approach, indicators of feeding practices (such as whether or not a child is breastfed) are obtained from an impact evaluation; following this, estimates of the probability of the health-related consequences of undesired feeding practices (such as no EBF) are obtained from the literature for the specific population or the closest population group. Subsequently, the disability weights are attached to health-related consequences based on the estimates available in the literature – this allows us to calculate DALYs associated with the intervention. The same is done for the control areas to obtain DALY estimates. To estimate cost data, intervention-related costs for the providers are obtained using the institutional cost approach (discussed later). Furthermore, the health services costs and patient-related costs associated with treating health-related consequences (such as diarrhoea) are obtained. All the cost data are aggregated and compared against DALYs to obtain the cost per DALY. This approach has been used in several studies (including Renfrew *et al.* (2009) presented above) and is recommended for full economic evaluation. The approach is summarised in the figure below.

Impact evaluation: Indicators for feeding practices (such as exclusive, partial or no breastfeeding, or initiation of complementary feeding)

Health outcomes: health-related consequences associated with undesired feeding practices are identified through literature review (such as diarrhoea/respiratory infections) → health-related consequences are converted into DALYs

Costs: a) Health provider costs associated with the delivery of IYCF; and b) health services and patient-level resource use associated with health consequences of undesired feeding practices (such as diarrhoea)

Cost per DALY analysis is conducted

Figure 2: Proposed approach for the economic evaluation of the CMAM programme

Combined analysis of the CMAM programme and the IYCF interventions

While we recommend that the economic evaluation of the CMAM programme and the IYCF interventions are conducted and reported on separately (i.e. that the costs per DALY are estimated

separately for the two interventions), the evaluation of the two workstreams can potentially be combined. This may only make sense if the resources used for the two workstreams have a significant degree of overlap, such as the use of community health workers. For a combined evaluation, the health benefits of the two programmes, expressed in terms of a common currency (i.e. DALYs averted), can be combined to estimate the combined effect in terms of DALYs averted; this outcome measure is then evaluated against the costs associated with implementing the two workstreams.

However, in this case, it is **crucial to avoid double counting costs and outcome benefits**. Some of the health service resources may be common across the two workstreams, such as support/advice provided by community health workers or high-level supervision provided by senior management. It is important that such costs and any health benefits that may be common to the two workstreams are identified early on through discussions with programme delivery teams and that the evaluation process reflects these common costs and outcomes to avoid double counting.

Micronutrient interventions and deworming (workstream 3) and integration of direct nutrition interventions into routine health services (workstream 4)

While an outcome evaluation of workstreams 3 and 4 is not part of the impact evaluation exercise (as no outcome data will be available for them), these workstreams can/will be evaluated as part of the economic evaluation. We propose that the economic evaluation of workstreams 3 and 4 takes the form of a costing study or cost analysis.

The costing study will take a health provider or institutional perspective. Further details are discussed in the following section.

Table 19: Proposed approaches for the economic evaluation

Programme	Approaches for the economic evaluation	
CMAM programme (Workstream 1)	Cost-utility analysis (cost per DALY)	
	Options	
IYCF interventions (Workstream 2)	Cost-utility analysis	Cost-consequence analysis
Micronutrients/deworming (Workstream 3)	Costing study	
Integration of direct nutrition interventions into routine health services (Workstream 4)	Costing study	

A.2.1.8 Framework for the economic evaluation

It is common practice in economic evaluations to use decision tree models or Markov models, especially in situations when the aim is to evaluate the long-term cost-effectiveness of interventions. The decision tree represents a sequence of events with different probabilities along the pathway with associated costs and health outcomes. The decision tree is then rolled back to estimate the expected costs and expected health benefits of interventions and comparators. These values can be averaged on the basis of the likelihood, or probability, of each path in the tree.

CMAM model: the decision tree approach

The decision tree approach was also used in the Wilford *et al.* (2011) study, which also evaluated the cost-effectiveness of a CMAM programme. Similarly, Bachmann (2009) also used the same approach. An alternative approach would be to develop a Markov model, which is a cohort model that is commonly used when the decision tree becomes too unwieldy with recurrent events or when time is an important consideration in the transition pathway. For relatively simpler cases, the

decision tree approach is usually appropriate and sufficient; however, we suggest that the option to use a Markov model should be considered if it becomes obvious that more states and/or decision nodes are required than can be comfortably handled by the decision tree.

We propose that the economic analysis is based on a decision modelling approach that uses a decision tree or Markov model. The decision tree approach is close to the method used by Wilford *et al.* (2011). However, our interpretation of the Wilford model suggests that it has several limitations that can be improved upon in this study:

- The Wilford *et al.* (2011) model is primarily a treatment-based model, i.e. it does not explicitly model community-based case findings; this is an important and integral part of the CMAM programme. We propose that the model in this study starts by introducing probability at the start of the decision tree to take into account the case finding of a malnourished child who is then referred to outpatient or inpatient therapeutic care.
- The Wilford *et al.* (2011) model was based on a health services perspective but we propose that a societal perspective is taken to capture the full impact of the WINNN interventions on society.
- The Wilford *et al.* (2011) study did not collect any data from control or non-CMAM sites, and made assumptions around programme effectiveness. This is a serious limitation that we propose addressing in the current study.
- Wilford *et al.* (2011) assumed that the no treatment arm did not incur any costs. We think this assumption needs to be evaluated.
- Wilford *et al.* (2011) used several other assumptions when data were not available. The validity of some of these assumptions may be contestable. We propose that robust data are collected so that fewer assumptions are made.
- We do not see that the Wilford *et al.* (2011) model considered the cost of death, i.e. the high expenditure associated with healthcare before death.

Thus, the Wilford *et al.* (2011) model should be revisited and further areas of improvement should be explored. However, we agree with the general approach of using a decision tree for this purpose, although as noted above the need for a Markov model should be revisited later on. We understand that there may be opportunities to contact the authors directly to better understand the model parameters and how our study can improve on them.

For illustration purposes, we present a modified version of the decision tree presented by Wilford *et al.* (2011). It should be noted that the decision tree is likely to be modified at a later stage. The required model parameters will be discussed in the cost and outcomes sections.
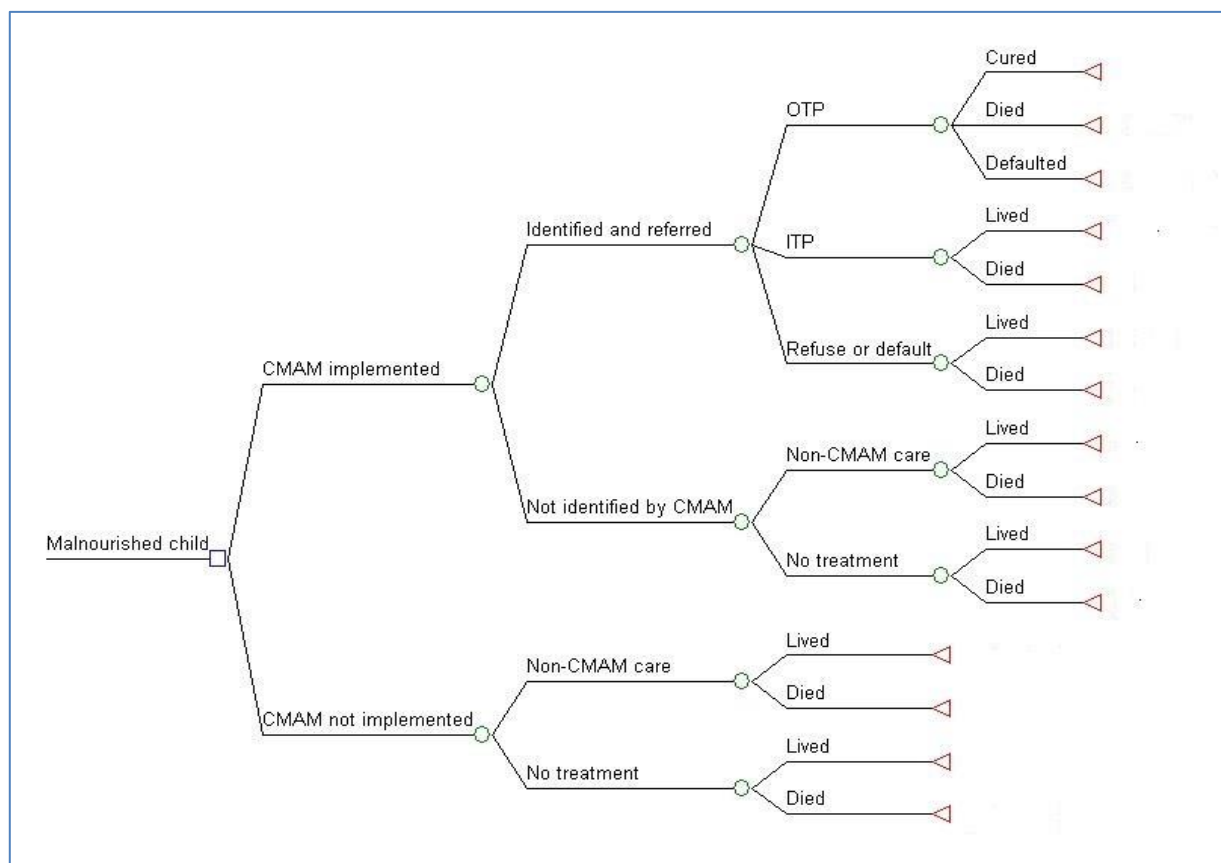
Analysis of the IYCF interventions

As discussed earlier, the analysis of the IYCF interventions will take one of the two forms: a cost-utility analysis or a cost-consequence analysis. We propose that the cost-utility analysis option should be explored first because it would allow decision-makers to compare the VfM of the IYCF interventions against other competing interventions. While the outcomes of IYCF interventions cannot be directly associated with disability or utility weights, we propose that the immediate outcomes from the impact evaluation (e.g. breastfeeding rate) are mapped onto the probability of longer-term benefits in terms of health-related consequences averted (such as diarrhoea, respiratory infections or possibly other infections), which are then used to estimate DALYs averted. We have presented one study in the literature review section (Renfrew *et al.*, 2009) that conducted such an analysis for an intervention aimed at promoting breastfeeding.

Analysis of workstreams 3 and 4: costing study

Cost studies are usually conducted to provide budgetary estimates or to estimate the costs of a programme initiative. The costing study of workstreams 3 and 4 will be conducted from a provider's perspective to capture all programme-related costs. These are discussed in detail later and will include programme investment costs and operational costs, including staff salaries, procurement and distribution of supplies (such as Vitamin A capsules for children and iron and folic acid for pregnant women), supervision costs, training costs and travel costs.

A.2.1.9   Perspective of the economic evaluation

As discussed above, it is important to establish the perspective of an economic evaluation. Both health services and societal perspectives have been used in economic evaluations of interventions targeting severe malnutrition (presented in the literature review section above). Wilford *et al.*

(2011) conducted a cost-per-DALY analysis of the CMAM programme using a health services perspective. No patient-related costs were included in the analysis. Similarly, Bachmann (2009) used the same approach and focused only on the health services perspective. However, Ashworth and Khanum (1997) used a societal perspective to include parent-related costs such as transport costs, wage loss for working parents, payments to neighbours for looking after the family in the mother's absence and child's food cost when at home. However, the costs of out-of-pocket expenditure on health services were not considered.

We propose that, for the full economic evaluations of the CMAM programme and the IYCF interventions, the preferred option is to take a societal perspective. The potential cost elements to be included are discussed in detail in the following section. There are several reasons for proposing a societal perspective for this analysis: 1) a societal perspective in an economic evaluation provides an estimate of the return of investment on health services for society; 2) the burden of malnutrition and the burden of care seeking have direct cost implications for households; and 3) a restricted budget perspective is inconsistent with decisions based on willingness to pay for DALYs. However, for pragmatic reasons we propose that due consideration should be given to both perspectives. In the following discussion on cost components, we will discuss all relevant costs, including societal costs. A decision can be reached later in terms of which perspective should be adopted.

Costing studies generally tend to take a provider's perspective. This is mainly because the aim of the costing study is to provide budgetary estimates or to estimate the costs of a programme initiative to the provider. A broad health services or societal perspective is more appropriate when a full economic evaluation is planned. For the current scenario, we propose that all costs associated with delivering workstreams 3 and 4 are captured during the evaluation using the provider's perspective.

