BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers’ comments and the authors’ responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (http://bmjopen.bmj.com).

If you have any questions on BMJ Open’s open peer review process please email info.bmjopen@bmj.com
What does it cost to combine supply-side and demand-side RBF approaches in a single intervention? Evidence from the Results Based Financing for Maternal and Newborn Health Initiative in Malawi

| Journal:          | BMJ Open                  |
|-------------------|---------------------------|
| Manuscript ID     | bmjopen-2021-050885       |
| Article Type:     | Original research         |
| Date Submitted by the Author: | 29-Oct-2021 |
| Complete List of Authors: | Torbica, Aleksandra; Bocconi University Grainger, Corinne; Options Consultancy Services Ltd Okada, Elena; Options Consultancy Services Ltd De Allegri, Manuela; Heidelberg University, |
| Keywords:         | PUBLIC HEALTH, HEALTH ECONOMICS, HEALTH SERVICES ADMINISTRATION & MANAGEMENT |
I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd (“BMJ”) its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge (“APC”) for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author’s Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.
What does it cost to combine supply-side and demand-side RBF approaches in a single intervention? Evidence from the Results Based Financing for Maternal and Newborn Health Initiative in Malawi

Aleksandra Torbica¹, Corinne Grainger², Elena Okada³, Manuela De Allegri⁴*
*Corresponding author

¹ Centre for Research on Health and Social Care Management (CERGAS), Bocconi University
² Options Consultancy Services, United Kingdom
³ Options Consultancy Services, United Kingdom
⁴ Heidelberg Institute of Global Health, University Hospital and Medical Faculty, University of Heidelberg, Germany

* Corresponding author: Manuela De Allegri – manuela.deallegri@uni-heidelberg.de
Abstract

Objective: To estimate the economic cost associated with implementing the Results Based Financing for Maternal and Newborn Health (RBF4MNH) Initiative in Malawi. No specific hypotheses were formulated ex-ante.

Setting: Primary and secondary delivery facilities in rural Malawi.

Participants: Not applicable. The study relied almost exclusively on secondary financial data.

Intervention: The RBF4MNH Initiative was an RBF intervention including both a demand and a supply-side component.

Primary and secondary outcome measures: cost per potential and for actual beneficiaries.

Results: The overall economic cost of the Initiative during 2011 – 2016 amounted to 12,786,924 Euro, equivalent to 24.17 Euro per pregnant woman residing in the intervention districts. The Supply Side Activity Cluster absorbed over 40% of all resources, half of which were spent on infrastructure upgrading and equipment supply, and 10% on incentives. Costs for the Demand Side Activity Cluster and for Verification were equivalent to 14% and 6% respectively of the Initiative overall cost.

Conclusion: Carefully tracing resource consumption across all activities, our study suggests that the full economic cost of implementing RBF interventions may be higher than what was previously reported in published cost-effectiveness studies. More research is urgently needed to carefully trace the costs of implementing RBF and similar health financing innovations, in order to inform decision-making in LMICs around scaling up RBF approaches.

Trial registration: Not applicable.

Strengths and limitations of this study

- We adopted a rigorous approach, rooted in Activity Based Costing, to trace all resources and related costs associated with designing and implementing a Results Based Financing intervention, combining demand- and supply-side incentives, and classified them by activity and by cost category.
- Tracing resource consumption across all activities, the economic cost of implementing RBF interventions appears to be greater than what has been indicated by prior cost-effectiveness studies.
- Due to the retrospective nature of our work, it is possible that we did not capture all costs or assigned them to the respective activities as accurately as it would have been possible had we collected data prospective.
- Further research is needed replicating the Activity Based Costing approach applied in this study to strengthen the evidence base on the economic costs of RBF interventions.
Introduction

Results-based financing (RBF) interventions are gaining increased attention as a means of improving access to care and enhancing quality of service provision across low- and middle-income countries (LMICs) [1]. With specific reference to health service delivery, results-based financing approaches include demand-side interventions, chiefly conditional cash transfers (CCT), and supply-side interventions, most notably performance-based financing (PBF). Conditional cash transfers are payments to healthcare users tied to compliance with a specific health behaviour, most frequently utilization of a given service, such as facility-based delivery or vaccinations [2]. Performance-based financing refers to the implementation of performance contracts, whereby healthcare providers and/or managers are paid upon the attainment of pre-defined quantity and quality indicators [3].

The widespread implementation of RBF has drawn attention to the need to assess the costs associated with these interventions. A recent publication by Chi and colleagues (2018) invites the research and policy community to be mindful of the identification, measurement and validation of the costs of RBF implementation as an integral element of research to inform investments in the health sector. To date, the scientific evidence base on the costs associated with RBF is extremely limited; it is mostly generated by studies that have focused exclusively on supply-side PBF interventions, and has largely neglected the estimation of costs associated with implementing demand-side programs, such as CCT [4]. This paucity of evidence is somewhat surprising considering that demand and supply-side RBF interventions are increasingly being combined in a single program design intended to address both sets of barriers to accessing health services [5].

Moreover, the available literature suffers from two limitations. First, existing costing studies on RBF struggle to accurately trace full costs across activities and cost categories, hence providing only limited information for policy makers as to which activities drive implementation costs [6]. Second, existing studies often aim to assess cost-effectiveness, relating the costs of implementing RBF approaches to their benefits, measured in terms of improved health service utilization and/or health gains [7–9]. While cost-effectiveness studies are instrumental in enabling policy makers to select interventions that generate the greater health benefits at lower costs, the evidence they generate does not provide guidance on the full cost structure of such programs, which is needed to inform further implementation and scale-up pilot interventions.

It is against this background that we aimed to fill the aforementioned gaps in knowledge by estimating the costs associated with implementing the Results Based Financing for Maternal and Newborn Health (RBF4MNH) Initiative in Malawi. This was an RBF intervention encompassing both a demand and a supply-side component to tackle maternal and newborn mortality by increasing access to better quality institutional delivery services. Our objective was to estimate the economic costs of the intervention, including both demand and supply-side components, clearly differentiating the costs across project phases, activities, and cost categories.
Methods

Study setting
With an estimated 2020 GDP per capita of 412 USD (current USD), Malawi is one of the poorest countries in sub-Saharan Africa. In 2010, prior to the launch of the RBF4MNH Initiative, maternal and neonatal mortality were estimated respectively at 639 deaths per 100,000 [10] and at 31 deaths per 1,000 live births [11]. Obstetric care services are provided through the country’s essential health package offered free of charge at public and contracted not-for-profit faith-based health facilities. Facility-based delivery utilization rates have increased dramatically over the course of the last two decades, increasing from 55% in 2000 to 91% in 2016 [12].

In spite of the high rates of institutional delivery, in 2014, unmet need for emergency obstetric care (EmOC) among women with obstetric complications was estimated at 75%, given that the majority of health facilities still did not meet EmOC standards. The healthcare system was at the time, and continues to be, characterized by poor infrastructure, and severe shortages in human resources and medical supplies, largely linked to insufficient funding capacity [13]. In 2013, annual per capita total health expenditure amounted to 39 USD [14], with donor funding covering nearly 70% of this amount.

Intervention design
The RBF4MNH Initiative has been described extensively in the literature, since sustained research efforts have been channelled towards assessing its impact on providers’ motivation [15], effective coverage [16], quality of service delivery [17,18], and maternal mortality at birth [19]. Hereafter, we synthetize the Initiative’s main features to allow the reader to follow the rationale of the methodological decisions we made for the cost analysis and to contextualize the findings we present.

The RBF4MNH Initiative was implemented between 2013 and 2018 by the Reproductive Health Directory (RHD) of the Ministry of Health, with financing from Governments of Germany and Norway, and technical and management assistance by Options Consultancy Services. Initially implemented in 18 EmOC facilities, it was later expanded to a total of 33 facilities, including 28 Basic EmOC facilities and 5 Comprehensive EmOC facilities, distributed across four districts (Balaka, Dedza, Mchinji, Ntcheu). Not all health facilities in each district participated. The Initiative aimed at reducing maternal and neonatal deaths by targeting the quality of obstetric services, encouraging utilization of facility-based delivery and 48 hours in-facility post-partum stays. To achieve these objectives, the Initiative included a supply and a demand-side component, specifically: (a) performance contracts with health facilities and district health management teams (DHMTs) linked to defined obstetric and neonatal care quality and utilization targets; and (b) conditional cash transfers (CCT) to pregnant women arriving at a participating facility for delivery, intended as partial reimbursement for the costs associated with delivering at a health facility. An additional integral component of the RBF4MNH Initiative, setting it aside from other RBF interventions, was the investment made to support infrastructure works and supply of essential medical equipment to participating public health facilities (e.g., renovation of labor rooms, construction of maternity waiting homes).
The participating facilities and the respective DHMTs received performance payments on top of the usual budget and in-kind resources (i.e., staff salaries, drugs and medical supplies) allocated by central and district governments. Approximately two-thirds of performance payments could be redistributed among staff as personal incentives, while one third was to be re-invested by the staff to support quality improvements at the facility (i.e., using the funds to purchase drugs and basic supplies, hiring contract staff and paying for minor infrastructure works and repairs).

In a departure from the current system whereby health facilities are not designated as cost centres and districts are largely responsible for all expenditure related to health facility functioning, the RBF Initiative worked to enable participating health facilities to manage the additional funds acquired autonomously. Health workers were also directly in charge of disbursing the CCT to women at the facility (paid in instalments on arrival and before/after delivery), and to register women for eligibility during antenatal care.

**Study design**

Our retrospective cost analysis aimed at estimating the full economic cost of the RBF4MNH Initiative. Hence, we captured the full value of all resources used by any of the parties involved in the design and implementation of all activities related to the Initiative [20]. We adopted a health system perspective, accounting for costs incurred by the Ministry of Health (MoH) and their development and implementing partners. These included: the MoH Malawi as key implementing lead, Options Consultancy Services (providing programme management and technical assistance), the German Development Bank KfW (as co-funder), and Norwegian cooperation (represented by both Norad and the Norwegian Embassy in Lilongwe). Our analysis captures the costs incurred by the Initiative in the four concerned districts as well as costs incurred in any other relevant settings, including the capital Lilongwe, where both the MoH and the central RBF4MNH office were located, as well as London, Frankfurt and Oslo, where monitoring and oversight activities were undertaken.