In the following sections, we discuss the costs and outcomes to be included in the economic evaluation. We present specific cost components, line items, potential sources, method of data collection and process of cost estimation. We will also discuss a CMAM-specific costing tool that has been developed by Food and Nutrition Technical Assistance (FANTA). Following this, the next section will discuss the outcome measures required for the economic analysis and their potential sources, and will also identify the sources used by previous studies.

A.2.1.10 Cost components of CMAM programme and the IYCF interventions

Two broad categories of cost for economic evaluation

The following cost elements will be collected for the evaluation of all four workstreams:

1. **Programme delivery costs (A):** these include capital costs, fixed operating costs and variable operating costs, which are outlined in the table below. These cost elements relate to programme inputs for service delivery, monitoring, training, supervision, community visits to households and provision of curative care. These costs are discussed in detail in the following section.

2. **Household costs (B):** these costs relate to household expenditures in relation to the health condition. As discussed above, the household costs will only be considered in the evaluation of workstreams 1 and 2 and will not be part of the costing study of workstreams 3 and 4.

For programme delivery costs of all workstreams, the CMAM cost template from USAID's FANTA-2 project (summarised later in the document) will be used. This document can be adapted to suit

workstreams 2–4 and will ensure that cost elements are captured in a standardised format across all workstreams.

Programme delivery costs (A)

Programme costs may be incurred by the IPs, i.e. UNICEF, Save the Children, and ACF, and the government health provider that provides care. Hence, during the process of evaluation, all programme-related costs should be evaluated for all organisations involved in the delivery, management, supervision or other directly related activities of the programme.

The programme components of the CMAM programme can be represented by the diagram below, which shows community outreach services, outpatient services, inpatient care and services and programmes addressing management of malnutrition. Based on this, the cost components can be identified and are listed below.

Figure 14:   Programme-related components of the CMAM programme
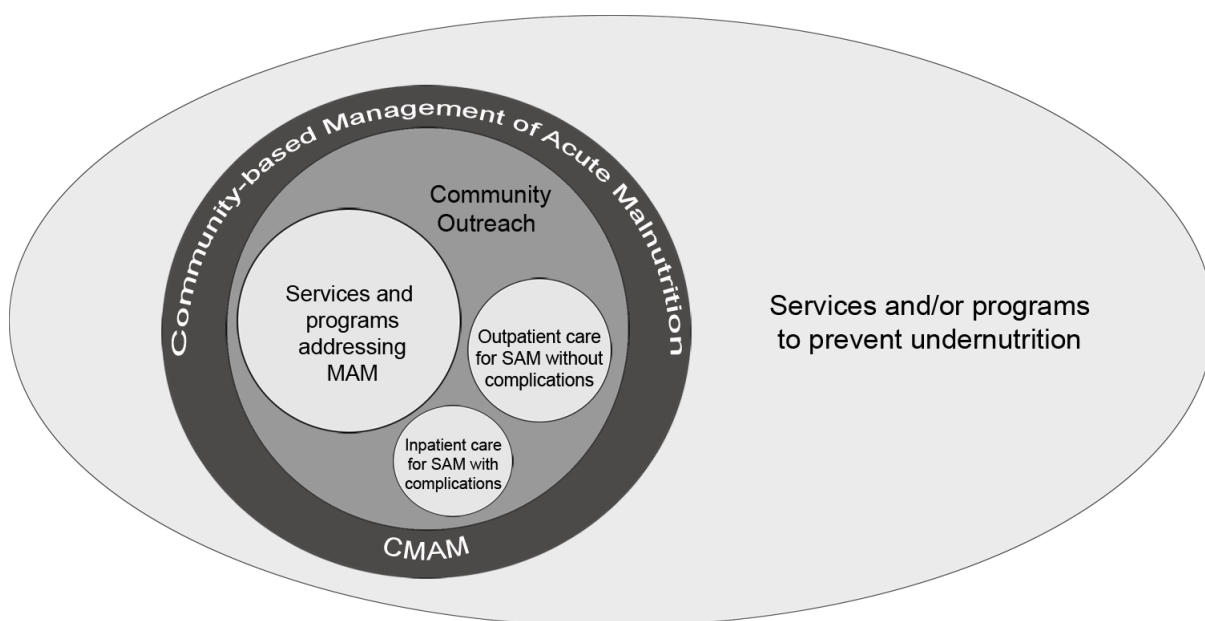
Source: UNICEF (2013)

Activities that will incur costs in the CMAM programme:

- **Treatment** (or case management) of children with SAM (on either an inpatient or an outpatient basis);
- **Community outreach** in support of the management of SAM;
- **Supply logistics** (transportation and storage of supplies, especially of RUTF and other therapeutic food);
- **Training** of health care providers and health managers;
- **Supervision** of health care providers and health managers; and
- **Management** of the service/programme (e.g. planning, budgeting, monitoring).

Activities that will incur costs in the IYCF interventions:

Similarly, the cost components of the IYCF interventions are listed below:

3

- **Mothers' support group training** and other training;
- **Information, education and communication** materials;
- **Sensitisation** and community outreach;
- **Training** of health workers;
- **Supervision** of health care providers and health managers;
- **Management** of the service/programme (e.g. planning, budgeting, monitoring);
- **Festivals** (e.g. breastfeeding weeks); and
- **Mass media**.

For the economic evaluation of the IYCF interventions, the last two cost elements may not be included in the analysis.

Activities that will incur costs in workstreams 3 and 4:

- **Supply logistics** (procurement, transportation and storage of supplies, especially Vitamin A capsules for children and iron and folic acid for pregnant women);
- **Distribution costs**;
- **Training costs**;
- **Supervision** of health care providers and health managers; and
- **Management** of the service/programme (e.g. planning, budgeting, monitoring).

Household costs related to health conditions

These costs are related to household out-of-pocket expenditure or opportunity costs associated with the health condition. For instance, for the evaluation of the CMAM programme, the household costs may include the following:

- Out-of-pocket payments for medication;
- Informal payments;
- Expenses on transportation;
- Expenses on food;
- Employment status;
- Daily wage; and
- Payments to neighbours for looking after the family in the mother's absence.

Types of programme-related costs for all workstreams

For practical purposes of cost analysis, we propose that the above cost components are evaluated in three categories: capital costs, fixed operating costs and variable operating costs. These are defined with specific examples from the CMAM/IYCF interventions in the table below. In the following section, we have identified specific cost line items for each one of these categories, and further details are provided.

Table 20:   Types of programme-related cost included in the economic evaluation of the CMAM programme/IYCF interventions

Type of cost	Description	Programme-specific costs for the CMAM programme and the IYCF interventions
Programme capital costs	* These are direct costs that can be incurred at the start of a programme or at later stages. * These will include infrastructure-related costs, equipment and vehicle purchase costs and training costs. * To avoid losing cost-related information, it is best practice to collect this cost data early on, and also at later time points.	* Construction or start-up renovation/repair of facilities. * Depreciation of existing facilities. * Cars and other vehicles. * Computers and other office equipment.
Fixed operating costs	* These are fixed direct costs that are incurred regularly regardless of programme-related variable indicators. * These may include the salaries of staff members (full or part time), facility rents and utilities.	* Salaries of full-time and part-time staff. * Rent of facilities/items. * Utilities and other bills.
Variable operating costs	* These are variable direct costs that increase with the volume of service, and may not have much impact on cost *per capita* * These may include medical supplies, training materials, maintenance costs, supplies and variable staff costs.	* Ready-to-use food supplements. * Medication supplies. * Laboratory tests. * Vehicles (repairs and fuel). * Training costs (including training materials).

Capital costs to be evaluated for the economic analysis of all workstreams

Summaries of the cost data required, estimation methods, sources of data and assumptions are presented in the tables below. These include capital costs (i.e. costs related to starting up a nutritional programme at a health facility) and operating costs (i.e. the expenditure required to keep the facility fully functional). Operating costs are further divided into fixed operating costs, which include staff salaries, and variable operating costs, which include RUTF, medical supplies, laboratory test, utility bills, training costs and vehicle maintenance and fuel costs.

These cost elements should be thought of as programme inputs to service delivery, monitoring, training, supervision, community visits to households and provision of curative care. All cost elements below should be collected with such activities in mind.

Table 21:   **Capital cost elements for CEA of CMAM programme/IYCF interventions**

Capital costs	Who will incur the cost?	Cost estimation
Building facilities		
a. Cost of any <u>new</u> building facilities developed specifically for the programme (such as community-based treatment facilities). b. Start-up cost of renovating/restructuring <u>existing</u> building facilities used for CMAM/IYCF interventions (i.e. outpatient and inpatient treatment facilities). Also, depreciation cost of existing buildings used for CMAM/IYCF interventions will also be considered.	These costs are likely to be related to renovation/redecoration/construction of government health facilities. However, they may be incurred by the health service provider (i.e. the government) or IPs (i.e. Save the Children and ACF). Costs incurred at the central offices and local and community offices will be investigated. It is important to ensure that costs are not double counted when gathering data from multiple sources.	*Estimation of depreciation cost:* Attributable depreciation cost of building facilities will be estimated based on proportionate service activity (i.e. number of patients seen or admissions) attributable to the CMAM/IYCF interventions. A lifespan of 30–50 years will be assumed, discounted at 3% and 5%, and uniform depreciation will be used in calculations.
Equipment and furniture		
a. Purchase of <u>new</u> equipment, such as laboratory machines, and furniture for the programme (including community-based care, outpatient and inpatient facilities). b. Estimated depreciation cost of <u>existing</u> equipment shared with other services (such as machines in outpatient and inpatient facilities). Also, initial cost of repairs will also be included.	These costs can be related to purchases or use of existing equipment and furniture based at the offices of the IPs or health provider.	*Estimation of depreciation cost:* Attributable depreciation cost of equipment will be estimated based on proportionate use attributable to the programme annualised to 10 years, discounted at 3% and 5%.
Vehicles		
a. Purchase of <u>new</u> cars, motorbikes and other means of transportation for the programme and start-up repair costs. b. Depreciation cost of <u>existing</u> vehicles used for the programme.	These costs are likely to be related to IPs.	*Estimation of depreciation cost:* For vehicles used only for the programme, depreciation costs will be calculated over the lifespan of the vehicle and attributed completely to the programme. For vehicles shared with other programmes, depreciation cost will be estimated by keeping a

		log of total kilometres driven for CMAM/IYCF interventions purposes. For practical purposes, this can be done at representative sites and assumed to be constant across sites.
Computer and office equipment		
a. Purchase of <u>new</u> computer equipment and other office supplies specific to the programme. b. Use of <u>existing</u> computer equipment for the programme.	As above.	Estimation of depreciation cost: These costs will be annualised over three years to calculate the depreciation cost, discounted at 3% and 5%.

Operating costs to be evaluated for the economic analysis of all workstreams

Fixed and variable operating costs will be considered for all four workstreams. Details of these costs and how they should be estimated are presented in the table below.

Activity-based costing approach

For staff time operating costs (part of the operating costs), we propose to use an activity-based costing approach. This approach allocates activity-based staff time to specific programmes based on the proportion of the staff time spent on certain activities. Waters (2006) defines activity-based costing in the following way: 'Activity-based costing essentially defines the principal activities of the individuals who work within an organization, then traces costs, first, to these activities, and then from the activities to products and services. Human and financial resources within a department (production centre) are traced to activities, which are in turn traced to products and services. Allocation of personnel time among the activities becomes the principal means for assigning overhead and other indirect costs'.

This approach will be used to allocate costs to specific workstreams for staff who share work across several programmes or activities.

Table 22:   Operating cost elements for CEA of CMAM programme/IYCF interventions

Type of cost	Cost details	Who/what will incur the cost?	Cost estimation
Fixed operating costs	**Staff salaries** Salaries of staff specific to the CMAM programme/IYCF interventions as well as non-programme-specific staff (shared with other programmes). Staff members employed by the IPs and the government will be included in the analysis based on their share of time. The staff members may be in: * Management and administrative roles * Community-based roles (although many may be volunteers) * Health facility-based (including nurses, doctors, medical assistants, district staff, district nutritionists, maternal and child health coordinators and health management information system officers). * Salaries of international staff and consultants * Salaries of staff members shared with other programmes.	A previously published CEA of the CMAM programme (Wilford, 2012) suggests that programme-specific management and administrative costs and international staff costs are incurred mainly by the IPs. However, the staff salaries of health centre staff and district staff are incurred by the government.	Staff cost attributable to the programme will be calculated based on whether staff are employed solely (full or part time) by the programme or shared with other projects. Solely employed staff costs will be equal to the salary for staff working only for the CMAM/IYCF interventions. For staff members with shared work activities, proportionate time spent on the CMAM/IYCF interventions will be estimated by interviewing staff at each level about their role share with other programmes, and subsequently costing based on time share using salary data.
	Any rented facilities/items – to be investigated with field staff.	These can be incurred by government or IPs.	Data on rent paid divided by the time period will be used to estimate cost over the period of the programme.

Variable operating costs	RUTF * Cost of all RUTF procured and used during the study period should be documented.	A previous evaluation suggests that these costs are incurred mainly by IPs. Any government facilities used for this purpose (such as warehouses) should also be evaluated.	It should include the cost of purchase, transport from the producer's factory and warehousing. Distribution mechanisms will be explored before they are costed to avoid double counting.
	Medication supplies * Including cost of medication and other supplies used to treat patients at OTP or SC facilities.	Incurred by government facilities or IPs.	Programme-specific drug costs will be estimated based on supplies dispensed/used (or, if these data are not available, then supplies purchased).
	Laboratory tests.	As above.	All laboratory tests will be documented for each patient and their costs will be obtained from the Department of Health. If not available, their market price may be considered. Alternatively, a micro-costing approach may be used at selected facilities.
	Vehicles * Cost of repairs and cost of fuel (staff costs will be covered in the salaries category).	Incurred primarily by the IPs.	Running costs of dedicated programme vehicles will be based on financial accounts and/or receipts. Cost of shared cars will be allocated based on logs recording total kilometres driven for CMAM programme purposes.
	Utility bills (gas, electric, water, others).	As above.	Taken directly from the financial accounts of bill history.
	Training costs, including venue and per diems.	As above.	These will be calculated directly from the financial accounting records of IPs.

Available/recommended template for collection of cost data

As mentioned earlier, we are aware of the FANTA costing tool developed by USAID specifically for costing CMAM programmes in developing countries. This tool can be very useful in ensuring that all line items are captured and a standardised costing practice can be used across all CMAM programmes. Below we present a summary of the extensive list of staff salaries that are required to be captured by this tool. We propose that this tool is used as much as possible for costing purposes.

Table 23:   List of line items required to be collected by the CMAM programme costing tool developed by USAID

Health care providers and other staff	Provided type and functions
Central HQ	
Senior Central HQ staff (head/deputy head of department)	Manage and advocate for CMAM programme at national level
Mid-level Central HQ staff (programme manager)	Establish, coordinate CMAM programme activities
Group area HQ	
Senior group area HQ staff (graduated nutrition officers – more experienced)	Regional Nutrition Officer – management of CMAM programme
Mid-level group area HQ staff (technical officers)	Assistant Nutrition Officer – supervision and training of area HQ staff
Junior group area HQ staff (community health nurse or officer at regional level)	Technical Officer – monitoring/data collection and analysis and assisting with other management tasks
Area HQ	
Senior area HQ staff (District Nutrition Officer, who graduated within 1–3 years)	Nutrition Officer (graduate/technical officer) – Management of CMAM programme
Mid-level area HQ staff (technical officers)	Technical officers/National service officers – Supervision and training at outpatient care sites/inpatient care sites
Junior area HQ staff (community health nurses or officers at district level)	Technical officers/community health nurses – Monitoring/data collection and analysis and support to mid-level and senior staff
Outpatient care site – Health care providers	
Senior outpatient care staff (senior nurse, medical assistant – health facility in-charges)	Medical assistant/midwifes/clinical nurses – management of SAM cases, establishing community outreach, training of COWs, data management
Junior outpatient care staff (community health nurses, community health officers, and public health nurses)	Community health nurses – assisting with management of SAM cases, supervision of COWs, helping establish community outreach, data collection
Community Outreach Worker	CMAM programme outreach in the community (volunteers)
Inpatient care site – Health care providers	

Senior inpatient care staff (clinician, paediatrician, or other medical specialist)	Physician/paediatricians – in-house supervision of health care providers, managing SAM children with complications, data analysis
Mid-level Inpatient Care staff (clinical nurses, dieticians, graduate nutritionist)	Clinical nurses/graduate dietician/graduate nutritionist – day-to-day management of SAM in inpatient care, nursing care supervision of feeds and preparation, monitoring and reporting
Junior inpatient care staff (health aids, health extension workers)	Health aid/heath extension worker – assisting in care of SAM cases with complications, preparation of therapeutic foods, data collection
Other workers (all levels)	
Driver	Driving vehicles carrying supplies or people
Store guard	Guarding stores of RUTF

We propose that patient (carer)-related costs are also captured in this study to reflect the societal perspective of the value of the intervention compared to the control. Patient-related costs may make up a significant proportion of the total cost of the programme. Below we present a list of patient (carer)-related costs that will be captured in the current study.

Sources of cost data

Summaries of the sources of the cost data required, as well as some consideration of requirements and assumptions, are provided in the tables below.

Table 24:   Sources of cost data, requirements and assumptions

	Source of data	Requirements and assumptions	Notes
Building facilities	Capital cost: Financial accounting books and financial reports (systems). Alternatively, they can be estimated according to the local market price, using current replacement costs.

Service-level activity: Hospital and outpatient records required to estimate proportion of service activity attributable to the programme. | Assumption:
- Financial accounting data exists and is accessible.
- Data on service-level activity is available and accessible.
- Technical resources are available to carry out estimation based on the approach described.
- Qualification: We recommend basic knowledge of financial accounting. | This type of cost, albeit important, is sometimes ignored in economic evaluations, partly due to the difficulty of estimation of depreciation costs (especially, cost of existing facilities). Although this is ideal, if it is a challenge to collect this cost, the approach can be revisited. |

Equipment and furniture	Same as capital cost sources above.	As above.	Cost of existing equipment and furniture may not be available. Hence, replacement cost can be used and depreciation cost applied.
Vehicles	As above. In addition, vehicle logs will be required.	Vehicle logs will be required. We assume that this may be part of routine practice or can be implemented for evaluation purposes, at least in selected sites.	If vehicles logs are not available or cannot be used, an estimate of the proportionate share of use of vehicles can be obtained by interviewing selected programme staff and/or drivers at each level.
Computer and office equipment	Same as capital cost sources above.	Accounting data will be available. If not, then data on the market price of the used models will be available or can be estimated.	Cost of any relevant purchases, such as software, should be included.

Further sources of cost data were identified through our communication with Dr Kenneth Ojo in Nigeria. These are listed below. These sources will be explored with a view to identifying cost-related data and other inputs for the economic analysis.

Table 25: Costing studies in Nigeria

UNFPA/DFID/PATHS2: Report on Costing the Integrated Maternal, Newborn and Child Health Package of Interventions

Harmonized Nigeria Living Standard Survey 2011: Data collection for poverty analysis using a welfare and expenditure approach.

The Costs and Benefits of a Maternal and Child Health Project in Nigeria, Health Policy Initiative, USAID: The Initiative completed interviews with officials from the government, health maintenance organisations and development partners, as well as academics and several primary healthcare providers, and collected information on the costs of delivering services on NHIS/MDG Maternal and Child Health Project and analysed the financial sustainability and incentive structure of the programme design.

NPHCDA Costing Ward Minimum Health Care Package. It provides an estimate of the cost of providing a minimum level of health care package at each PHC and by inference at each ward of Nigeria.

SMART Nutrition Survey in eight Sahel states of northern Nigeria, 2010/2011; Kano, Jigawa, Katsina, Kebbi, Sokoto, Yobe, Zamfara, and Borno.

Multiple Indicator Cluster Survey 4 (MICS 4) funded by UNICEF Nigeria 2010. The survey collected data on maternal and child health care and MDG health indicators.

Household Baseline Survey by Partnership for Transforming Health Systems 2 (PATHS2) 2010/11, 2011/12, Collected baseline data for health systems strengthening.

Baseline Survey on Drug Revolving Fund Programme by PATHS2.

Core Welfare Indicator Questionnaire Survey. It involves data collection for poverty analysis using a welfare approach.

Outcome measures in the economic evaluation

The other important aspect of the economic evaluation is the outcome data. These are the model parameters that will inform the decision model. These data will be collected through various

sources and using different methods. Where possible, we have proposed that data on outcome parameters for the economic analysis are collected alongside the impact evaluation. Details of the model parameters and their sources are presented below.

A.2.1.11   Outcome measures for evaluation of the CMAM programme

Table 26:   Model parameters, sources of data and method of data collection

Model parameters	Source	Method
Prevalence of malnutrition		
Prevalence of moderate and severe malnutrition in under-fives in programme evaluation areas.	- The ORIE baseline population survey (impact evaluation).	- Random sample of households within each LGA.
	- Other sources: Demographic and Health Survey (DHS) of Nigeria (report available online). - Other data sources and major reports.	- Focused literature search for published reports/papers based on DHS, Nigeria. - Further data or reports may be available from or through Dr Kenneth Ojo's team at the Centre for Health Economics and Development, Nigeria (we have had direct correspondence through Aly Visram).
Identification and referral to OTP/SC facilities in CMAM programme areas		
Probability of identification and referral to OTP facility for moderate malnutrition in CMAM programme implementation areas **[Pr(OTP)]**.	- The ORIE impact evaluation survey.	- The ORIE impact evaluation survey will evaluate the malnutrition status of children and establish whether or not the malnourished patient was identified and referred to OTP/SC facilities through the CMAM programme - These data will be used to estimate the probability of being referred to OTP/SC facilities, given moderate malnutrition.
Probability of referral to SC for severe malnutrition in CMAM programme implementation areas **[Pr(SC)]**.	- As above.	
Probability of refusal or default without seeking referred care in CMAM programme implementation areas **[Pr(RD)]**.	- As above.	- As above - Alternatively, patient records available with the CMAM community team will be evaluated against OTP and SC facilities attendance data to estimate default and refusal rates.
Probability of not identifying malnutrition through CMAM programme **[Pr(notI)]**		[Pr(notI)] = 1 – [Pr(OTP) + Pr(SC) + Pr(RD)]
Probability of seeking non-CMAM outpatient or inpatient care for malnutrition among those not identified by CMAM	- As above.	- The ORIE impact evaluation survey.

programme (in CMAM programme areas).		
Type of non-CMAM care sought for malnutrition.	- As above.	- The impact evaluation survey will ask about the kind of non-CMAM care sought.

Referral to OTP/SC facilities in non-CMAM programme areas

Probability of seeking outpatient care for malnutrition in non-CMAM programme areas.	- Same as for CMAM programme areas – based on data collected from control sites.	- Same as for CMAM programme areas.
Type of outpatient care sought.	- As above.	- The impact evaluation survey will ask about the kind of non-CMAM care sought.
Probability of referral (including self-referral) to inpatient care for malnutrition in non-CMAM programme areas.	- As above.	- As above.

Outcome of OTP facility care in CMAM programme areas

Probability of being cured during treatment at OTP facility/community-based treatment.	- CMAM programme data.	- Routine data collection system will be put in place to collect patient-level data for all children seeking care at OTP over a period of 12 months (preferably once the programme is well established).
Probability of death during treatment at OTP facility/community-based treatment.	- As above.	- The database should collect the following outcome data for each patient seeking OTP care: cured, referred to SC, died or refusal or discontinuation of treatment, revisit during the 12-month period for malnutrition.
Probability of referral to SC facility during treatment at OTP facility.	- As above.	
Probability of refusal or discontinuation of CMAM programme treatment at OTP facility.	- As above.	

Outcome of outpatient care in non-CMAM areas

Probability of being cured during outpatient treatment in non-CMAM programme areas.	- Data from non-CMAM programme facilities.	
Probability of death during outpatient treatment in non-CMAM programme areas.	- As above.	- A routine data collection system will be established for control OTP component area/s and the abovementioned data should be collected.
Probability of referral to SC during treatment at OTP facility.	- As above.	
Probability of refusal or discontinuation of non-CMAM-outpatient treatment in non-CMAM programme areas.	- As above.	