Our work covers the period from 2011, the year when the initial Feasibility Study was commissioned marking the onset of the Initiative’s design, to 2016. Hence, our analysis covers two years related to the Initiative design and start-up (2011-2012), and four years related to its implementation (2013-2016). While the Initiative was extended into 2018, our analysis concludes at 2016, since our research funding was aligned with the initial timeline of the Initiative and could not be prolonged to match its extension. Since the Initiative was also subject to some design modifications during implementation, we continued tracing design costs for the period 2013-2016. To the extent possible, we attempted to differentiate the cost of supply-side from demand-side activities. Given the retrospective nature of the study and the lack of relevant details in the financial data at our disposal, however, this was not always possible, so some activities, such as management, are not directly attributable to either the supply-side or the demand-side component.

**Data sources and data collection strategies**

To trace all costs pertaining to the design and implementation of the RBF4MNH Initiative, we adopted an Activity-Based Costing (ABC) approach. Accordingly, we started by retrospectively mapping all micro-level activities related to the design and
implementation of the Initiative and then traced all resources being consumed by these activities. We completed these first two steps by reviewing the complete documentation of the intervention and engaging in a series of repeated exchanges with key stakeholders, who had been involved in the implementation of the Initiative.

To attribute value to either single resources (where possible) or complete activities (when the former was not possible), we extracted relevant cost information from the financial data of the different implementing partners. These included: a. Options’ financial data reporting central level costs related to implementation, including personnel costs; b. the RBF4MNH Initiative financial data, reporting costs for all activities related to field implementation, including incentive payments; c. financial data contributed by the development partners, including cost information on specific activities, such as the early Feasibility Study and the consultancies conducted during the course of the implementation.

To estimate resource consumption for activities that could not be traced in financial data, we conducted key informant interviews with MoH and development and implementing partners’ staff. These interviews allowed us to quantify the extent to which these staff had contributed towards the Initiative, albeit the value of their engagement was not directly reflected in the financial data. To value the days of work contributed by MoH staff, we used official national-level cadre-specific salary information. To value the days of work contributed by development and implementing partner staff, we used level-specific average international and national consultancy rates. In addition, to value material contributions by development partners not included in the financial data, such as flights and other transport, we used average market price items. In line with the literature, we applied a 15% overhead rate to the costs incurred by MoH, Norwegian Embassy and Norad, as well as KfW, to account for overarching costs (such as overall management) not easily traceable when accounting only for crude salaries and/or consultancy rates.

The RBF4MNH Office provided us with the number of women who benefitted from the Initiative while the National Office of Statistics provided us with the number of expecting mothers estimated for the RBF4MNH district catchment areas over the 2013-2016 period. This information served as basis to compute the size of the actual and the potential beneficiary population respectively.

Data sharing statement
Given the sensitive nature of the data used for this analysis, the authors cannot share the data used for analysis with third parties. Any request for data needs to be directed to the Ministry of Health of Malawi and its partners.

Analytical approach: cost analysis
To complete the cost analysis, aggregating information across data sources, we proceeded in steps, exemplified in Figure 1. First, once we had identified all single micro-level activities, we aggregated them into Activity Clusters, i.e., a series of broader activity groups to facilitate policy appraisal of the intervention costs (see Appendix 1 for details). The Activity Clusters were identified in consultation with the RBF4MNH implementation team as follows: Design, Management, Promotion, Operations Research, Monitoring and Evaluation (M&E), Verification, Demand side and Supply side costs.
In order to estimate costs for each Activity Cluster identified above, we then adopted the following approach. We aggregated detailed cost information across specific micro-level activities into broader meaningful Cost Categories. Normally, cost categories refer to general cost items, such as transport, staff, office supplies, etc. In our case, however, due to the structure of the data available, we had to work with cost categories that were broader and more inclusive. Then, we further aggregated these Cost Categories into Analysis Cost Categories, to draw a link between Cost Categories and Activity Clusters. We attributed Analysis Cost Categories to the single Activity Clusters and then aggregated values within a given Activity Cluster. This process was designed to inform decision-making by indicating which broad activity area absorbed what portion of the overall costs of the Initiative.

Similarly to what was reported by De Allegri et al (2019), one challenge we faced was the attribution of staff costs to single activities. Staff costs were easily traceable to the individuals involved in implementation, but they were documented as salaries or consultancy fees and did not provide any indication of the breakdown of activities undertaken by staff who worked across more than one Activity Cluster. Hence, to attribute staff costs to single Activity Clusters, we interviewed key implementers to reconstruct their engagement in the project. We attributed all time contributed by MoH, Norway, and KfW partners to general management activities, since we could confirm that staff employed at this level were not involved directly in other activities.

Lastly, to allow the reader a better sense of the ‘value’ of the RBF4MNH Initiative, we computed the cost per beneficiary, accounting for both actual beneficiaries, i.e., the actual number of delivering women served each year, and potential beneficiaries, i.e., the expected annual total number of delivering women across the four districts, within and beyond the direct catchment areas of the intervention facilities (since mobility across catchment areas is allowed and we know that women moved to receive care at RBF4MNH facilities).

All costs were adjusted to the base year 2016. We used a GDP deflator for the Euro area to adjust for inflation from 2011 to 2016. The cost items expressed in local currency were converted to Euros using official yearly average conversion rates to account for the extreme fluctuations in exchange rates which occurred during the period of our analysis.

**Ethical approval**
Both the Ethics Committee at the Medical Faculty of Heidelberg University and the Ethics Committee in Malawi waived ethical approval since the study was based exclusively on secondary costing data.

**Patients and public involvement**
Given the nature of the work conducted, patients and the public were not involved in any phase of the project.

**Funding**
This research was made possible by funding from the Ministry of Health Malawi and the KfW, the German Development Bank. Grant number not available.
Results

Table 1 presents a synthesis of the Initiative costs, across all years and all Activity Clusters. Under Management, we purposely differentiate costs incurred by the RBF4MNH implementation unit, by the MoH, and by its development and implementing partners.

The overall economic cost of the Initiative for the period 2011 to 2016 amounted to 12,786,924 Euro. The MoH financial contribution when comparing to that of the RBF4MNH implementation unit which, while situated within the MoH, and financed by development partners was (0.04% vs. 20.5% of the total costs).

Table 1 here

Table 2 differentiates costs between the start-up (all costs incurred in 2011-2012 period) and the implementation phase (all costs incurred in 2013-2016 period), with start-up costs absorbing 1,521,454 Euro and implementation costs across the four years we followed absorbing a total of 11,265,470 Euro. Implementation costs rose in the initial years, but then stabilized and started to decrease by 2016. Reflecting the pattern observed for total costs, implementation costs per beneficiary increased in the early years, but stabilized and started to decrease in 2016.

Table 2 here

Combining start-up and implementation costs, Table 3 shows which Activity Cluster absorbed which portion of total costs and which Analysis Cost Category contributed towards each activity. The Supply Side Activity Cluster absorbed over 40% of all resources devoted to the project. Within this figure the incentives only represented approximately 10% of the total value of this activity whilst considerable infrastructural investment represented nearly half. In 2016, once the program reached full maturity, the value of the incentives relative to the total value of the Supply Side Activity Cluster increased substantially, reaching one third of the overall value of the activity.

The Demand Side Activity Cluster absorbed nearly 14% of the intervention value, with incentives in this case representing nearly one third of all activity-specific costs. Verification costs, referring exclusively to supply side verification (since demand-side verification was incorporated in demand-side supervision), only absorbed 6% of the overall value of the intervention. Overall management costs absorbed over one fifth of the intervention value. Design activities absorbed less than 5% of the total value of the initiative, with the cost being driven exclusively by the initial feasibility study and by personnel costs.

Table 3 here

Table 4 presents the same cost data in a different form, looking at the cost of the single Cost Categories and pooling across costs pertaining to both the start-up and the implementation phase across all activities included in Table 3. Personnel costs for contracted RBF4MNH staff represented the most substantial cost driver, absorbing nearly 23% of the intervention value. Structural investments absorbed nearly one fourth of the intervention cost. Here, supply side verification appears to have absorbed only
slightly above 3% of the intervention costs, while in Table 3, this is shown to be 6%. This difference can be explained by the fact that in Table 3, we look at the value of the entire Activity Cluster, including the value of personnel time devoted towards verification. In Table 4, instead, the term supply side verification is used as a Cost Category, reflecting only the payments directly made by the implementation unit (either to external verification agencies or to district teams) to execute the verification procedures. Supply side and demand side incentives accounted for approximately 15% of the value of the intervention, with supply side incentives accounting for 10% and demand side incentives accounting for 5%.

Table 4 here

Discussion

This study makes an important contribution to the literature, being the first to describe in detail start-up and implementation costs of an RBF intervention, including both a demand-side and a supply-side component. Not only have prior analyses of similar programs focused almost exclusively on costs related to supply-side incentive systems, but they have also been conducted primarily with the objective of assessing cost-effectiveness of such programs in relation to status quo service provision [7–9]. We aimed at informing policy decisions on further implementation of RBF programs by describing the cost of single activities and the comparative weight of the single cost categories in detail. As such, our work complements existing literature on the cost-effectiveness of RBF interventions.

The first important finding emerging from our study is the substantial cost of the intervention, estimated at a total of 12,786,924 euros, distributed across the six years of the evaluation period, including two start-up and four implementation years. It should be noted, however, that unlike other RBF programs, this value includes a sizeable investment in infrastructure up-grading and provision of equipment to all participating public health facilities. The fact that implementation costs (across all activities) increased between 2013 and 2015 is likely to be a reflection of the fact that the RBF4MNH Initiative grew in size from 18 facilities in 2013, to 28 in 2014, and to 33 in 2015. The decrease in implementation costs observed in 2016 is a potential indication that program management became more efficient as the intervention settled. This would not be surprising, given that the intensive efforts to enable RBF to function as expected, characterized the early implementation years. However, longer-term data would be necessary to confirm this hypothesis.

When considering the total number of women reached by the program, the cost of the RBF4MNH Initiative is equivalent to Euro 24.17 per potential beneficiary and 62.52 per actual beneficiary. Our estimates stand out as being somewhat higher than estimates produced by prior economic analyses of RBF programs, including the prior cost-effectiveness analysis of the RBF4MNH Initiative, which detected lower unit costs for delivery services [7]. This discrepancy may seem particularly surprising considering that our analysis did not include the cost of providing care so we would have expected our estimates to be lower than previous estimates. However, it may also indicate that our work captured costs associated with RBF implementation, such as those related to design and human resource inputs by development partners, which can easily go
unnoticed in studies focused on the cost-effectiveness of providing care under PBF. While this emerging hypothesis deserves further empirical verification, it would be aligned with the arguments postulated by Chi et al (2018) [6] in calling for the application of more rigorous cost tracing to determine the actual economic value of RBF.

The second finding of interest is the fact that domestic resources only accounted only for a very limited portion of the total costs of the intervention, while development and implementing partners contributed most resources. In line with literature on RBF programs [21,22] as well as other complex health interventions [23,24], this high reliance on donor funding has turned out to be a key challenge for the sustainability of the RBF4MNH Initiative. In spite of the positive effects reported by both the scientific literature [15–19] and by the implementation team [25], the Initiative was discontinued in 2018, once the relevant development cooperation agreement reached the end of its current funding cycle. Although the RBF4MNH Initiative was well-integrated within MoH structures and systems, the combination of human resource capacity constraints and very low operating budgets at the Reproductive Health Directorate (RHD) of the MoH, meant that only a very small portion of the human resources deployed towards managing the Initiative were contributed by staff already stationed at the RHD. Such reliance on external funding has been recognized before as a key challenge to the sustainability of RBF interventions [22,26–29].

Looking at findings in relation to the different activities which made up the RBF4MNH Initiative, we bring the reader’s attention again to the fact that the Supply Side Activity Cluster absorbed over 40% of all resources devoted to the project, albeit the incentives only represented approximately 10% of the total value of this activity while the infrastructural investment represented nearly half of its value. The high proportion of costs absorbed by the Supply Side Activity likely reflects the strong focus on improving the quality rather than the quantity of care at participating facilities. The fact that the value of the incentives relative to the total value of the Supply Side Activity Cluster increased substantially over time suggests that as facilities become confident with working within the framework of a RBF intervention, their payoff increases, while the overall investments needed to operate the system (such as those in capacity building) decrease. While this pattern has been reported before in the literature [30], data from further implementation years would have been needed to confirm a trend towards increasing investments in incentives and decreasing investments in capacity building over time.

Nonetheless, the cost of the incentives compared to the overall cost of the intervention captured by our analysis is substantially lower than that observed in previous studies focused on supply-side RBF programs. In Zambia, for instance, incentives accounted for nearly half of all costs of the PBF program [8]. In a separate PBF program funded by USAID in Malawi, the SSDI-PBI program, incentives took up nearly one third of the overall cost of the intervention [30]. In Afghanistan, incentives were observed to absorb two-thirds of all economic costs [9]. Two factors may explain the differences observed between our findings and prior evidence. First, as discussed earlier, discrepancies may emerge as a consequence of different methodological approaches, specifically our focus on tracing and costing each and every activity making up the RBF program rather than solely estimating the costs of providing services under RBF. Second, the RBF4MNH Initiative included substantial capital investment in
infrastructure and purchase of large amounts of equipment for participating health facilities which the other programs it has been compared to may have not.

The Demand Side Activity Cluster absorbed nearly 14% of the intervention value, with incentives in this case representing nearly one third of all activity-specific costs. The fact that the value of the demand-side incentives decreased in 2016 compared to 2015 is attributable to the fact that the program switched from offering CCT to all women delivering in an intervention facility to offering cash transfers only to the women most in need. This measure was introduced at the request of the MoH in order to align better with the government’s targeted social cash transfer program. Analyses conducted after the end of the official impact evaluation indicated that this shift did not affect utilization of delivery services, which remained high even once the universal cash transfers were discontinued.

Somewhat surprisingly, verification costs, referring exclusively to supply-side verification, only absorbed 6% of the overall value of the intervention. This value appears low considering that prior research has found verification costs to account for as much as 23% of overall costs of supply-side RBF programs [9] and that the costs associated with verification are often raised as an intrinsic challenge to the effective implementation of PBF programs [31–33]. The low verification cost observed in our study may be an indication that the verification processes within the framework of the RBF4MNH Initiative were managed efficiently. This was probably largely due to the fact that during the early stages of the intervention, the central management staff largely undertook the verification function (due to challenges in identifying and contracting a suitable verification strategy) while later the contract was awarded to a local agency, avoiding the high costs charged by international agencies in other settings.

Of additional interest is the fact that over the entire six-year period, design activities absorbed less than 5% of the total value of the initiative, with the cost being driven largely by the initial feasibility study (we had no break down of the feasibility study in specific cost categories) and by personnel costs. Comparatively, design activities absorbed one third of the total costs of the parallel RBF intervention being rolled out in Malawi [30]. The fact that costs were incurred over time for design activities is indicative of the adaptive and dynamic nature of the intervention, which as observed in the impact evaluation final report, represents one of its key success features. Still, the reduction in design costs observed overtime suggests that by 2015, the Initiative had reached its full form and did not necessitate substantial further adjustments. This element ought to be considered in light of a possible scale up, since design decisions may need to be made to expand geographical scope, but assuming that the experience of the four pilot districts is representative of the country, the intervention may not necessitate extensive re-shaping, hence design costs could be kept to a minimum.

**Methodological considerations**

Beyond its value as the first cost analysis carefully tracing all activities of a complex RBF intervention including both a supply-side and a demand-side component, we ought to recognize some important methodological limitations to our study. First, the retrospective nature of data collection made it impossible for us to trace resource consumption across activities as accurately as we would have wished to. Nonetheless, we engaged closely with the implementation team to reconstruct to the extent possible
the roll-out of the intervention, complementing information from documents and financial data with information emerging from key informant interviews. This process was facilitated by the close relationship between the implementation and the research team, having worked together on the impact evaluation already. Second, given the paucity of similar studies focused specifically on the costs of RBF interventions, we recognize an inability to appraise our findings more comprehensively in relation to the experience of other settings. Third, since our study adopted a health system perspective, the resulting findings represent an underestimation of the total costs of the intervention, neglecting what costs might have been incurred at community level to enable its functioning (e.g., community leaders mobilization, identification of poor women, etc.). Fourth, we need to acknowledge that the computation of the cost per potential beneficiary is based on the estimated number of deliveries in the district. Hence, any imperfection in this population-based estimate is also reflected in our own cost estimate. Last, we need to acknowledge that due to the timing of our data collection, we could not include costs related to 2017 and 2018.

Conclusions
Our study represents the first comprehensive effort to assess the costs of setting up a RBF intervention, including both a demand and a supply-side component, examining all activity clusters and cost categories in detail. We have purposely not related these efforts to the benefits generated by the intervention, because, as documented by the literature, those have been very diverse and not easily reducible to a single matrix. Carefully tracing resource consumption across both start-up and design phases, our work suggests that the costs of bringing such an intervention into reality may be higher than what has been indicated by prior cost-effectiveness analyses. This observation calls for further research in the field, monitoring start-up and implementation costs of RBF programs as well as those of comparable health financing interventions, aimed at reforming purchasing structures. To overcome the challenges we have faced due to the retrospective nature of our work, we would argue in favour of integrating such research efforts in the infrastructure of the intervention evaluation from its very onset.
Acknowledgements
This would have not been possible had the staff at the Ministry of Health Malawi, the RBF4MNH implementation unit, the consulting agency Options, and both German and Norwegian cooperation agencies not supported us, sharing all documentation with us and answering our frequent questions. The authors are indebted to Jobiba Chinkhumba for his support with logistics and with data collection during the early phases of the project and to Bjarne Robberstad for his valuable comments on our study design and analytical approach.

Funding
This research was made possible by funding from the Ministry of Health Malawi and the KfW, the German Development Bank.

Conflict of interest
Manuela De Allegri was the principal investigator of the impact evaluation of the RBF4MNH Initiative, but funding for the two parallel studies was acquired and managed independently of one another (different funding agencies). Corinne Grainger and Elena Okada worked for the agency that supported the implementation of the RBF4MNH Initiative, Options Consultancy Services (Options) during the data collection phase of the study. Subsequent contributions to this work have been purely voluntary and as such, the views expressed in this paper represent her own views and not those of Options.

Authors’ contribution
MDA and AT were responsible for the initial study design, data collection strategy, and analytical approach. AT and MDA shared the responsibility for data acquisition, including both the retrieval of information from existing documents and the interviews with key informants. AT and MDA were in charge of analysis, with contributions by CG. MDA drafted the manuscript, with support from all authors. All authors read and approved of the final manuscript.

Data sharing statement
Given the sensitive nature of the data used for this analysis, the authors cannot share the data used for analysis with third parties. Any request for data needs to be directed to the Ministry of Health of Malawi and its partners.
References

1. Gautier L, De Allegri M, Ridde V. How is the discourse of performance-based financing shaped at the global level? A poststructural analysis. *Globalization and Health* 2019;15. doi:10.1186/s12992-018-0443-9

2. G. Carrin DOKX and. Conditional cash transfers: what’s in it for health? Technical Brief for Policy-Makers. *Geneva, World Health Organization* 2008;01.

3. Fritsche GB, Soeters R, Meessen B. *Performance-Based Financing Toolkit*. World Bank Publications 2014.

4. Oxman AD, Fretheim A. NIPH Systematic Reviews. In: *An Overview of Research on the Effects of Results-Based Financing*. Oslo, Norway: Knowledge Centre for the Health Services at The Norwegian Institute of Public Health (NIPH), Copyright ©2008 by The Norwegian Institute of Public Health (NIPH). 2008.