Outcome of SC care in children directly referred to SC through CMAM programme		
Probability of being cured during SC treatment.	- Hospital routine data.	- A routine data collection system will be put in place to collect patient-level data for all children seeking care at SC over a period of 12 months (during the same period when data from OTP facilities is being collected). The database should collect the following outcome data for each patient seeking SC care: cured, referred to OTP facility, died or refused or discontinued treatment.
Probability of death during SC treatment.	- Hospital routine data.	
Probability of refusal or discontinuation of SC treatment.	- Hospital routine data.	
Outcome of SC care for non-CMAM programme patients/areas		
Probability of being cured during SC treatment.	- Hospital routine data.	- As above.
Probability of death during SC treatment.	- Hospital routine data.	
Probability of refusal or discontinuation of SC treatment.	- Hospital routine data.	

Below we summarise the main categories of data that will be required for the economic evaluation (as presented in detail above), and the sources/studies proposed in this design document.

A.2.1.12 Outcome measures for evaluation of the IYCF interventions

As discussed in the methods section, the outcome measures for the economic evaluation of the IYCF interventions are the same as the outcome measures of the impact evaluation, i.e. young children and infant feeding related outcomes. These outcomes will be converted into probabilities of health consequences (as discussed earlier) and subsequently converted into DALYs. Hence, the outcome data for the evaluation of the IYCF interventions will come from the impact evaluation exercise.

Sampling strategy for data collection (cost and outcome data)

In order to get a representative sample of the population to reflect the costs and outcomes associated with the programme, we propose that variation across states and between LGAs within states should be considered. With regards to the economic evaluation, the functional capacity/performance of the healthcare system, level of disease burden, socioeconomic gradient and cultural differences are among the variables of interest.

For the impact evaluation exercise, stratified random samples of households will be collected from four states, i.e. Zamfara, Jigawa, Kebbi and Katsina. Within each state, two or three LGAs will be selected and then households will be randomly selected within each LGA. The expected sample size for each state is 500 households for the intervention group and 500 for the control group within each state.

We have had a detailed discussion with Dr Kenneth Ojo of the Centre of Health Economics in relation to variability across states and between LGAs to achieve a representative sample in terms of variability in the factors outlined above. Based on this, we propose the following:

1. Cost and outcome data are collected from two states only, Jigawa and Zamfara. Jigawa is in the North East while Zamfara is in North West of Nigeria. Jigawa has relatively better health indicators compared to other northern states of Nigeria and much better compared to Zamfara.

2. Within each state, we propose that random samples of households are drawn from all three LGAs following the same strategy as the impact evaluation. Taking this approach would ensure that sufficient variation in health services, socioeconomic gradient and other regional variations will be captured. Hence, the household survey will be conducted using the same sample as the impact evaluation within the chosen LGAs. Both intervention and control households will be included in the sample, in line with the impact evaluation. The sample size used within each state for the impact evaluation will be sufficient for the economic evaluation.

3. For facility-based data collection (for programme-related costs and facility-based patient outcome data for CMAM; see below), the same strategy will be used as above. Hence, three LGAs will be selected from Jigawa and Zamfara. Within each LGA, we recommend that two health facilities are selected, one from the intervention area and one from control area. These health facilities should be close to each other in terms of rural/urban characteristics and socioeconomic status (and, possibly, disease burden).

The following data will be collected from the proposed states and LGAs:

1. Programme-related capital and operating costs, including all the costs identified in Table 26 and Table 27 . This relates to all four workstreams. Areas of shared resources should also be identified so that double counting can be avoided if a combined evaluation is conducted. These costs will be collected once for the health facilities (as discussed above).

2. Facility-based data collection: Outcome data for patients who used outpatient and inpatient facilities during a period of one year (i.e. during a one-year period when the programme is fully operational – preferably year 2 or year 3 to allow for data analysis and modelling work) – this will be used in the evaluation of the CMAM programme. The outcome data for the IYCF interventions analysis will come from the household survey conducted as part of the impact evaluation.

3. Facility-based data collection: Patient-related cost data will be collected to capture direct and indirect resource use, including opportunity cost (discussed later). These may be collected using a questionnaire-based survey or based on focused group interviews (recently used for the economic evaluation of CMAM in Bangladesh). As above, these data will also be collected in a cross-sectional manner, i.e. patients will be asked once about health-related costs.

4. Household survey data: Outcome data will be collected to be used for the evaluation of workstreams 1 and 2. This will be an add-on to the impact evaluation exercise and will be collected at baseline and follow-up.

Timing of data collection

We propose the following timetable for data collection:

1. **Programme delivery costs** will be collected from intervention and control areas once the programme is fully operational, which is likely to be between years 2 and 4. However, to allow time for data analysis and economic modelling, we would propose that programme delivery costs are collected during year 2 or year 3.

2. **Facility-based outcome and cost data** from patients should cover a period of one year for all patients admitted to health facilities during the one-year period. Using the same argument as above, we propose that this data is collected during year 2 or year 3 of the programme. In order to spread the data collection process, it may be feasible to collect programme delivery cost data during year 2 and facility-based outcome and cost data during year 3. Year 1 will allow preparation time for data collection.

3. **Household survey data:** This will be conducted in line with the impact evaluation exercise.

Annex B   WINNN programme costing methodology

This annex describes the methodology employed for computing WINNN's financial costs for Year 4, which bears similarities to the methodology employed for the previous three years, in order to facilitate as much comparison as possible between the implementation costs between the years. Methodological departures from previous years, where they occurred, have been mentioned below.

IPs mapped out all their relevant costs in WINNN Year 4, disaggregated by the four WINNN outputs, by economic category, and by the state in which expenditures were incurred. A sample of these tracking templates for Year 4 can be seen in Figure 15: below, and is similar to the mapping exercises undertaken for previous years—that is, the same categories of cost were analysed (using a similar methodology) in Years 1, 2 and 3.[34,35]

Figure 15:   Sample of an expenditure tracing template for WINNN IPs

Name of implementing partner	WINNN expenditures in NGN (total should = total reported to DFID)							
# Input category	**Total**	**Expenditure by state**						
		Unspecified	Abuja	Jigawa	Katsina	Kebbi	Yobe	Zamfara
TOTAL EXPENDITURE								
Recurrent expenditure	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Personnel								
1 Personnel 1: staff	0	0	0	0	0	0	0	0
[Programme staff; Staff shared with other programmes; Social Contributions/Allowances (pensions, insurance)]								
1.1 *Input fully attributed to WINNN*	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*
1.1.1 Cross-cutting								
1.1.2 CMAM								
1.1.3 IYCF		*No need to enter Personnel 1: staff costs for 4 WINNN outputs, as imputed through a separate survey*						
1.1.4 Micronutrient/de-worming								
1.1.5 Advocacy (WINNN #4)								
1.2 *Input partly attributed to WINNN (shared)*	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*
2 Personnel 2: non-staff	0	0	0	0	0	0	0	0
[Technical assistance; Bonuses/stipends for health workers (excluding per diems for training, M&E, etc.)]								
2.1 *Input fully attributed to WINNN*	0	0	0	0	0	0	0	0
2.1.1 Cross-cutting	0	0	0	0	0	0	0	0
2.1.2 CMAM	0	0	0	0	0	0	0	0
2.1.3 IYCF	0	0	0	0	0	0	0	0
2.1.4 Micronutrient/de-worming	0	0	0	0	0	0	0	0
2.1.5 Advocacy (WINNN #4)	0	0	0	0	0	0	0	0
2.2 *Input partly attributed to WINNN (shared)*	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*
Medical commodities								
3 Medical commodities *excluding* RUTF	0	0	0	0	0	0	0	0
[Vit A & other micronutrients; De-worming pills; Medical Supplies; Commodities shared with other programmes (anti-malarials, vaccines?)]								
3.1 *Input fully attributed to WINNN*	0	0	0	0	0	0	0	0
3.1.1 Cross-cutting	0	0	0	0	0	0	0	0
3.1.2 CMAM	0	0	0	0	0	0	0	0
3.1.3 IYCF	0	0	0	0	0	0	0	0
3.1.4 Micronutrient/de-worming	0	0	0	0	0	0	0	0
3.1.5 Advocacy (WINNN #4)	0	0	0	0	0	0	0	0
3.2 *Input partly attributed to WINNN (shared)*	0	*0*	*0*	*0*	*0*	*0*	*0*	*0*

B.1   Apportioning shared personnel and overhead costs

The second step was to determine the allocation basis for attributing shared costs to various WINNN outputs. These are costs which are shared across two or more of the WINNN outputs, such as (some) personnel costs, and general overheads. Various apportioning criteria can be used for this: for instance, activity-based costing uses the distribution of staff time inputs as a basis for apportioning staff wage expenditures or other non-staff shared costs, thus based on the assumption that staff time usage provides a close reflection of how those shared costs inputs are

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[34] All conversions from USD to GBP (or vice versa) were done using an exchange rate of £1= $1.55 (Source: IMF Representative rates for the period September 2014–August 2015). An exchange rate of £1=$1.59 was used in Year 3, of £1= $1.65 in Year 2 and of £1= $1.60 in Year 1.

[35] Additionally, it should be noted that all expenditures cited in this report refer to nominal costs, i.e. costs have not been adjusted to take account of inflation.

effectively allocated to different WINNN outputs. These apportioning criteria work well, say, when the total wage bill is known but not its attribution to various sub-activities. Similarly, other non-staff inputs (such as floor space) can also be used in cost analyses to apportion shared costs. Knowledge of the programme was also applied in specific cases for the purposes of apportioning expenditure categories such as medical commodities to specific outputs. For instance, shared expenditures on procurement and distribution of RUTF administered through the CMAM programme were apportioned fully to the CMAM programme output.

We employed an activity-based apportioning methodology in our analysis. In Year 1, we did this through a staff time-use survey administered to all staff working on WINNN (both full-time and part-time) within the three WINNN IPs (ACF, SCI and UNICEF). The apportioning percentages obtained from the staff time-use survey were then used to attribute common costs to various WINNN outputs and states. For the following years, we judged that a simpler, but still accurate, way to obtain the same information was to conduct key informant interviews to gather information on the relative usage of staff time. This exercise was conducted in the subsequent years for ACF and SCI (in the case of UNICEF a different exercise was done[36])

Shared personnel costs

To provide a simple example of activity-based costing: staff member A in IP organisation X has total salaries and allowances of $10,000 and spent, on average, 50% of her time on WINNN. She indicated in the key informant interview that of the time she spent on WINNN, 40%, 30%, 30% and 0% was spent on Outputs 1, 2, 3, and 4 respectively. We then apportioned and attributed staff member A's salary as shown in Table 27: 50% of staff member A's salary was attributed to WINNN, and this amount was further apportioned to various WINNN outputs as per the time-use percentages reported by staff member A in the staff time use survey.

Table 27:   An example of apportioning shared personnel costs

Staff details			Outputs			
Staff member	Salary	WINNN share (50%)	CMAM programme (40%)	IYCF interventions (30%)	MNCHW events (30%)	Advocacy (0%)
A	10,000	5,000	2,000	1,500	1,500	0
Source: Illustrative example						

Aside from the four WINNN outputs, IPs were also given the option of allocating time to a fifth category called 'cross-cutting activities'. Amounts allocated to this category were then apportioned to the four outputs as per the time-use percentages.

This apportioning process was repeated for all staff working on WINNN (whether full- or part-time, based in Abuja or in one of the focal states) in all the three IPs. The sum of each individual staff salary share in WINNN and its outputs gave us, for each IP, total staff costs attributable to WINNN and its four outputs.

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[36] Due to the information available, we used a different apportioning method for Year 2, Year 3 and Year 4 for UNICEF's costing data. For Year 2 and Year 3 we used weights to allocate common costs to WINNN outputs derived from the DFID impact logframe. For Year 4 UNICEF common costs were apportioned in their majority to the CMAM programme due to the fact that RUTF was the largest share of the total expenses. We will be working with UNICEF to find a suitable method of standardising previous years' costing analyses.

Shared overhead costs

As illustrated in Table 28: , we then obtained the ratio of the total salary sums attributable to each WINNN output. These ratios were used for apportioning utilities, fuel, stationary and other shared common costs to various WINNN outputs. This implies an implicit weighting by salary—i.e. the activities of people with higher salaries count more in the weighting.

Table 28: An example of calculating apportioning percentages for shared common costs

Staff details			Outputs			
Staff member	Salary	WINNN share	CMAM programme	IYCF interventions	MNCHW events	Advocacy
A	10,000	5,000	2,000	1,500	1,500	0
B	20,000	15,000	5,000	10,000	0	0
C	50,000	20,000	10,000	5,000	0	5,000
Total	80,000	40,000	17,000	16,500	1,500	5,000
Ratios			42.5%	41.25%	3.75%	12.5%
Source: Illustrative example						

Where possible, IPs themselves carried out the allocation of some other shared services, such as capital expenditures, training and capacity development, and goods and services for volunteers. This process was followed by discussions with ORIE analysts to understand and sense-check the bases for these allocations. This process took place from Year 2 onwards, while the allocation in Year 1 was done largely by OPM using the weights derived from the staff survey and discussion with IP.

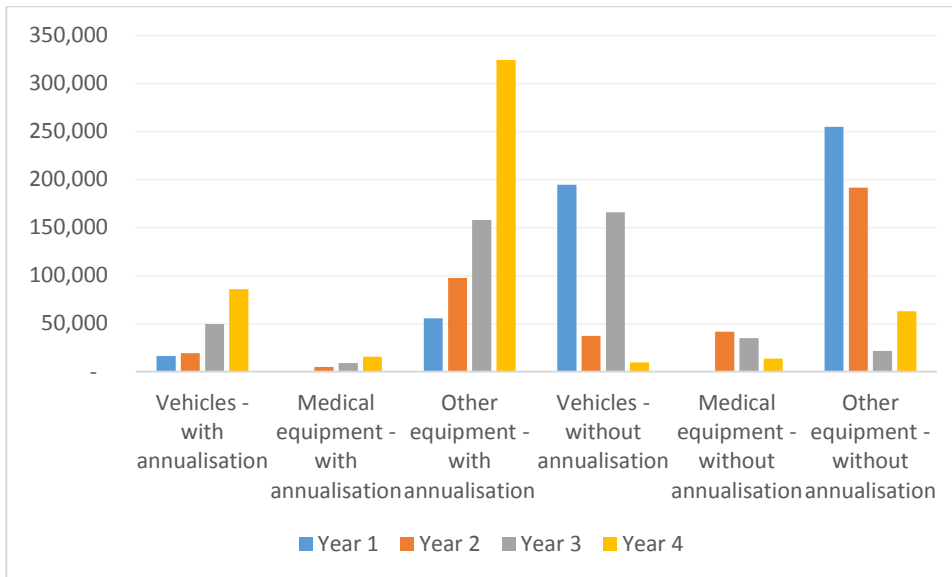## B.2   Annualisation of capital costs

In previous Preliminary Annual Costing Reports we have always noted that the capital costs of the WINNN programme have yet to be annualised. Initial years of a programme often involve lumpy capital expenditure for acquiring buildings, vehicles and equipment. These expenditure items are then 'annualised'—i.e. their value is spread across their useful life period. In this analysis, we have annualised all capital expenditures across Year 1 and Year 4.

We have done this by assuming an annual interest rate of 3% and an average lifespan for the different capital expenditure categories reported by the IPs as follows: 15 years for 'vehicles', 10 years for 'medical equipment', and five years for 'other equipment'. For any given financial capital expenditure reported in every year, we calculate the annualised costs using the assumptions regarding interest rate and asset life period described above. Given that the life period for all assets considered surpasses our analysis timeframe (four years), we assign the calculated annualised cost to the year in which that asset was bought and each subsequent year.

Figure 16: shows how the financial accounting per capital cost category varies across years with the annualisation of capital costs. This figure shows that the annualisation method spreads the value of the capital expenditure across the years or the asset life period. More weight is given to later years since they include new annualised capital costs and annualised costs pulled from previous years. Figure 17: shows the implications of this analysis for the relative weight of capital expenditure on total expenditure. The analysis without annualisation of capital costs shows a trend away from capital expenditure, while the analysis with annualisation shows an upward trend in respect of the relative share. All our results in Section 3 are calculated using annualisation of

capital costs. However, WINNN is not a very capital-intensive programme, and so this does not make a substantial difference to the overall findings of previous reports, just the finding about trends in capital expenditure.

Figure 16: Capital expenditure by category under annualisation and no annualisation scenarios, Years 1–4

Figure 17: Capital expenditure share under annualisation and no annualisation scenarios, Years 1–4
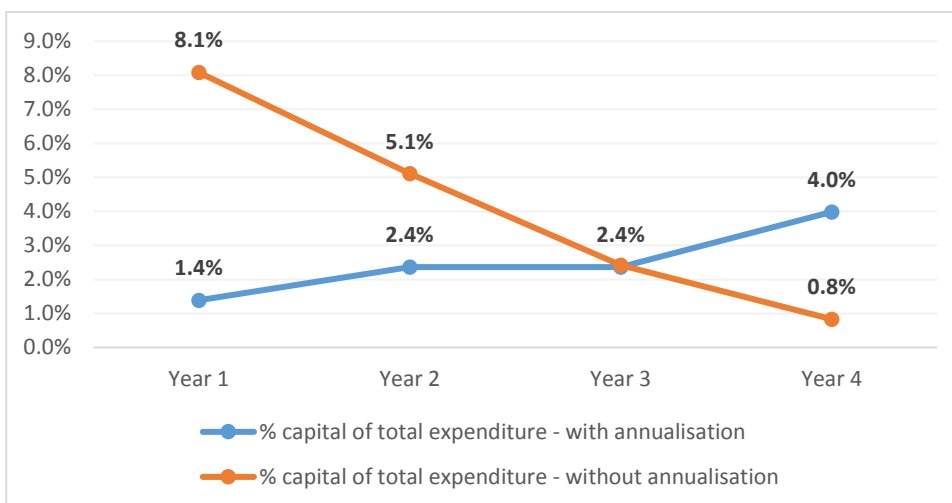
Annex C Methodology, data and assumptions for the IYCF interventions costing

This annex was prepared at the outset of the implementation of ORIE workstream. It is a methodological note that guided all primary data collection and analysis.

C.1 Health facility staff costs

The approach used for calculating the IYCF interventions staff costs is the same as that used in the CMAM programme evaluation. Here we present aspects that are specific to the IYCF interventions, including data sources and calculations.

As for the CMAM programme evaluation, health facility staff costs for providing IYCF interventions training will be calculated using the following information:

Staff cost per session = Σ (Staff time per IYCF session x staff salary)

Here Σ represents the sum of all clinical staff types.

The above will be calculated for individual as well as group sessions. For group sessions, staff cost per session will be divided by the number of participants in the group:

Staff cost per group session

Number of participants in the group session

Finally, staff cost per session will be multiplied by the number of IYCF sessions attended by each mother. Below we describe each component of this calculation and the related data sources.

Staff time per IYCF session

The following data will be collected for the IYCF interventions:

- identification of all clinical staff members involved in providing IYCF interventions training (either based at a health facility or in the community);
- grade level of clinical staff;
- time spent per individual and group counselling session; and
- number of mothers per group counselling session.

Data sources for staff time

There are two sources of data for number of sessions and staff time per session:

WHO norms – WHO has recommended the following duration of IYCF sessions by child's age:

- <6 months (six counselling sessions):
  - ο 10 mins antenatal consultation
  - ο 10 mins antenatal consultation
  - ο 20 mins neonatal consultation
  - ο 10 min postnatal consultation at one week

- ο   10 min postnatal consultation at five weeks
- ο   10 min postnatal consultation at five months

- 6–23 months (three counselling sessions):
  - ο   10 mins (6–8 months
  - ο   10 mins (9–11 months)
  - ο   10 mins (12–23 months)

LGA-level data collection or HFS – The following data will be collected to calculate staff time per IYCF session:

- number of staff members of each type involved in delivering an individual or group session
- total number of minutes spent per IYCF session by staff category
- this will be multiplied by the number of IYCF sessions, which will be obtained separately in the ORIE endline survey (described below).

Staff salaries

As part of the WINNN evaluation, staff salaries will be obtained from higher-level offices, i.e. LGA and state-level offices in all WINNN states. This approach has been described in the CMAM programme sections above.

Number of IYCF sessions per mother

Data on the number of IYCF sessions per mother will be obtained in the ORIE endline survey. More specifically, the endline survey includes the following questions (these will be asked separately for health facility based and community-based sessions):

- Have you ever received any specific training on breastfeeding and feeding practices in respect of infants and young children at a health facility (or in the community)?
- When was the first time you received this type of training?
- How many times did you receive this type of training in the last one month?
- How many times have you received this type of training in total?
- The last time you received this type of training, who gave the main health talk?
- The last time you received this type of training, the setting was?

one-to-one training; or

group training

- If group training, how many other people were in the group?
- The last time you received this type of training, how long did it last?

Another source of information for the number of attendees per group session is the f-IYCF group session attendance form. Depending on the accuracy of these data sources, we will make a decision about which should be used as the primary source – the other will be used in the sensitivity analysis.

Finally, the number of sessions reported in the ORIE endline survey will be compared with WHO recommended norms.

C.2 Health facility overhead costs

As described in the discussion of the CMAM programme evaluation, monthly health facility overhead costs will be obtained at the level of each health facility. This will then be divided by the number of patient visits in a calendar month to arrive at health facility-level overhead cost per patient visit. This will then be multiplied by the number of IYCF visits per mother, which will be used as a cost input in the decision model. The following formula will be used for this purpose:

Health facility overhead cost per mother =

Σ (Overhead resource use cost per visit) x number of IYCF sessions per mother

Here Σ represents the sum of all overhead resource use types described in the previous section.

Below we present how data on each component of the above formula will be obtained.

Health facility overhead cost per IYCF session

Overhead cost at health facility-level will be collected through a questionnaire survey of LGA-level officials (described earlier). Using these costs, annualisation of costs will be carried out (as described for CMAM). Costs will then be apportioned to the IYCF interventions using one of the following two options:

apportioned based on IYCF <u>patient visits per month</u> as a proportion of total number of visits at the health facility; or

* apportioned based on IYCF-related <u>activity time per month</u> as a proportion of total activity time at the health facility.

Finally, the following formula will be used to calculate health facility overhead cost per IYCF session:

Overhead cost per IYCF session = <u>Overhead cost x proportion attributable to IYCF interventions</u>

Number of IYCF visits per year

Once overhead cost per IYCF session is established, this will be multiplied by the number of sessions per mother. This will then be added to the health facility staff costs (above) to arrive at the total health facility cost.

C.3 CV costs

The following costs will be included: (1) expenses incurred by CVs when providing CMAM care; and (2) opportunity cost of CVs. The approach used for calculating the costs incurred by CVs when carrying out IYCF-related activities is the same as CMAM programme evaluation. Here we present aspects that are specific to the IYCF interventions.

CV expenses

CV expenses are recorded in the HFS (details are provided in the CMAM programme section). This information is recorded for a representative sample of CVs to calculate average expenses per CV. The following formula will then be used to calculate CV expenses per mother:

CV expenses per mother receiving IYCF-related services =

Average CV expenses per month x Total number of CVs in the LGA

Number of IYCF interventions beneficiaries in the LGA

CV opportunity cost

The following data will be collected to calculate the CV opportunity cost.

Number of hours spent on IYCF-related activities per week: there are two sources of data for this:

Source 1: HFS – CVs instrument

Source 2: Operational research – CV interviews

Number of CVs per LGA

Source: LGA-level data collection

Number of individual IYCF interventions beneficiaries per LGA

Source: IYCF interventions LGA monthly Summary Forms

In addition, the HFS collected information on whether CVs gave up income to do IYCF-related work; estimated/expected income given up; and the time spent on IYCF-related activities (see details in CMAM programme section). We will use this information on time spent on IYCF-related activities and will multiply it by the expected income (if available) or average daily wage in northern Nigeria or the national average wage for Nigeria (age- and gender-specific, if possible).

C.4 Higher-level costs: WINNN programme

Higher-level costs of implementing the CMAM programme are incurred by the WINNN programme, as well as by the LGA- and state-level governments. First, we discuss the cost incurred by the WINNN programme. The costs incurred by the programme can be categorised as personnel costs and overhead costs.

Personnel costs: WINNN programme

WINNN personnel costs include costs of staff at all levels who are involved in planning, implementing, managing or M&E of the programme at any level. This information is available in the WINNN ORIE Economic Evaluation Implementing Partner Expenditure Mapping Template. For further details, see the CMAM programme sections of the report.

Personnel costs will be divided by the number of IYCF interventions beneficiaries per year (obtained from WINNN monitoring data) to arrive at the cost per IYCF interventions beneficiary of WINNN personnel time.