5. Bowser D, Gupta J, Nandakumar A. The effect of demand-and supply-side health financing on infant, child, and maternal mortality in low-and middle-income countries. *Health Systems and Reform* 2016;2:147–59. doi:10.1080/23288604.2016.1166306

6. Chi YL, Gad M, Bauhoff S, et al. Mind the costs, too: towards better cost-effectiveness analyses of PBF programmes. *BMJ Glob Health* 2018;3:e000994. doi:10.1136/bmjgh-2018-000994

7. Chinkhumba J, De Allegri M, Brenner S, et al. The cost-effectiveness of using results-based financing to reduce maternal and perinatal mortality in Malawi. *BMJ Global Health* 2020;5. doi:10.1136/bmjgh-2019-002260

8. Zeng W, Shepard DS, Nguyen H, et al. Cost-effectiveness of results-based financing, Zambia: a cluster randomized trial. *Bull World Health Organ* 2018;96:760–71. doi:10.2471/blt.17.207100

9. Salehi AS, Borghi J, Blanchet K, et al. The cost-effectiveness of using performance-based financing to deliver the basic package of health services in Afghanistan. *BMJ Global Health* 2020;5:e002381. doi:10.1136/bmjgh-2020-002381

10. WHO. Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. *Geneva: World Health Organization* 2019;;104.

11. WHO. Malawi. 2010.

12. National Statistical Office Malawi; DHS Program. Malawi Demographic and Health Survey 2015-16 Key Indicators Report. 2016.

13. Mueller DH, Lungu D, Acharya A, et al. Constraints to implementing the Essential Health Package in Malawi. *PLoS One* 2011;6:e20741. doi:10.1371/journal.pone.0020741
14 Organization WH. Global Health Expenditure Database. 2020.

15 Lohmann J, Muula AS, Houlfort N, et al. How does performance-based financing affect health workers’ intrinsic motivation? A Self-Determination Theory-based mixed-methods study in Malawi. *Social Science and Medicine* 2018;208. doi:10.1016/j.socscimed.2018.04.053

16 Brenner S, Mazalale J, Wilhelm D, et al. Impact of results-based financing on effective obstetric care coverage: Evidence from a quasi-experimental study in Malawi. *BMC Health Services Research* 2018;18. doi:10.1186/s12913-018-3589-5

17 Kambala C, Lohmann J, Mazalale J, et al. How do Malawian women rate the quality of maternal and newborn care? Experiences and perceptions of women in the central and southern regions. *BMC Pregnancy and Childbirth* 2015;15. doi:10.1186/s12884-015-0560-x

18 Brenner S, Wilhelm D, Lohmann J, et al. Implementation research to improve quality of maternal and newborn health care, Malawi. *Bulletin of the World Health Organization* 2017;95. doi:10.2471/BLT.16.178202

19 De Allegri M, Chase RP, Lohmann J, et al. Effect of results-based financing on facility-based maternal mortality at birth: An interrupted time-series analysis with independent controls in Malawi. *BMJ Global Health* 2019;4. doi:10.1136/bmjgh-2018-001184

20 Drummond MF, Drummond MFM, Sculpher MJ, et al. *Methods for the Economic Evaluation of Health Care Programmes*. Oxford University Press 2005.

21 Witter S, Bolton L. *Towards sustainability of RBF in the health sector – learning from experience in high and middle income countries*. TASRI Report for the World Bank. 2015. doi:10.13140/RG.2.2.17093.86246

22 Seppey M, Ridde V, Touré L, et al. Donor-funded project’s sustainability assessment: a qualitative case study of a results-based financing pilot in Koulikoro region, Mali. *Globalization and Health* 2017;13:86. doi:10.1186/s12992-017-0307-8

23 Muluh G, Kimengsi J, Azibo N. Challenges and Prospects of Sustaining Donor-Funded Projects in Rural Cameroon. *Sustainability* 2019;11:6990. doi:10.3390/su11246990

24 Bossert TJ. Can they get along without us? Sustainability of donor-supported health projects in Central America and Africa. *Social Science & Medicine* 1990;30:1015–23. doi:https://doi.org/10.1016/0277-9536(90)90148-L

25 Development FM for EC and. How rewards improve health practice in Malawi. 2017.

26 Bertone MP, Wurie H, Samai M, et al. The bumpy trajectory of performance-based financing for healthcare in Sierra Leone: agency, structure and frames
shaping the policy process. *Globalization and Health* 2018; 14:99. doi:10.1186/s12992-018-0417-y

27 Ridde V, Yaogo M, Zongo S, et al. Twelve months of implementation of health care performance-based financing in Burkina Faso: A qualitative multiple case study. *The International Journal of Health Planning and Management* 2018; 33:e153–67. doi:10.1002/hpm.2439

28 Bertone MP, Falisse J-B, Russo G, et al. Context matters (but how and why?) A hypothesis-led literature review of performance based financing in fragile and conflict-affected health systems. *PLoS One* 2018; 13:e0195301. doi:10.1371/journal.pone.0195301

29 McMahon SA, Muula AS, De Allegri M. “I wanted a skeleton … they brought a prince”: A qualitative investigation of factors mediating the implementation of a Performance Based Incentive program in Malawi. *SSM - Population Health* 2018; 5. doi:10.1016/j.ssmph.2018.04.006

30 De Allegri M, Makwero C, Torbica A. At what cost is performance-based financing implemented? Novel evidence from Malawi. *Health Policy and Planning* 2019; 34. doi:10.1093/heapol/czz030

31 Gergen J, Josephson E, Vernon C, et al. Measuring and paying for quality of care in performance-based financing: Experience from seven low and middle-income countries (Democratic Republic of Congo, Kyrgyzstan, Malawi, Mozambique, Nigeria, Senegal and Zambia). *J Glob Health* 2018; 8:21003. doi:10.7189/jogh.08.021003

32 Antony M, Bertone MP, Barthes O. Exploring implementation practices in results-based financing: the case of the verification in Benin. *BMC Health Serv Res* 2017; 17:204. doi:10.1186/s12913-017-2148-9

33 Grover D, Bauhoff S, Friedman J. Using supervised learning to select audit targets in performance-based financing in health: An example from Zambia. *PLoS One* 2019; 14:e0211262. doi:10.1371/journal.pone.0211262
Table 1. Total costs by activity over time in 4 districts (real values in €, base year 2016)

| Activity cluster                  | 2011    | 2012    | 2013    | 2014    | 2015    | 2016    | TOTAL   |
|-----------------------------------|---------|---------|---------|---------|---------|---------|---------|
| Design                            | 261,684 | 228,319 | 52,619  | 26,289  | 9,627   | 0       | 578,537 |
| Management                        |         |         |         |         |         |         | 3,112,263 |
| Contracted implementation unit (set within MOH) | 69,095  | 355,224 | 347,065 | 477,790 | 537,819 | 830,828 | 2,617,821 |
| MoH own resources                 | 1,425   | 882     | 737     | 689     | 662     | 515     | 4,909   |
| Development partners (KfW, Norad) | 88,260  | 82,464  | 81,439  | 80,000  | 78,838  | 78,532  | 489,533 |
| Promotion                         | 2,246   | 3,703   | 40,300  | 58,478  | 238,202 | 278,128 | 621,058 |
| Operations research               | 15,024  | 14,862  | 17,263  | 12,164  | 11,987  | 43,304  | 114,604 |
| M&E                               | 25,417  | 115,859 | 179,822 | 154,114 | 156,171 | 107,590 | 738,973 |
| Verification                      | 0       | 0       | 59,803  | 157,818 | 321,833 | 207,956 | 747,410 |
| Demand side                       | 8,103   | 45,752  | 269,044 | 290,987 | 574,657 | 507,354 | 1,695,897 |
| Supply side                       | 30,136  | 173,001 | 1,105,949 | 1,340,743 | 1,423,795 | 1,104,558 | 5,178,181 |
| Totals by year                    | 501,390 | 1,020,064 | 2,154,041 | 2,599,073 | 3,353,592 | 3,158,765 | 12,786,924 |
Table 2. Total start-up and implementation costs by year in 4 districts (real values €, base year 2016)