Overhead costs: WINNN IYCF interventions

For details of cost categories included in the overhead costs, see the CMAM programme evaluation section. All cost categories will be added to obtain the total WINNN IYCF interventions

overhead cost per year, which will be divided by the total number of IYCF interventions beneficiaries per year to obtain the cost per mother. This information will be based on actual expenditure data, which are available in the WINNN ORIE Economic Evaluation Implementing Partner Expenditure Mapping Template. Further details are provided in the CMAM programme evaluation sections.

C.5   Higher-level costs: LGA and state level

Higher-level costs at the level of LGAs and states include personnel costs as well as non-personnel costs. We use the same approach as is used in the CMAM programme economic evaluation (see relevant sections above).

LGA- and state-level personnel costs

We will identify LGA- and state-level personnel involved in the WINNN IYCF interventions (e.g. monitoring visits), their grades and the number of hours worked on the IYCF interventions per week. This information will be collected through interviews conducted with LGA and state-level officials (as discussed earlier).

These data will be combined with the total number of IYCF interventions beneficiaries at LGA- and state-level to calculate the number of minutes of LGA- and state-level staff time for each type of staff:

Total number of minutes spent by EACH staff member per IYCF interventions beneficiary =

Number of hours per week spent on IYCF-related activities. x 60 minutes x (52 weeks/12 months)

Total number of IYCF interventions beneficiaries per month

The above calculation will be repeated for each category of LGA and state-level staff. The number of minutes per staff category is subsequently multiplied by their respective salaries and summed to arrive at the cost per IYCF interventions beneficiary.

C.6   LGA and state level: specific costs

Besides the overall cost of managing the WINNN IYCF interventions (captured through personnel costs, as described above), we will collect additional data on the following two cost categories, which are not captured in LGA and state-level personnel costs above:

- monitoring and supervision costs; and
- training costs.

Further details of what these cost categories include are provided in the CMAM programme evaluation section. These costs will be added to the overall costs and divided by the total number of IYCF interventions beneficiaries (as described above).

C.7   Carer costs

Finally, we capture costs incurred by carers, including out-of-pocket expenses incurred during care-seeking, and the opportunity cost of providing care.

Carer out-of-pocket expenses

This includes expenses incurred on food, travel, medicines and other aspects of care-seeking for SAM. The following data are collected during the HFS (sampling approach discussed earlier) at both OTP and SC health facilities:

- Main mode of transportation used to get to the facility today
- Did caregivers spend money on transport today on a one-way trip?
- Average amount of money spent on a one-way trip to the facility today (of caregivers that spent money on transport)
- Did caregivers spend money on food and drink at the facility today?
- Average amount of money spent on food and water at the facility today (of caregivers that spent money on food and water)
- Did caregivers spend money on medicines at the facility today?
- Average amount of money spent on medicines at the facility today (of caregivers that spent money on medicines)
- Did caregivers spend money on any other thing at the facility today?

Carer opportunity cost

We also collected data on carer opportunity cost in our HFS. The following information was collected at both OTP and SC health facilities:

- Did caregivers work to generate an income?
- Did caregivers give up some income to be at the CMAM facility (of caregivers that worked to generate income)?
- Average estimated income caregivers gave up to be at the CMAM facility (of caregivers that worked and gave up some income)
- We will use this information on opportunity cost and multiply it by the average daily wage in northern Nigeria, or alternatively by national average wage for Nigeria (age- and gender-specific, if possible).

Annex D Data and assumptions for the CMAM programme costing

This annex was prepared at the outset of the implementation of ORIE workstream. It is a methodological note that guided all primary data collection and analysis.

D.1 Introduction

Cost data will be collected from a societal perspective, as has been described earlier in the report. Using the societal perspective, there are four main groups (organisations and individuals) that incur costs which are captured in the economic evaluation:

- **LGA- and state-level government –** costs incurred by this group include:
  ο health service provision costs (including health services staff costs, overhead costs, medicines, instruments and other supplies); and
  ο management costs (including management, and M&E).

- **WINNN programme and IPs –** costs incurred by this group include:
  ο RUTF cost; and
  ο personnel and overhead costs.

- **CVs** – costs incurred by this group include:
  ο out-of-pocket expenditure; and
  ο opportunity costs.

- **Parents seeking health care**– costs incurred by this group include:
  ο out-of-pocket expenditure; and
  ο opportunity costs.

Below we summarise these costs based on the level at which the costs are incurred. They are also presented in Figure 18 below.

CMAM programme-specific costs

- Higher-level costs: state and LGA:
  ο personnel costs
  ο overhead costs

- Higher-level costs: IP:
  ο personnel costs
  ο overhead costs

- SAM treatment costs
  ο RUTF cost
  ο Drug and equipment costs

- Health facility costs (OTP and SC facilities)
  ο Health facility staff costs
  ο Health facility overhead costs

- CV costs
  - Out-of-pocket costs
  - Opportunity cost

- Carer costs
  - Out-of-pocket costs
  - Carer opportunity cost

Figure 18:   Cost data for CEA of CMAM programme
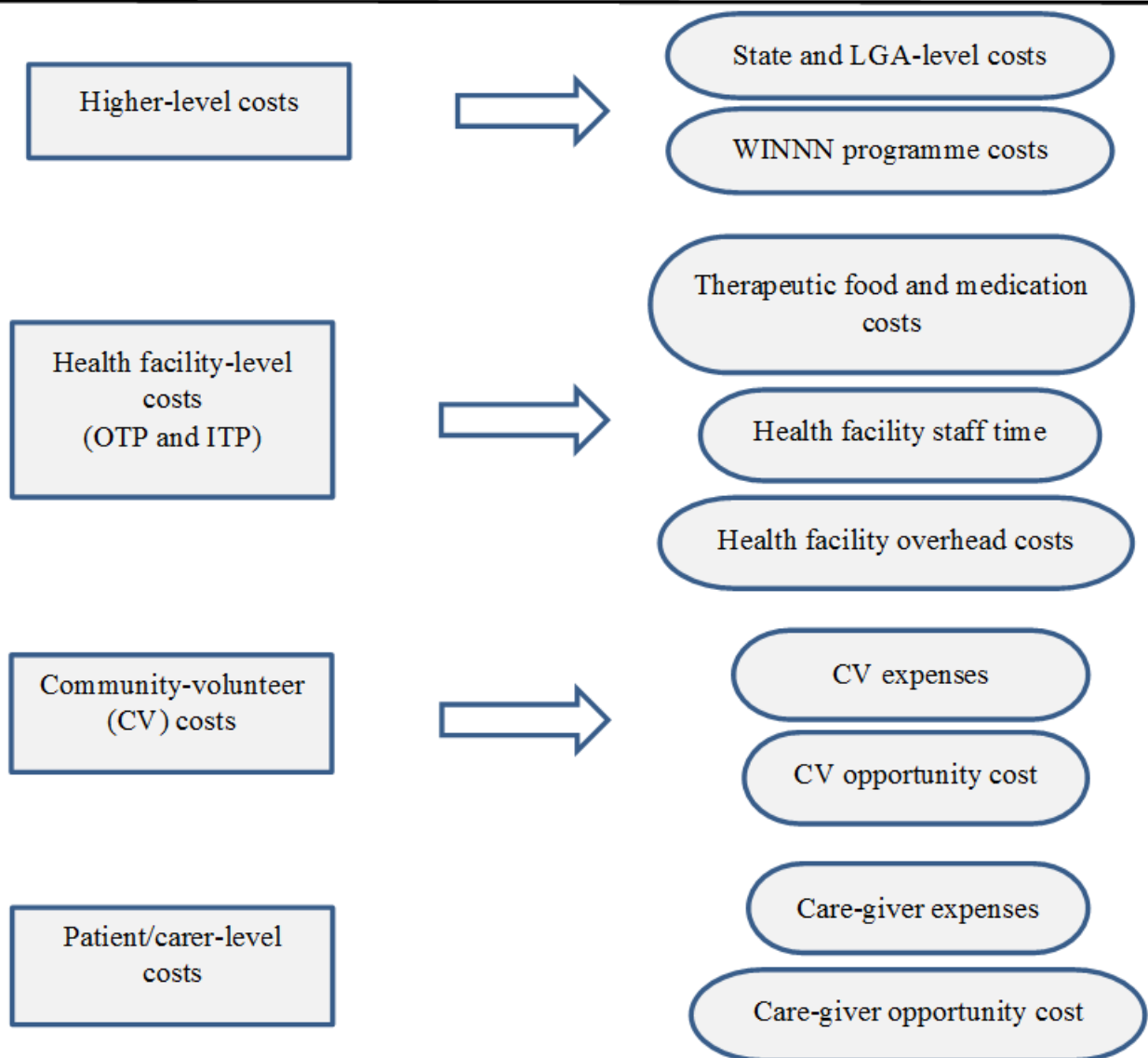
The remainder of the annex will discuss each of these cost centres and their data sources and assumptions.

D.2   Health facility staff costs

Health facility staff cost for treating children with SAM will be calculated using the following information:

OTP/SC facility staff cost for each exit category =

Σ (Clinical staff time per SAM visit x staff salary) x number of visits to/nights at OTP/SC facilities per child with SAM

Here Σ represents the sum of all clinical staff types, including doctors, nurses and other clinical staff. The same calculation will be conducted for SC staff cost.

Below we present how data on each component of the above formula will be obtained.

Staff time per SAM visit

Calculations

Data on staff time has been collected for OTP and SC facility staff members, including doctors, nurses and other supporting clinical staff. Non-clinical support staff time will be captured under the heading 'overhead costs'. These data include:

- identification of all clinical staff members involved in providing care for SAM (either based at the facility or deployed to the facility for CMAM day);
- number of hours worked on CMAM programme per week; and
- grade level of clinical staff.

This information is then combined with the number of SAM cases at the health facility in a week to calculate the number of minutes of clinical staff time for each type of clinical staff (such as doctors and nurses):

Total number of minutes spent by EACH staff type per SAM patient =

Number of hours per week spent on CMAM prog. x 60 minutes x (52 weeks/12 months)

Number of SAM cases per month

The above will be calculated for each staff type separately. For instance, the above calculation may show that the total number of minutes spent by all nurses together in a month on treating SAM children in an OTP facility is 1,000 minutes. This is then divided by the number of SAM appointments in this OTP facility in a month to obtain the number of minutes of nurse's time per SAM appointment in the OTP facility.

The above calculation is repeated for each category of clinical staff, such as doctors, nurses, and other clinical staff. The number of minutes per staff category is subsequently multiplied by their respective salaries (discussed below) to calculate the cost of a SAM visit. The same approach is used to calculate SC staff costs.

Data source for staff time

Data for the above will be obtained from the HFS.

The HFS includes the following information:

- categories of clinical staff (such as doctors and nurses) involved in delivering CMAM care at OTP and SC facilities;
- number of staff members in each category; and
- total number of hours spent on delivering CMAM care in a typical week by staff category.

Data on total time spent on SAM is then divided by the total number of SAM cases seen at the facility, as described later.

Staff salaries

This information was obtained from higher-level offices, i.e. LGA and state-level offices in all WINNN states. We collected this information through interviews conducted with officials identified in LGA- and state-level offices. The interviews were conducted by a senior health economist based in Nigeria who conducted field visits and collected this information using a structured questionnaire developed by OPM. The questionnaire asked for the following information:

- salary at each grade level from grade level 1 to grade level 17 and salary steps from 1 to 15 or more within each grade level; and
- how salaries have changed over the past few years, particularly since 2012 when the WINNN programme started.

All four WINNN states and one LGA per state are included in our survey.

The salaries considered in our calculations are the consolidated health salary structure plus the non-clinical duty allowance for nurses/other health professionals who are not entitled to a call duty allowance each month.

To obtain the hourly salary, the total salary is then divided by 208, which is the number of working hours per month.

Given that for Zamfara the salary information is missing, we considered the average hourly salary for Jigawa, Katsina and Kebbi.

Number of SAM visits per month

Data on the number of SAM cases per month per health facility was obtained using **Monthly Electronic Forms**. These are monthly tables that record the number of SAM cases under the following exit categories:

- **Total SAM patients in a given month:**
  ο new cases, including relapses;
  ο transfers from OTP facility;
  ο transfers from SC facility; and
  ο returned defaulters.

- **Outcomes for SAM patients:**
  ο number recovered;
  ο number died;
  ο number defaulted;
  ο number non-recovered;
  ο number sent to outpatient; and
  ο number sent to inpatient.

Number of OTP/SC facility visits per exit category

After obtaining cost per visit of OTP or SC facility, we multiplied this by the number of OTP facility visits or SC facility nights for each exit category. This information was obtained from **Patient Registration Cards**, which were obtained from OTP and SC facilities. A Patient Registration Card includes information about the number of visits made by each child with SAM and their eventual exit category. To get a representative sample of patients, we used the following sampling approach:

- quarterly sampling in one year to account for seasonal fluctuations;
- two OTP facilities and one SC facility in each LGA;
- all three LGAs per state and all four WINNN states in northern Nigeria; and
- patients sampled in each exit category.

Based on this, the target sampling size is presented below:

- eight cards of patients who have RECOVERED from treatment at OTP facilities;
- eight cards of patients who have DIED during treatment at OTP facilities;
- eight cards of patients who DEFAULTED from treatment at OTP facilities;
- eight cards of patients who have NOT RECOVERED from treatment at OTP facilities;
- eight cards of patients who have been TRANSFERRED to SC from treatment at OTP facilities;

This is summarised in the table below.

	April–June 2015	January–March 2015	October–December 2014	August–September 2014	Total
Recovered	2	2	2	2	**8**
Died	2	2	2	2	**8**
Defaulted	2	2	2	2	**8**
Non-recovered	2	2	2	2	**8**
Transferred to SC	2	2	2	2	**8**
Total	**10**	**10**	**10**	**10**	**40**

4 states x 3 LGAs per state x 2 OTP facilities and 1 SC facility per state = 24 OTP facilities + 12 SC facilities.

Total OTP facility cards: 8 cards per category x 5 categories (recovered, non-recovered, defaulted, died and referred to SC) = 40 cards per OTP facility x 24 OTP facilities = 960 cards.

Total SC cards: 8 cards per exit category (two categories: lived or died) = 16 cards per SC. This is multiplied by 12 SCs = 192 cards.

However, it should be noted that for some exit categories we did not achieve the proposed sample size because not enough events took place per health facility. For instance, there were fewer observed deaths than the proposed numbers.

D.3   Health facility overhead costs

Monthly health facility overhead costs will be summarised at the level of OTP and SC health facilities. This will then be divided by the number of patient visits in a calendar month to arrive at

the health facility-level overhead cost per patient visit. This will then be multiplied by the number of visits per SAM child based on the exit category, which will be directly used as the cost input in the decision model. The following formula will be used for this purpose:

OTP/SC facility overhead cost for each exit category =

Σ (Overhead resource use cost per visit) x number of OTP/SC facility visits per SAM child

Here Σ represents the sum of all overhead resource use types, which includes the following:

- non-clinical staff time;
- building costs, including depreciation, maintenance and new building costs;
- vehicles, including depreciation, maintenance and new vehicle costs;
- medical equipment, including depreciation, maintenance and new equipment costs;
- non-medical equipment, including depreciation, maintenance and new equipment costs;
- utilities, including electricity, gas, water, internet, telephone and other costs;
- fuel cost for vehicles; and
- any other overhead costs not covered above.

The same calculation will be conducted for both OTP and SC facility overhead costs.

Below we present how data on each component of the above formula will be obtained.

Health facility overhead cost per SAM visit

Data on health facility-level overhead resource use will be collected for the cost categories mentioned above. These data are collected through:

- **total OTP facility overhead cost:** LGA-level questionnaire (Part 3 of the questionnaire); and
- **total SC facility overhead costs**: state-level questionnaire (Part 3 of the questionnaire).

These questionnaires were implemented in a survey of LGA and state-level officials identified in LGA and state-level offices (as discussed above under the category 'Staff salaries'). However, our initial assessment of the data collected through this survey suggests that the quality of the data may not be optimal. Several expenditure items appear to be based on gross approximations, which may be incorrect. Moreover, it is not possible to check these data against official documents because these documents were not made available by state and LGA offices. We will have a better understanding of the data quality during summer 2016, when we start analysing these data.

Once total overhead costs have been established at OTP facility and SC facility level, the following calculations were conducted:

- **Annualisation of costs (Larson and Wambua, 2011; Formson and Forsythe, 2010):** Annualisation in this context refers to apportioning depreciation of capital goods to a period of time during the lifecycle. This is particularly relevant to capital costs, including buildings, vehicles and equipment, to account for depreciation cost. We expect that cost data for certain categories, such as equipment, may not be disaggregated at the level of items (for instance, furniture).
- Hence, we propose to use the following pragmatic approach:
  - ο **buildings:** 30 years as base case, and 20 and 50 years in sensitivity analysis;
  - ο **vehicles:** 15 years as base case and 10 years in sensitivity analysis;

- ο **medical equipment:** 10 years as base case and five years in sensitivity analysis; and
- ο **other equipment:** five years as base case and seven years in sensitivity analysis.

- **Apportioning to CMAM programme:** We will consider the following two options to apportion overhead costs to CMAM programme
  - ο apportioning, based on CMAM programme <u>patient visits per month</u> as a proportion of total number of visits at the health facility; and
  - ο apportioning, based on CMAM programme <u>activity time per month</u> as a proportion of total activity time at the health facility.

Finally, the following formula will be used to calculate health facility overhead cost per SAM visit:

Overhead cost per SAM visit = <u>Annualised overhead cost x proportion attributable to CMAM programme</u>

Number of SAM visits per year

Once overhead per SAM visit is established, this will be multiplied by the number of visits per SAM patient in each exit category to calculate overhead cost per patient. This will then be added to the staff costs (above) to arrive at the total health facility cost (for OTP and SC facilities) for each exit category.

D.4 SAM treatment costs: RUTF, therapeutic milk and medication

The following items will be costed in the CEA:

- RUTF;
- therapeutic milk: F75;
- therapeutic milk: F100; and
- medications prescribed at OTP or SC facilities, including:
  - ο antibiotics
  - ο anti-malarial
  - ο Vitamin A
  - ο folic acid
  - ο albendazole/ mebendazole
  - ο deworming
  - ο analgesics
  - ο any other drugs

There are two components of the abovementioned costs:

- unit cost of RUTF pack, therapeutic milk and medication
  - ο unit cost of procurement
  - ο unit cost of storage and transportation

- quantity of RUTF packs, therapeutic milk and medication per child in each exit category.

Below we present the calculations and data sources for each of these components.

Cost of procurement, storage and transportation

In the CMAM programme, procurement of RUTF and therapeutic milk (F75 and F100) is done by WINNN IPs, while storage and transportation of these items is done by WINNN and state and LGA governments at different stages. For medications, some of these are procured, stored and transported by WINNN programme, while for others this is done by state and LGA governments.

Below we describe the sources of data for these items.

Cost data are provided by UNICEF for every year (from Year 1 to Year 5). The following information has been collected:

- item-level total expenditure on RUTF, therapeutic food and medications (i.e. those that UNICEF is responsible for); and
- item-level total quantity of the above. (Expenditure and quantity are not disaggregated by state).

Since the data are not split by procurement, storage and transportation, we calculate these separate costs as follows:

Cost of procurement of one item = total expenditure on the item

Cost of distribution and storage of one item = (total expenditure on the item) x (total quantity of the item) / (total quantity of all the items)

Data on drugs which are procured (and stored and distributed) by the government are collected through the higher-level data collection. This is captured in Part 2 ('CMAM programme supply chain costs' module) of the LGA-level and state-level data collection. The data collection questionnaire asks the following questions:

- Does the LGA or State pay for storage and/or transportation of RUTF and CMAM programme routine medicines and supplies?
- If yes, how much was paid in total for these activities?
- How much quantity was stored/transported?

In particular, we find that the state encountered some costs for the storage and transportation only of RUTF.

Hence, the total cost of each commodity will be:

Total cost of RUTF/therapeutic food/medicines =

Cost of procurement (provided by IP) + cost of storage and transportation (provided by IP and state-/LGA-level office)

To arrive at unit cost, we will use the following formula:

Unit cost of RUTF/therapeutic food/medicines =

Total cost of RUTF/therapeutic food/medicines

Quantity of RUTF/therapeutic food/medicines

Quantity of RUTF, therapeutic milk and medication per patient

Unit cost of RUTF/therapeutic food are multiplied by the quantity of these products per patient in each exit category at the level of OTP and SC facilities. The source of data is the following:

- **OTP and SC facility Patient Registration Cards:** This is our preferred source and is described above. Patient Registration Cards provide detailed information on quantities of RUTF and therapeutic food given to each patient.

We note that it is not possible to use health facility caseload and stock records for this as these medicines will also be used for other patients.

Quantity of other medication per patient

The unit costs of routine medicines are multiplied by the quantity of these products per patient at the level of OTP and SC facilities. The source of data is the following:

- **Normative approach based on recommended/common practice:** This approach was used in Puett *et al.* [2013], who assumed that each patient gets Cotrimoxazole and folic acid during admission. In order to apply this approach, we would need to confirm the drug regimen for treatment at OTP facilities (what is given routinely on every visit, or just the first or second visit, depending on age or diagnosis), In particular, this involves checking: folic acid, zinc, immunisation, HIV test, antiretroviral, tuberculosis therapy Cotrimoxazole prophylaxis.

D.5   CV costs

CV costs include: (1) expenses incurred by CVs when providing CMAM care; and (2) opportunity costs of CV. We collect this information in the HFS, as well as data on the number of CVs attached to each health facility. Details of CV cost data are provided below.

CV expenses

This includes expenses incurred in relation to food, travel and other costs incurred when providing CMAM care. The following data are collected through the HFS (sampling approach discussed earlier) of both OTP and SC health facilities:

- Main mode of transportation used to get to the facility today
- Did CVs spend money on transport today on a one-way trip?
  - ο Average amount of money spent on a one-way trip to the facility today (of CVs that spent money on transport)
- Did CVs spend money on food and drink at the facility today?
  - ο Average amount of money spent on food and water at the facility today (of CVs that spent money on food and water)
- Did CVs spend money on any other thing at the facility today?
- Did CVs give money to support caregivers?
- What was this money given for:
  - ο food
  - ο water
  - ο transport

- ο drugs
- ο other

- Average total amount of money given last time (of CVs that have given money to caregivers)
- Did CVs give anything other than money last time
- Average total value of items given in kind last time (of CVs that have given anything other than money to caregivers)
- Average total value of items given in kind last time (of CVs that have given anything other than money to caregivers)

This information is recorded for a representative sample of CVs to calculate average expenses per CV. The following formula will then be used to calculate CV expenses per mother:

CV expenses per mother receiving CMAM-related services =

Average CV expenses per month x Total number of CVs in the LGA

Number of CMAM programme beneficiaries in the LGA

CV opportunity costs

We also collected data on CV opportunity costs in our HFS. The following information was collected/questions were asked:

- Do CVs work to generate an income?
- Did CVs give up some income to be at the CMAM facility?
- Average time spent by CV on the following:
  - ο time spent to arrive at the health facility;
  - ο average number of hours spent at the health facility on CMAM day;
  - ο average number of hours spent at the health facility on WINNN programme; and
  - ο average number of hours spent in the community to do CMAM programme work.

- Average estimated income CVs gave up to be at the CMAM facility.

To estimate the hourly wage we apply the following formula:

Hourly wage = Estimated income given up/(travel time + time spent on CMAM programme work)

D.6   Higher-level costs: WINNN programme

Higher-level costs of implementing the CMAM programme are incurred by the WINNN programme as well as the LGA- and state-level governments. First, we discuss the cost incurred by the WINNN programme. The costs incurred by the programme can be categorised as personnel costs and overhead costs.

Personnel costs: WINNN programme

WINNN personnel costs include the costs of staff at all levels who are involved in planning, implementing, managing or M&E of the programme at any level. This information is available in the WINNN ORIE Economic Evaluation Implementing Partner Expenditure Mapping Template.

- These data are disaggregated at state level and by financial year.
- If possible, we will try to distinguish between the start-up costs versus ongoing programme costs to estimate the cost of starting the CMAM programme, as well as continuing the programme that is already ongoing in selected states and LGAs in northern Nigeria.