|                        | 2011   | 2012   | 2013   | 2014   | 2015   | 2016   | TOTAL  |
|------------------------|--------|--------|--------|--------|--------|--------|--------|
| **Start-up costs**     | 501,390| 1,020,064|        |        |        |        | 1,521,454 |
| **Implementation costs**|        |        | 2,154,041 | 2,599,073 | 3,353,592 | 3,158,765 | 11,265,470 |
| **N. of expected births (beneficiaries)** | 111,181 | 114,739 | 118,283 | 121,838 | 466,041 |
| **No. of women served per year** | 28042 | 41801 | 52399 | 57948 | 180,190 |
| **Implementation cost by potential beneficiary** | 19.37 | 22.65 | 28.35 | 25.93 | 24.17 |
| **Implementation cost by actual beneficiary** | 76.81 | 62.18 | 64.00 | 54.51 | 62.52 |
| Activity cluster | Analysis Cost category | 2011     | 2012     | 2013     | 2014     | 2015     | 2016     | TOTAL    | % of total cost |
|------------------|------------------------|----------|----------|----------|----------|----------|----------|----------|-----------------|
| **Design**       | Personnel              | 58,541   | 228,319  | 52,619   | 26,289   | 9,627    | 0        | 375,394  |                 |
|                  | Feasibility study      | 203,143  | 0        | 0        | 0        | 0        | 0        | 203,143  |                 |
| **Total by year**|                        | 261,684  | 228,319  | 52,619   | 26,289   | 9,627    | 0        | 578,537  | 4.52%           |
| **Management**   | Personnel              | 83,069   | 167,956  | 195,200  | 180,326  | 172,410  | 187,107  | 986,069  |                 |
|                  | External Audit         | 0        | 0        | 0        | 0        | 0        | 0        | 3,760    |                 |
|                  | Capacity building      | 18,584   | 97,812   | 41,899   | 46,385   | 49,342   | 103,218  | 357,241  |                 |
|                  | General management     | 17,916   | 12,810   | 62,575   | 105,746  | 150,134  | 140,438  | 489,619  |                 |
|                  | Transport/Accommodation| 39,211   | 159,992  | 108,862  | 141,118  | 91,604   | 80,689   | 621,475  |                 |
| **Total by year**|                        | 158,780  | 438,570  | 429,240  | 558,479  | 617,319  | 909,875  | 3,112,263| 24.34%          |
| **Promotion**    | Personnel              | 2,246    | 3,703    | 35,600   | 40,685   | 38,452   | 47,884   | 184,519  |                 |
|                  | Awareness campaign     | 0        | 0        | 4,700    | 17,793   | 190,318  | 223,728  | 436,540  |                 |
| **Total by year**|                        | 2,246    | 3,703    | 40,300   | 58,478   | 238,202  | 278,128  | 621,058  | 4.86%           |
| **Operation**    | Personnel              | 15,024   | 14,862   | 14,677   | 12,164   | 11,987   | 11,804   | 80,518   |                 |
|                  | Operation research     | 0        | 0        | 2,586    | 0        | 0        | 31,500   | 34,086   |                 |
| **Total by year**|                        | 15,024   | 14,862   | 17,263   | 12,164   | 11,987   | 31,500   | 114,604  | 0.90%           |
| **M&E**          | Personnel              | 25,417   | 115,859  | 79,251   | 87,514   | 65,790   | 439,977  |                 |
|                  | Baseline assessment    | 0        | 0        | 72,622   | 16,399   | 17,480   | 0        | 106,502  |                 |
|                  | Capacity building      | 0        | 0        | 27,949   | 50,201   | 72,543   | 41,800   | 192,494  |                 |
| **Total by year**|                        | 25,417   | 115,859  | 179,822  | 154,114  | 156,171  | 107,590  | 738,973  | 5.78%           |
| **Verification** | Personnel              | 0        | 0        | 38,452   | 34,104   | 35,275   | 37,192   | 145,023  |                 |
|                  | Agent                  | 0        | 0        | 20,628   | 123,715  | 82,167   | 159,347  | 385,857  |                 |
|                  | Internal Audit         | 0        | 0        | 722      | 0        | 204,391  | 11,417   | 216,531  |                 |
| **Total by year**|                        | 0        | 0        | 59,803   | 157,818  | 321,833  | 207,956  | 747,410  | 5.85%           |
| **Demand side**  | Personnel              | 8,103    | 45,752   | 89,982   | 104,773  | 111,471  | 123,972  | 484,053  |                 |
|                                | 0    | 0    | 42,701 | 128,158 | 246,210 | 159,750 | 576,819 |
|--------------------------------|------|------|--------|---------|---------|---------|---------|
| Incentives                     | 0    | 0    |        |         |         |         |         |
| Capacity building              | 0    | 0    | 17,882 | 58,056  | 204,592 | 136,060 | 416,590 |
| General management             | 0    | 0    | 118,479| 0       | 12,385  | 87,571  | 218,435 |
| Total by year                  | 8,103| 45,752| 269,044| 290,987 | 574,657 | 507,354 | 1,695,897 |
| Supply side                    |      |      |        |         |         |         |
| Personnel                      | 30,136| 173,001| 165,311| 108,437 | 81,060  | 85,021  | 642,964 |
| Infrastructure Investments     | 0    | 0    | 698,783| 796,371 | 583,137 | 334,021 | 2,412,312|
| Equipment Investment           | 0    | 0    | 52,372 | 170,323 | 142,342 | 99,138  | 464,174 |
| Incentives                     | 0    | 0    | 0      | 11,805  | 66,709  | 427,057 | 505,571 |
| Capacity building              | 0    | 0    | 189,484| 253,807 | 550,548 | 159,322 | 1,153,161|
| Total by year                  | 30,136| 173,001| 1,105,949| 1,340,743| 1,423,795| 1,104,558| 5,178,181|
| GRAND                          | 413,130| 937,600| 2,072,602| 2,519,072| 3,274,753| 3,080,233| 12,786,924|

**Total** 13.26% **Supply side**

**Grand total** 5,178,181 40.50%
### Table 4 Overall distribution of costs across cost categories (all years and all activities together; real values in €, base year 2016)

| Cost Category                              | 2011    | 2012    | 2013    | 2014    | 2015    | 2016    | Total   | %       |
|--------------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Personnel_RBF4MNH                          | 145,009 | 673,219 | 595,924 | 522,482 | 465,107 | 489,735 | 2,891,476 | 22.61   |
| Structural Investment - Infrastructure     | 0       | 0       | 698,783 | 796,371 | 583,137 | 334,021 | 2,412,312 | 18.87   |
| Supply side incentives                     | 0       | 0       | 103,551 | 171,450 | 516,356 | 479,811 | 1,271,168 | 9.94    |
| Capacity building - management             | 0       | 0       | 63,714  | 160,482 | 338,841 | 407,933 | 970,969   | 7.59    |
| Transport / accommodation                  | 39,211  | 159,992 | 108,862 | 141,118 | 91,604  | 80,689  | 621,475   | 4.86    |
| Demand-side incentives                     | 0       | 0       | 42,701  | 128,158 | 246,210 | 159,750 | 576,819   | 4.51    |
| General management                         | 0       | 0       | 53,631  | 94,107  | 169,957 | 247,362 | 565,056   | 4.42    |
| Structural Investment - Equipment          | 0       | 0       | 52,372  | 170,323 | 142,342 | 99,138  | 464,174   | 3.63    |
| Communications                             | 0       | 0       | 4,700   | 17,793  | 190,318 | 223,728 | 436,540   | 3.41    |
| Supply side verification                   | 0       | 0       | 20,628  | 123,715 | 82,167  | 159,347 | 385,857   | 3.02    |
| Office and equipment                       | 18,584  | 97,812  | 41,899  | 4,700   | 17,793  | 190,318 | 223,728   | 3.41    |
| Personnel (DP)                             | 61,264  | 60,603  | 59,850  | 59,048  | 58,190  | 57,300  | 356,254   | 2.79    |
| Capacity building - supportive supervision | 0       | 0       | 69,140  | 73,004  | 43,223  | 69,258  | 254,625   | 1.99    |
| Internal data audit                        | 0       | 0       | 722     | 0       | 204,391 | 11,417  | 216,531   | 1.69    |
| Initial feasibility study                  | 203,143 | 0       | 0       | 0       | 0       | 0       | 203,143   | 1.59    |
| Operations/Administration                  | 0       | 0       | 118,479 | 0       | 12,385  | 0       | 130,864   | 1.02    |
| Governance                                 | 0       | 0       | 1,741   | 1,651   | 10,577  | 92,029  | 105,998   | 0.83    |
| Baseline assessment                        | 0       | 0       | 72,622  | 16,399  | 17,480  | 0       | 106,502   | 0.83    |
| Fraud mitigation                            | 0       | 0       | 36,831  | 43,070  | 13,757  | 93,658  | 130,864   | 1.02    |
| General management (DP)                    | 17,730  | 12,695  | 12,537  | 12,021  | 11,847  | 12,566  | 79,395    | 0.62    |
| Consultancy (supportive)                   | 15,024  | 14,862  | 14,677  | 12,164  | 11,987  | 17,804  | 86,518    | 0.68    |
| Investment - Human Resources               | 0       | 0       | 0       | 0       | 0       | 0       | 0         | 0.00    |
| Capacity building - Data collection & analysis | 0       | 0       | 1,737   | 17,342  | 36,806  | 55,885  | 55,885    | 0.44    |
| Operations research                        | 0       | 0       | 2,586   | 0       | 0       | 31,500  | 34,086    | 0.27    |
| Quality assurance                          | 0       | 0       | 13,105  | 13,144  | -47     | 0       | 26,201    | 0.20    |
| Capacity building - Financial Management | 0 | 0 | 1,080 | 0 | 8,066 | 5,001 | 14,147 | 0.11% |
|-------------------------------|---|---|-------|---|-------|-------|--------|-------|
| Personnel (MoH)                | 1,239 | 767 | 641 | 599 | 575 | 448 | 4,268 | 0.03% |
| Audit                         | 0 | 0 | 0 | 0 | 0 | 3,760 | 3,760 | 0.03% |
| Management (MoH)              | 186 | 115 | 96 | 90 | 86 | 67 | 640 | 0.01% |
## Appendix 1 Mapping from micro-level activities to Cost Categories to Main Activities

| Main Activity | Analysis Cost Categories | Cost Categories | Original description of micro-level activities |
|---------------|--------------------------|----------------|---------------------------------------------|
| Demand side   | Personnel                | Personnel      |                                             |
| Demand side   | Demand-side incentives   | Demand-side incentives | Cash Transfers to districts and facilities |
| Demand side   | Capacity building        | Capacity building - management | Institutionalisation of the RBF Initiative |
| Demand side   | Demand side incentives   | Demand-side incentives | Demand side cash transfers |
| Demand side   | Capacity building        | Capacity building - management | Development of manual for operation, key guidelines |
| Demand side   | General management       | Operations/Administration | Operational Costs/Admin - Demands Side Related |
| Demand side   | General management       | General management | Print and distribute eligibility cards |
| Demand side   | Capacity building        | Capacity building - management | Capacity building (demand side structures and processes) |
| Demand side   | Capacity building        | Capacity building - management | Capacity building (demand side structures and processes) |
| Demand side   | Capacity building        | Capacity building - financial management | In conjunction with NLGFC train district accountants on RBF financial management and reconciliation |
| Design        | Personnel                | Personnel      |                                             |
| Design        | Initial Feasibility Study | Initial feasibility study | Initial feasibility study |
| M&E           | Personnel                | Personnel RBF  |                                             |
| M&E           | Capacity building        | Capacity building - management | Improve quality of data |
| M&E           | Baseline assessment      | Baseline assessment | Baseline Assessment AND Facility Readiness Assessment |
| M&E           | Capacity building        | Capacity building - Data collection & analysis | Conduct regular data collection and analysis |
| M&E           | Capacity building        | Capacity building - Data collection & analysis | Train and orient district teams and facilities on the data collection tools and equipment provided |
| M&E           | Capacity building        | Capacity building - Data collection & analysis | Provide data collection tools and equipment to RBF health facilities |
| M&E | Capacity building | Data collection & analysis | Support partnership and collaboration for M&E (capacity building) |
|-----|------------------|---------------------------|---------------------------------------------------------------|
| M&E | Capacity building | Management                | Quality Assessment Contributions                              |
| M&E | Capacity building | Management                | Modify the database                                            |
| M&E | Baseline assessment | Baseline assessment        | Conduct Baseline Reassessments                                 |
| M&E | Baseline assessment | Baseline assessment        | SHOULD BE: Baseline Assessment and Facility Readiness Assessment |
| M&E | Baseline assessment | Baseline assessment        | Printing of MoH key guidelines and tools (MNH Guidelines / Internal Supervision Tools) |
| M&E | Baseline assessment | Baseline assessment        | Orient district M&E officers on collection tool for missing data |
| M&E | Baseline assessment | Baseline assessment        | Collect baseline data from RBF health facilities               |
| M&E | Baseline assessment | Baseline assessment        | Collect missing baseline data for continuous monitoring         |
| Management | Personnel | Personnel RBF | Orientation and re-orientation of facility and district staff |
| Management | Capacity building | Capacity building - management | RBF Coordination |
| Management | General management | General management | International and local travel for foreign personnel |
| Management | Transport & Accommodation | Transport/accommodation | Local Transport |
| Management | Transport & Accommodation | Transport/accommodation | Allowance and accommodation costs for foreign personnel |
| Management | Office & equipment | Office and equipment | Project Office |
| Management | Transport & Accommodation | Transport/accommodation | RBF COORDINATION |
| Management | Office & equipment | Office and equipment | Equipment |
| Management | Office & equipment | Office and equipment | Project Office |
| Management | Transport & Accommodation | Transport/accommodation | Local Transport |
| Management | Capacity building | Governance | Support the creation of a RBF steering committee on MoH level (D 2.2) |
| Management | General management | General management | Develop structure of the Initiative |
| Management | Transport & Accommodation | Transport/accommodation | Allowance and accommodation costs for foreign personnel |
|------------|---------------------------|-------------------------|-------------------------------------------------------|
| Management | General management         | General management       | RBF COORDINATION                                      |
| Management | Office & equipment         | Office and equipment     | Office and Equipment                                   |
| Management | Capacity building          | Fraud mitigation         | Set up monitoring system for fraud control            |
| Management | Capacity building          | Capacity building - management | Briefing District Councils and DHMTs on RBF4MNH Phase II Extension |
| Management | Capacity building          | General management       | District Coordination Support                         |
| Management | Capacity building          | Capacity building - management | Conduct meetings to increase cooperation with other players like CHAM, Government ministries |
| Management | Capacity building          | Capacity building - management | Consultations with key stakeholders (MoH, MoF, MoLGaRD, NLGFC, …) |
| Management | Transport & Accommodation | Transport/accommodation | International and local ravel for foreign personnel |
| Management | Capacity building          | Governance               | Develop steering processes of the initiative         |
| Management | Capacity building          | Capacity building - management | Coordinate with partners and stakeholders             |
| Management | Capacity building          | Fraud mitigation         | Set up monitoring systems for fraud control (see S14) |
| Management | Capacity building          | Fraud mitigation         | Strengthen monitoring systems for fraud control       |
| Management | Capacity building          | Capacity building - management | Provide capacity building and promote innovation for partners of RBF4MNH |
| Management | General management         | General management       | Link RBF4MMH with other related initiatives          |
| Management | Capacity building          | Capacity building - management | Briefing of MoH officials and partners at National level |
| Management | Capacity building          | Capacity building - financial management | Strengthen RBF disbursement and accounting procedures at health facility level |
| Management | Transport & Accommodation | Transport/accommodation | Allowance and accommodation costs for local personnel |
| Management | Capacity building          | Capacity building - management | Develop the RBF4MNH Options Office to a centre of excellence |
| Management | Capacity building          | Capacity building - management | Briefing MoH top officials (Directors) and CHAM officials |
| Management | Audit | Audit | RBF Audit & external Evaluation |
|------------|-------|-------|------------------------------|
| Management | Capacity building | Capacity building - financial management | Establish RBF disbursement and accounting procedures at HF level |
| Management | Personnel | Personnel _MoH | Director RH unit |
| Management | Office & equipment | Office and equipment | Reports and Documents |
| Management | Personnel | Personnel _MoH | Senior officer RH unit |
| Management | Capacity building | Capacity building - financial management | Discuss and develop expenditure guidelines with HF staff |
| Management | Capacity building | Capacity building - financial management | Establish bank accounts at district and facility level |
| Management | Capacity building | Capacity building - financial management | Support the establishment and management of bank account at district and facility level |
| Management | General management | General management | Bank Charges |
| Management | General management | Management | Overheads MoH |
| Management | General management | General management | Bank Charges |
| Management | Audit | Audit | - |
| Management | Capacity building | Capacity building - financial management | Strengthen district accounts oversight |
| Management | Capacity building | General management | Support MoH organize technical and steering committee meetings |
| Management | Capacity building | Governance | Support regular meetings of the RBF steering committee on MoH level (D 2.2) |
| Management | Capacity building | General management | Support regular meetings of the district RBF steering committee on district level (ME 8.1) |
| Management | General management | General management | Miscellaneous (local) |
| Operations research | Personnel | Consultancy (supportive) | Phase I consultancies |
| Operations research | Personnel | Consultancy (supportive) | Phase II consultancies |
| Operations research | Operation research | Operations research | Conduct workload analysis in RBF facilities in 2016/17 |
| Operations research | Operation research | Operations research | Disseminate workload analysis results to stakeholders in the RBF participating districts |
|---------------------|--------------------|---------------------|--------------------------------------------------------------------------------------|
| Operations research | Operation research | Operations research | Operational Research                                                                  |
| Operations research | Operation research | Operations research | utilisation of payments; why women are not delivering at RBF participating HF         |
| Promotion            | Personnel          |                     | Do Awareness Campaign for communities                                                 |
| Promotion            | Awareness campaign | Communications      | SHOULD BE - Community Awareness Campaigns                                             |
| Promotion            | Awareness campaign | Communications      | Develop promotional products                                                          |
| Promotion            | Awareness campaign | Communications      | Community Awareness Campaigns                                                         |
| Promotion            | Awareness campaign | Communications      | Develop leaflet (brochure) in English and Chichewa                                    |
| Promotion            | Awareness campaign | Communications      | Make use of promotional products to market the initiative                             |
| Promotion            | Awareness campaign | Communications      | Use the launch of the initiative for promotion                                         |
| Promotion            | Awareness campaign | Communications      | SHOULD BE: Launch of the initiative for promotion                                      |
| Promotion            | Awareness campaign | Communications      | Make use of promotional products to market the initiative                             |
| Promotion            | Awareness campaign | Communications      | Develop communication strategy                                                       |
| Promotion            | Personnel          | Consultancy (supportive) | Consultancy for dissemination workshop                                           |
| Promotion            | Awareness campaign | Communications      | Develop communication strategy                                                       |
| Promotion            | Awareness campaign | Communications      | Community Awareness Campaigns                                                         |
| Promotion            | Awareness campaign | Communications      | Give the initiative a nationally recognised name and logo                             |
| Promotion            | Awareness campaign | Communications      | Open days to market the initiative at community level (dramatization etc.)          |
| Promotion            | Awareness campaign | Communications      | Create RBF newsletter                                                               |
| Promotion            | Awareness campaign | Communications | Advertising |
|----------------------|--------------------|----------------|-------------|
| Promotion            | Awareness campaign | Communications | Roll out the RBF4MNH Communication strategy |
| Supply side          | Infrastructure Investment | structural investment - infrastructure | Provide Infrastructure Investment (IE) |
| Supply side          | Capacity building  | Supply side incentives | Supply Side Incentives |
| Supply side          | Personnel          |                |             |
| Supply side          | Supply side incentives | Supply side incentives | Supply Side Incentives |
| Supply side          | Equipment investment | structural investment - equipment | Provide Procurement of equipment (IE) |
| Supply side          | Capacity building  | Capacity building - supportive supervision | Provide capacity building and training for staff |
| Supply side          | Infrastructure Investment | structural investment - infrastructure | Provide Infrastructure Investment (IE) |
| Supply side          | Capacity building  | Investment - Human Resources | Support DHMTs to ensure health facility staff are well staffed and new staff have orientation towards RBF |
| Supply side          | Capacity building  | Capacity building - supportive supervision | DHMT Bi-monthly supportive supervision |
| Supply side          | Capacity building  | Capacity building - supportive supervision | Provide Capacity building and training for Health workers |
| Supply side          | Equipment investment | structural investment - equipment | Provide Procurement of equipment (IE) |
| Supply side          | Capacity building  | Capacity building - supportive supervision | Conduct RBF supportive supervision and MNH mentorship |
| Supply side          | Capacity building  | Capacity building - management | Support Facilities & DHMTs |
| Supply side          | Capacity building  | General management | Ensure sufficient staffing levels in facilities according to MoH guidelines as a precursor to signing Quality and Performance Contracts |
| Supply side          | Capacity building  | Quality assurance | Establish quality assurance and improvement system |
| Supply side          | Capacity building  | Quality assurance | Establish quality assurance and improvement system |
| Supply side          | Capacity building  | General management | Ensure sufficient staffing levels in facilities according to MoH guidelines as a precursor to signing Quality and Performance Contracts |
| Supply side | Capacity building | Capacity building - management | Support facilities and DHMT in complying to the RBF SOPs and requirements |
|-------------|-------------------|-------------------------------|--------------------------------------------------------------------------------|
| Supply side | Capacity building | General management            | Ensure sufficient staffing levels in facilities according to MoH guidelines as a precursor to signing Quality and Performance Contracts |
| Supply side | Capacity building | Capacity building - supportive supervision | Make protocols available for 7-9 signal functions |
| Supply side | Capacity building | Capacity building - management | Capacity assessment and re-assessment of new and old facilities |
| Supply side | Capacity building | Capacity building - supportive supervision | Quarterly Zone supervision |
| Verification | Verification agent | Supply side verification | Identify, contract Verification agent, and conduct verification |
| Verification | Verification audit | Internal data audit | Internal Data Verification by RBF Team and MoH Team |
| Verification | Verification agent | Supply side verification | Identify and contract verification agent |
| Verification | Personnel | | |
| Verification | Verification audit | Internal data audit | Data verification (RBF and MoH team)  
SHOULD BE - Internal Data Verification by RBF Team and MoH Team |
| Verification | Verification agent | Supply side verification | Support to External Data Verification Teams by RBF Team and MoH Team |
How much does it cost to combine supply-side and demand-side RBF approaches in a single intervention? Full Cost Analysis of the Results Based Financing for Maternal and Newborn Health Initiative in Malawi

| Journal: | BMJ Open |
|----------|-----------|
| Manuscript ID | bmjopen-2021-050885.R1 |
| Article Type: | Original research |
| Date Submitted by the Author: | 14-Mar-2022 |
| Complete List of Authors: | Torbica, Aleksandra; Bocconi University Grainger, Corinne; Options Consultancy Services Ltd Okada, Elena; Options Consultancy Services Ltd De Allegri, Manuela; Heidelberg University, |
| Primary Subject Heading: | Health economics |
| Secondary Subject Heading: | Global health, Health policy |
| Keywords: | PUBLIC HEALTH, HEALTH ECONOMICS, HEALTH SERVICES ADMINISTRATION & MANAGEMENT |
I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd (“BMJ”) its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our licence.