Personnel costs are divided by the number of CMAM programme beneficiaries per year (obtained from CMAM programme monitoring data, discussed above) to arrive at cost per patient of WINNN personnel time using the following formula:

Cost/patient of WINNN personnel time = <u>WINNN annual expenditure on CMAM programme personnel</u>

<div align="right">Number of CMAM programme beneficiaries per year</div>

Overhead costs: WINNN programme

The following cost categories were included in the calculation of overhead costs:

- cost of operations and maintenance expenses;
- cost of training (including capacity development) expenses;
- cost of WINNN M&E (including supervision and assessment) expenses;
- cost of WINNN goods and services for CVs;
- cost of other WINNN goods and services;
- cost of WINNN vehicles;
- cost of WINNN medical equipment; and
- cost of other equipment.

The costs are disaggregated by state level and by financial year (as above). Also, if possible, we will aim to distinguish between start-up and ongoing programme costs.

All cost categories above are added to obtain the total WINNN overhead cost per year, which is divided by the total number of CMAM programme beneficiaries per year to obtain the cost per patient.

Cost/patient of WINNN overhead costs = WINNN annual overhead expenditure: (a) – (g)

<div align="right">Number of CMAM programme beneficiaries per year</div>

This information is based on actual expenditure data, which are available in the WINNN ORIE Economic Evaluation Implementing Partner Expenditure Mapping Template. One concern is that we have not received this information from UNICEF yet.

We discuss each of these categories below:

Cost of operations and maintenance expenses

This includes the cost incurred by WINNN IPs in terms of rent, vehicle fuel, vehicle maintenance, utilities, communications and other expenses that can be allocated to the CMAM programme. Allocation of operations and maintenance costs to CMAM programme staff will be done using staff time cost weighting, i.e. a staff member working full-time on CMAM programme work will be weighted twice as much as a staff member working half-time.

Cost of training (including capacity development) expenses

This includes the cost incurred by WINNN IPs in terms of training materials, venue hire, per diems and travel to deliver training

In order to allocate training costs to the CMAM programme, our ideal scenario is to distinguish between CMAM programme-specific and non-specific training. For instance, training on project management is non-CMAM programme-specific while training to organise CMAM days is CMAM programme-specific. Non-CMAM programme-specific costs can be partly attributed to the CMAM programme using an allocation based on proportion of staff time spent on CMAM programme-related activities, whereas the full cost of CMAM programme-specific training can be allocated to the programme.

However, information at this level may not be available from IPs. Hence, our back-up option is to use staff time-based cost weighting, as described above.

Cost of WINNN M&E (including supervision and assessment) expenses

This includes the cost incurred by WINNN IPs in terms of M&E materials, venue hire, per diems and travel. This cost item will be based on M&E expenditure made by IPs.

Cost of WINNN goods and services for CVs

This includes the cost incurred by WINNN IPs in terms of overhead costs incurred in respect of CVs, including per diems and training costs.

Cost of other WINNN goods and services

This includes the cost incurred by WINNN IPs in terms of other overhead costs of the WINNN programme, including the cost of management meetings and stakeholder sensitisation meetings.

Cost of WINNN vehicles

This includes the cost incurred by WINNN IPs in terms of the depreciation cost of new and existing vehicles, including 4x4 vehicles, other cars, motorbikes and bicycles. These costs will be annualised using the approach discussed earlier in the report.

Cost of other equipment

This includes the cost incurred by WINNN IPs in terms of computers, telephones, mobile phones, furniture and generators. These costs will be annualised using the approach discussed earlier in the report.

D.7   Higher-level costs: LGA and state level

Higher-level costs at the level of LGA and states include personnel costs as well as non-personnel costs. We use a pragmatic approach for this and collect primary data on expenditures on activities and personnel. The details of our approach and data source are presented below.

LGA- and state-level personnel costs

Calculation

We propose using a similar approach to the one used for costing health facilities personnel time. This involves collecting data on the following items:

- identification of LGA and state-level personnel involved in the WINNN CMAM programme (e.g. monitoring visits);
- grade level of the abovementioned staff members; and
- number of hours worked on the CMAM programme per week.

The following staff members were identified as relevant to the CMAM programme:

- LNO;
- Director of Health at LGA level;
- nutrition focal person;
- CMAM programme focal person; and
- any other personnel.

This information is then combined with the total number of CMAM programme beneficiaries to calculate the LGA-level personnel cost per SAM patient for treatment at OTP facilities:

LGA-level personnel cost per SAM patient for treatment at OTP facilities =

LGA-level monthly personnel costs / Total number of CMAM programme beneficiaries per month

Similarly, we calculate:

State- and LGA-level personnel cost per SAM patient for SC =

LGA-level monthly personnel costs / Total number of CMAM programme beneficiaries per month

The OTP and SC facility personnel cost is given by multiplying the hourly salary times the number of hours spent on CMAM care, and respectively weighted by the number of WINNN OTP facilities or SC facilities within their remit. The hours spent are aggregated on the basis of the staff grade level.

Data source for staff time

For each of the personnel identified, we asked for the following information at LGA and state level:

- current grade level;
- total working hours last month;
- percentage share allocated to WINNN CMAM programme activities;
- number of WINNN OTP facilities within their remit; and
- number of WINNN SC facilities under remit.

This information was obtained from higher-level offices: i.e. LGA- and state-level offices in all WINNN states. We collected this information through interviews conducted with officials identified in LGA- and state-level offices. The interviews were conducted by a senior health economist based in Nigeria who conducted field visits and collected this information using a structured questionnaire developed by OPM.

Staff salaries

This information was obtained from higher-level offices, i.e. LGA- and state-level offices in all WINNN states. We collected this information through interviews conducted with officials identified in LGA- and state-level offices. The interviews were conducted by a senior health economist based in Nigeria, who conducted field visits and collected this information using a structured questionnaire developed by OPM.

The salaries considered in our calculations are the consolidated health salary structure plus the non-clinical duty allowance for nurses/other health professionals who are not entitled to a call duty allowance each month.

To obtain the hourly salary, the total salary is then divided by 208, which is the number of working hours per month.

Given that for Zamfara the salary information is missing, we considered the average hourly salary for Jigawa, Katsina and Kebbi.

D.8   LGA and state level: specific activity costs

Besides the overall role in managing WINNN (captured through personnel costs above), our field experience indicated that we should consider two specific activities in which the LGA and state offices may have a role and therefore incur costs.

Monitoring and supervision costs

In our interviews with LGA- and state-level officials (discussed earlier), in addition to staff time costs, we collected data on the following/asked the following questions:

- Are LGA- or state-level staff members involved in monitoring and supervision of WINNN activities?
- How many monitoring visits took place in the last three months?
- How has the number of monitoring visits changed since the WINNN programme started?
- What was the cost of the last monitoring visit, in terms of the following:
    ο   cost of vehicle hire and fuel
    ο   cost of communication
    ο   field allowance(s) for staff and token for driver
    ο   other costs

These costs are added to the overall costs and divided by the total number of CMAM programme beneficiaries (as mentioned before). The number of visits is divided by three because a period of three months is considered.

Training costs

As described above, in our interviews with LGA- and state-level officials, we collected data on the following/asked the following questions:

- Does the LGA or state pay for training of WINNN CMAM programme staff members?
- Does the LGA or state pay for training of health facility staff at OTP and SC facilities?
- How many training sessions took place in the last three months?

- What was the total training cost in the last three months?
- How many health facility staff were trained in the last three months?

As before, these costs are added to the overall costs and divided by the total number of CMAM programme beneficiaries. In our case the training costs are zero.

D.9   Carer costs

Finally, we capture costs incurred by carers, including out-of-pocket expenses incurred during care-seeking, and the opportunity cost of providing care.

Carer out-of-pocket expenses

This includes expenses incurred in respect of food, travel, medicines and other aspects of care-seeking for SAM. The following data were collected/questions were posed during the HFS (sampling approach discussed earlier) at both OTP and SC health facilities:

- Main mode of transportation used to get to the facility today
- Did caregivers spend money on transport today on a one-way trip?
    o Average amount of money spent on a one-way trip to the facility today (of caregivers that spent money on transport)

- Did caregivers spend money on food and drink at the facility today?
    o Average amount of money spent on food and water at the facility today (of caregivers that spent money on food and water)

- Did caregivers spend money on medicines at the facility today?
    o Average amount of money spent on medicines at the facility today (of caregivers that spent money on medicines)

- Did caregivers spend money on any other thing at the facility today?

Carer opportunity costs

We also collected data on carer opportunity costs in our HFS. The following information was collected at both OTP and SC health facilities:

- Did caregivers work to generate an income?
- Did caregivers give up some income to be at the CMAM facility (of caregivers that worked to generate income)?
- Average estimated income caregivers gave up to be at the CMAM facility (of caregivers that worked and gave up some income)

To estimate the hourly wage we apply the following formula:

Hourly wage = Estimated income given up/ (travel time + time spent on CMAM programme work)

Annex E Summary of focused literature reviews

E.1 IYCF

Table 29: **Summary of published economic evaluation studies of feeding practices in respect of children under two years of age**

Study	Country	Type of analysis	Perspective	Intervention	Comparator	Costing approach	Cost elements	Results
Chola *et al.* (2011)	Uganda	Cost analysis	Health provider	Individual peer support counselling intervention	None	Activity-based costing and an ingredient approach	**Start-up** Travel Manual adaptation and initial training **Overheads** Communication Utilities Office rent **Peer support** Personnel cost Bicycles Field materials **Peer supervision** Personnel cost Transport cost Supervisory meetings Office supplies Capital costs	Cost per mother counselled was $139, Cost per visit was $26 Cost per week of EBF was estimated to be $15 at 12 weeks postpartum
Nkonki *et al.* (2014)	South Africa	Cost analysis	Health provider	Individual peer support counselling intervention	None	As above	As above	Cost per mother counselled was $228 and cost per visit was $52. In an operational 'non-research' scenario,

								these were $137 and $32 per mother and per visit, respectively

E.2   CMAM programme

Table 30:   Summary of published economic evaluation studies of severe acute malnutrition in children

Study	Country	Type of analysis	Perspective	Comparator	Costing approach	Cost elements	Cost per child treated	Cost per DALY averted
Abdul-Latif and Nonvignon (2014)	Ghana	Cost analysis	Societal	None	Traditional expenditure-based costing	Vehicles purchase Equipment purchase Staff salaries Vehicle operation Training cost Job aids Monitoring cost Building rent RUTF	$805.36 per child detected and treated	-
Puett *et al.* (2013)	Bangladesh	Cost-effectiveness	Societal	Inpatient treatment (facility-based)	Activity-based costing	Monitoring cost Training cost Supervision cost Growth Monitoring and Promotion sessions Household visits by community health workers Curative care	Community treatment = $165 per child Inpatient treatment = $520 per child	Community treatment = $26 Inpatient treatment = $214
Purwestri *et al.* (2012)	Indonesia	Cost analysis (with some outcomes presented separately)	Societal	None	Traditional expenditure-based costing	Capital costs Staff salaries Transportation Incentives for voluntary workers Food supplements Haemoglobin and health assessment	Daily programme: $376.2 per child Weekly programme: $331.8 per child	-

Tekeste *et al.* (2012)	Ethiopia	Cost-effectiveness	Societal	Inpatient treatment (facility-based)	Traditional expenditure-based costing	All personnel salaries Capital depreciation Utilities Medicines RUTF/milk-based formula Caretakers' food Non-food and other supplies	Therapeutic Feeding Centre: $262.62 (institutional) and $21.01 (opportunity cost) per child treated Community-based therapeutic care: $128.58 (institutional) and $5.87 (opportunity cost) per child treated	-
Wilford *et al.* (2011)	Malawi	Cost-effectiveness	Health services	Existing health services without a CMAM programme	Traditional expenditure-based costing	Capital costs: cars, motorbikes, computers Recurrent costs: RUTF, admin cost, direct staff cost, transport, training cost, medical supplies, inpatient cost	CMAM programme area = $169.3 Non-CMAM programme area = $16.7	$42 per DALY averted (base case) $493 per DALY averted (worst case)
Bachmann (2009)	Zambia	Cost-effectiveness	Health services	Do nothing	Traditional expenditure-based costing	Cost of health centre visit Cost of RUTF Cost of community mobilisation	CTC = $203 per child No treatment = $0	$53 per DALY averted
Ashworth and Khanum (1997)	Bangladesh	Cost-effectiveness	Societal	i) Inpatient care ii) Day care	Traditional expenditure-based costing	Staff salaries Capital depreciation Utilities Laboratory costs X-ray cost Medicines/supplies Child's food Carer's food	Inpatient = $159 Day care = $63.8 Domiciliary = $38.8	-