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge (“APC”) for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which Creative Commons licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author’s Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.
How much does it cost to combine supply-side and demand-side RBF approaches in a single intervention? Full Cost Analysis of the Results Based Financing for Maternal and Newborn Health Initiative in Malawi

Aleksandra Torbica¹, Corinne Grainger², Elena Okada³, Manuela De Allegri⁴*
*Corresponding author

¹ Centre for Research on Health and Social Care Management (CERGAS), Bocconi University
² Options Consultancy Services, United Kingdom
³ Options Consultancy Services, United Kingdom
⁴ Heidelberg Institute of Global Health, University Hospital and Medical Faculty, University of Heidelberg, Germany

* Corresponding author: Manuela De Allegri – manuela.deallegri@uni-heidelberg.de
Abstract

Objective: To estimate the economic cost associated with implementing the Results Based Financing for Maternal and Newborn Health (RBF4MNH) Initiative in Malawi. No specific hypotheses were formulated ex-ante.

Setting: Primary and secondary delivery facilities in rural Malawi.

Participants: Not applicable. The study relied almost exclusively on secondary financial data.

Intervention: The RBF4MNH Initiative was an RBF intervention including both a demand and a supply-side component.

Primary and secondary outcome measures: cost per potential and for actual beneficiaries.

Results: The overall economic cost of the Initiative during 2011 – 2016 amounted to 12,786,924 Euro, equivalent to 24.17 Euro per pregnant woman residing in the intervention districts. The Supply Side Activity Cluster absorbed over 40% of all resources, half of which were spent on infrastructure upgrading and equipment supply, and 10% on incentives. Costs for the Demand Side Activity Cluster and for Verification were equivalent to 14% and 6% respectively of the Initiative overall cost.

Conclusion: Carefully tracing resource consumption across all activities, our study suggests that the full economic cost of implementing RBF interventions may be higher than what was previously reported in published cost-effectiveness studies. More research is urgently needed to carefully trace the costs of implementing RBF and similar health financing innovations, in order to inform decision-making in LMICs around scaling up RBF approaches.

Trial registration: Not applicable.

Strengths and limitations of this study

- We estimated full economic costs of Results Based Financing intervention combining both supply and demand side incentives
- We adopted Activity Based Costing methodology, to trace all resources and related costs associated with designing and implementing an intervention
- We identify and evaluate costs across activities and different cost categories to give a comprehensive cost assessment and overcome limitations of previous analyses
- Due to the retrospective nature of our work, it is possible that we did not capture all costs or assigned them to the respective activities as accurately as it would have been possible had we collected data prospective.
Introduction

Results-based financing (RBF) interventions are gaining increased attention as a means of improving access to care and enhancing quality of service provision across low- and middle-income countries (LMICs) [1]. With specific reference to health service delivery, results-based financing approaches include demand-side interventions, chiefly conditional cash transfers (CCT), and supply-side interventions, most notably performance-based financing (PBF). Conditional cash transfers are payments to healthcare users tied to compliance with a specific health behaviour, most frequently utilization of a given service, such as facility-based delivery or vaccinations [2]. Performance-based financing refers to the implementation of performance contracts, whereby healthcare providers and/or managers are paid upon the attainment of pre-defined quantity and quality indicators [3].

The widespread implementation of RBF has drawn attention to the need to assess the costs associated with these interventions. A recent publication by Chi and colleagues (2018) invites the research and policy community to be mindful of the identification, measurement and validation of the costs of RBF implementation as an integral element of research to inform investments in the health sector. To date, the scientific evidence base on the costs associated with RBF is extremely limited; it is mostly generated by studies that have focused exclusively on supply-side PBF interventions, and has largely neglected the estimation of costs associated with implementing demand-side programs, such as CCT [4]. This paucity of evidence is somewhat surprising considering that demand and supply-side RBF interventions are increasingly being combined in a single program design intended to address both sets of barriers to accessing health services [5].

Moreover, the available literature suffers from two limitations. First, existing costing studies on RBF struggle to accurately trace full costs across activities and cost categories, hence providing only limited information for policy makers as to which activities drive implementation costs [6]. Second, existing studies often aim to assess cost-effectiveness, relating the costs of implementing RBF approaches to their benefits, measured in terms of improved health service utilization and/or health gains [7–9]. While cost-effectiveness studies are instrumental in enabling policy makers to select interventions that generate the greater health benefits at lower costs, the evidence they generate does not provide guidance on the full cost structure of such programs, which is needed to inform further implementation and scale-up pilot interventions.

It is against this background that we aimed to fill the aforementioned gaps in knowledge by estimating the costs associated with implementing the Results Based Financing for Maternal and Newborn Health (RBF4MNH) Initiative in Malawi. This was an RBF intervention encompassing both a demand and a supply-side component to tackle maternal and newborn mortality by increasing access to better quality institutional delivery services. Our objective was to estimate the economic costs of the intervention, including both demand and supply-side components, clearly differentiating the costs across project phases, activities, and cost categories.
Methods

Study setting
With an estimated 2020 GDP per capita of 412 USD (current USD), Malawi is one of the poorest countries in sub-Saharan Africa. In 2010, prior to the launch of the RBF4MNH Initiative, maternal and neonatal mortality were estimated respectively at 639 deaths per 100,000 [10] and at 31 deaths per 1,000 live births [11]. Obstetric care services are provided through the country’s essential health package offered free of charge at public and contracted not-for-profit faith-based health facilities. Facility-based delivery utilization rates have increased dramatically over the course of the last two decades, increasing from 55% in 2000 to 91% in 2016 [12].

In spite of the high rates of institutional delivery, in 2014, unmet need for emergency obstetric care (EmOC) among women with obstetric complications was estimated at 75%, given that the majority of health facilities still did not meet EmOC standards. The healthcare system was at the time, and continues to be, characterized by poor infrastructure, and severe shortages in human resources and medical supplies, largely linked to insufficient funding capacity [13]. In 2013, annual per capita total health expenditure amounted to 39 USD [14], with donor funding covering nearly 70% of this amount.

Intervention design
The RBF4MNH Initiative has been described extensively in the literature, since sustained research efforts have been channelled towards assessing its impact on providers’ motivation [15], effective coverage [16], quality of service delivery [17,18], and maternal mortality at birth [19]. Hereafter, we synthetize the Initiative’s main features to allow the reader to follow the rationale of the methodological decisions we made for the cost analysis and to contextualize the findings we present.

The RBF4MNH Initiative was implemented between 2013 and 2018 by the Reproductive Health Directory (RHD) of the Ministry of Health, with financing from Governments of Germany and Norway, and technical and management assistance by Options Consultancy Services. Initially implemented in 18 EmOC facilities, it was later expanded to a total of 33 facilities, including 28 Basic EmOC facilities and 5 Comprehensive EmOC facilities, distributed across four districts (Balaka, Dedza, Mchinji, Ntcheu). Not all health facilities in each district participated. The Initiative aimed at reducing maternal and neonatal deaths by targeting the quality of obstetric services, encouraging utilization of facility-based delivery and 48 hours in-facility post-partum stays. To achieve these objectives, the Initiative included a supply and a demand-side component, specifically: (a) performance contracts with health facilities and district health management teams (DHMTs) linked to defined obstetric and neonatal care quality and utilization targets; and (b) conditional cash transfers (CCT) to pregnant women arriving at a participating facility for delivery, intended as partial reimbursement for the costs associated with delivering at a health facility. An additional integral component of the RBF4MNH Initiative, setting it aside from other RBF interventions, was the investment made to support infrastructure works and supply of essential medical equipment to participating public health facilities (e.g., renovation of labor rooms, construction of maternity waiting homes).
The participating facilities and the respective DHMTs received performance payments on top of the usual budget and in-kind resources (i.e., staff salaries, drugs and medical supplies) allocated by central and district governments. Approximately two-thirds of performance payments could be redistributed among staff as personal incentives, while one third was to be re-invested by the staff to support quality improvements at the facility (i.e., using the funds to purchase drugs and basic supplies, hiring contract staff and paying for minor infrastructure works and repairs).

In a departure from the current system whereby health facilities are not designated as cost centres and districts are largely responsible for all expenditure related to health facility functioning, the RBF Initiative worked to enable participating health facilities to manage the additional funds acquired autonomously. Health workers were also directly in charge of disbursing the CCT to women at the facility (paid in instalments on arrival and before/after delivery), and to register women for eligibility during antenatal care.

**Study design**

Our retrospective cost analysis aimed at estimating the full economic cost of the RBF4MNH Initiative. Hence, we captured the full value of all resources used by any of the parties involved in the design and implementation of all activities related to the Initiative [20]. We adopted a health system perspective, accounting for costs incurred by the Ministry of Health (MoH) and their development and implementing partners. These included: the MoH Malawi as key implementing lead, Options Consultancy Services (providing programme management and technical assistance), the German Development Bank KfW (as co-funder), and Norwegian cooperation (represented by both Norad and the Norwegian Embassy in Lilongwe). Our analysis captures the costs incurred by the Initiative in the four concerned districts as well as costs incurred in any other relevant settings, including the capital Lilongwe, where both the MoH and the central RBF4MNH office were located, as well as London, Frankfurt and Oslo, where monitoring and oversight activities were undertaken.

Our work covers the period from 2011, the year when the initial Feasibility Study was commissioned marking the onset of the Initiative’s design, to 2016. Hence, our analysis covers two years related to the Initiative design and start-up (2011-2012), and four years related to its implementation (2013-2016). While the Initiative was extended into 2018, our analysis concludes at 2016, since our research funding was aligned with the initial timeline of the Initiative and could not be prolonged to match its extension. Since the Initiative was also subject to some design modifications during implementation, we continued tracing design costs for the period 2013-2016. To the extent possible, we attempted to differentiate the cost of supply-side from demand-side activities. Given the retrospective nature of the study and the lack of relevant details in the financial data at our disposal, however, this was not always possible, so some activities, such as management, are not directly attributable to either the supply-side or the demand-side component.

**Data sources and data collection strategies**

To trace all costs pertaining to the design and implementation of the RBF4MNH Initiative, we adopted an Activity-Based Costing (ABC) approach. Accordingly, we started by retrospectively mapping all micro-level activities related to the design and
implementation of the Initiative and then traced all resources being consumed by these activities. We completed these first two steps by reviewing the complete documentation of the intervention and engaging in a series of repeated exchanges with key stakeholders, who had been involved in the implementation of the Initiative.

To attribute value to either single resources (where possible) or complete activities (when the former was not possible), we extracted relevant cost information from the financial data of the different implementing partners. These included: a. Options’ financial data reporting central level costs related to implementation, including personnel costs; b. the RBF4MNH Initiative financial data, reporting costs for all activities related to field implementation, including incentive payments; c. financial data contributed by the development partners, including cost information on specific activities, such as the early Feasibility Study and the consultancies conducted during the course of the implementation.

To estimate resource consumption for activities that could not be traced in financial data, we conducted key informant interviews with MoH and development and implementing partners’ staff. These interviews allowed us to quantify the extent to which these staff had contributed towards the Initiative, albeit the value of their engagement was not directly reflected in the financial data. To value the days of work contributed by MoH staff, we used official national-level cadre-specific salary information. To value the days of work contributed by development and implementing partner staff, we used level-specific average international and national consultancy rates. In addition, to value material contributions by development partners not included in the financial data, such as flights and other transport, we used average market price items. In line with the literature, we applied a 15% overhead rate to the costs incurred by MoH, Norwegian Embassy and Norad, as well as KfW, to account for overarching costs (such as overall management) not easily traceable when accounting only for crude salaries and/or consultancy rates.

The RBF4MNH Office provided us with the number of women who benefitted from the Initiative while the National Office of Statistics provided us with the number of expecting mothers estimated for the RBF4MNH district catchment areas over the 2013-2016 period. This information served as basis to compute the size of the actual and the potential beneficiary population respectively.

Data sharing statement
Given the sensitive nature of the data used for this analysis, the authors cannot share the data used for analysis with third parties. Any request for data needs to be directed to the Ministry of Health of Malawi and its partners.

Analytical approach: cost analysis
To complete the cost analysis, aggregating information across data sources, we proceeded in steps, exemplified in Figure 1. First, once we had identified all single micro-level activities, we aggregated them into Activity Clusters, i.e., a series of broader activity groups to facilitate policy appraisal of the intervention costs (see Appendix 1 for details). The Activity Clusters were identified in consultation with the RBF4MNH implementation team as follows: Design, Management, Promotion, Operations Research, Monitoring and Evaluation (M&E), Verification, Demand side and Supply side costs.
In order to estimate costs for each Activity Cluster identified above, we then adopted the following approach. We aggregated detailed cost information across specific micro-level activities into broader meaningful Cost Categories. Normally, cost categories refer to general cost items, such as transport, staff, office supplies, etc. In our case, however, due to the structure of the data available, we had to work with cost categories that were broader and more inclusive. Then, we further aggregated these Cost Categories into Analysis Cost Categories, to draw a link between Cost Categories and Activity Clusters. We attributed Analysis Cost Categories to the single Activity Clusters and then aggregated values within a given Activity Cluster. This process was designed to inform decision-making by indicating which broad activity area absorbed what portion of the overall costs of the Initiative.

Similarly to what was reported by De Allegri et al (2019), one challenge we faced was the attribution of staff costs to single activities. Staff costs were easily traceable to the individuals involved in implementation, but they were documented as salaries or consultancy fees and did not provide any indication of the breakdown of activities undertaken by staff who worked across more than one Activity Cluster. Hence, to attribute staff costs to single Activity Clusters, we interviewed key implementers to reconstruct their engagement in the project. We attributed all time contributed by MoH, Norway, and KfW partners to general management activities, since we could confirm that staff employed at this level were not involved directly in other activities.

Lastly, to allow the reader a better sense of the ‘value’ of the RBF4MNH Initiative, we computed the cost per beneficiary, accounting for both actual beneficiaries, i.e., the actual number of delivering women served each year, and potential beneficiaries, i.e., the expected annual total number of delivering women across the four districts, within and beyond the direct catchment areas of the intervention facilities (since mobility across catchment areas is allowed and we know that women moved to receive care at RBF4MNH facilities).

We purposely focused on costs related to the implementation of the RBF program, including those born directly by the Ministry of Health, but excluded the costs related to routine provision of MCH services, since those did not change as a function of the introduction of RBF. Our objective was not to cost MCH service provision with or without RBF, but to look more specifically at the costs related to implementing RBF per se. Our choice is motivated by lack of adequate evidence on the costs of RBF programs.

All costs were adjusted to the base year 2016. We used a GDP deflator for the Euro area to adjust for inflation from 2011 to 2016. The cost items expressed in local currency were converted to Euros using official yearly average conversion rates to account for the extreme fluctuations in exchange rates which occurred during the period of our analysis.

**Ethical approval**

Both the Ethics Committee at the Medical Faculty of Heidelberg University and the Ethics Committee in Malawi waived ethical approval since the study was based exclusively on secondary costing data.
**Patients and public involvement**

Given the nature of the work conducted, patients and the public were not involved in any phase of the project.

**Funding**

This research was made possible by funding from the Ministry of Health Malawi and the KfW, the German Development Bank. Grant number not available.

**Results**

Table 1 presents a synthesis of the Initiative costs, across all years and all Activity Clusters. Under Management, we purposely differentiate costs incurred by the RBF4MNH implementation unit, by the MoH, and by its development and implementing partners.

The overall economic cost of the Initiative for the period 2011 to 2016 amounted to 12,786,924 Euro. The MoH financial contribution when comparing to that of the RBF4MNH implementation unit which, while situated within the MoH, and financed by development partners was (0.04% vs. 20.5% of the total costs).

**Table 1 here**

Table 2 differentiates costs between the start-up (all costs incurred in 2011-2012 period) and the implementation phase (all costs incurred in 2013-2016 period), with start-up costs absorbing 1,521,454 Euro and implementation costs across the four years we followed absorbing a total of 11,265,470 Euro. Implementation costs rose in the initial years, but then stabilized and started to decrease by 2016. Reflecting the pattern observed for total costs, implementation costs per beneficiary increased in the early years, but stabilized and started to decrease in 2016.

**Table 2 here**

Combining start-up and implementation costs, Table 3 shows which Activity Cluster absorbed which portion of total costs and which Analysis Cost Category contributed towards each activity. The Supply Side Activity Cluster absorbed over 40% of all resources devoted to the project. Within this figure the incentives only represented approximately 10% of the total value of this activity whilst considerable infrastructural investment represented nearly half. In 2016, once the program reached full maturity, the value of the incentives relative to the total value of the Supply Side Activity Cluster increased substantially, reaching one third of the overall value of the activity.

The Demand Side Activity Cluster absorbed nearly 14% of the intervention value, with incentives in this case representing nearly one third of all activity-specific costs. Verification costs, referring exclusively to supply side verification (since demand-side verification was incorporated in demand-side supervision), only absorbed 6% of the overall value of the intervention. Overall management costs absorbed over one fifth of the intervention value. Design activities absorbed less than 5% of the total value of the initiative, with the cost being driven exclusively by the initial feasibility study and by personnel costs.
Table 3 here

Table 4 presents the same cost data in a different form, looking at the cost of the single Cost Categories and pooling across costs pertaining to both the start-up and the implementation phase across all activities included in Table 3. Personnel costs for contracted RBF4MNH staff represented the most substantial cost driver, absorbing nearly 23% of the intervention value. Structural investments absorbed nearly one fourth of the intervention cost. Here, supply side verification appears to have absorbed only slightly above 3% of the intervention costs, while in Table 3, this is shown to be 6%. This difference can be explained by the fact that in Table 3, we look at the value of the entire Activity Cluster, including the value of personnel time devoted towards verification. In Table 4, instead, the term supply side verification is used as a Cost Category, reflecting only the payments directly made by the implementation unit (either to external verification agencies or to district teams) to execute the verification procedures. Supply side and demand side incentives accounted for approximately 15% of the value of the intervention, with supply side incentives accounting for 10% and demand side incentives accounting for 5%.

Table 4 here

Discussion

This study makes an important contribution to the literature, being the first to describe in detail start-up and implementation costs of an RBF intervention, including both a demand-side and a supply-side component. Not only have prior analyses of similar programs focused almost exclusively on costs related to supply-side incentive systems, but they were also rather limited and not comprehensive of all cost items, thus not fully reflecting the opportunity costs of implementing RBF programs. The available studies have been conducted primarily with the objective of assessing cost-effectiveness of such programs in relation to status quo service provision thus focusing more on the estimation of consequences, related to process or health outcomes, and costs related to provision of health services in the presence or absence of RBF [7–9]. With our analysis, we aimed to trace all costs associated with designing and implementing a RBF intervention, beyond the focus on service provision. This is valuable not only to inform full economic evaluations, i.e., cost-effectiveness analyses but also for informing policy decisions on further implementation of RBF programs by describing the cost of single activities and the comparative weight of the single cost categories in detail. As such, our work complements existing literature on the economic evaluation of RBF interventions.

The first important finding emerging from our study is the substantial cost of the intervention, estimated at a total of 12,786,924 euros, distributed across the six years of the evaluation period, including two start-up and four implementation years. It should be noted, however, that unlike other RBF programs, this value includes a sizeable investment in infrastructure up-grading and provision of equipment to all participating public health facilities. The fact that implementation costs (across all activities) increased between 2013 and 2015 is likely to be a reflection of the fact that the RBF4MNH Initiative grew in size from 18 facilities in 2013, to 28 in 2014, and to 33 in 2015. The decrease in implementation costs observed in 2016 is a potential indication
that program management became more efficient as the intervention settled. This would not be surprising, given that the intensive efforts to enable RBF to function as expected, characterized the early implementation years. However, longer-term data would be necessary to confirm this hypothesis.

When considering the total number of women reached by the program, the cost of the RBF4MNH Initiative is equivalent to Euro 24.17 per potential beneficiary and 62.52 per actual beneficiary. We ought to specify that, when looking at cost per potential beneficiary, we did not account only for women who delivered in a healthcare facility, but for all women who were expected to experience a birth during a given year. We adopted this approach since the RBF4MNH Initiative aimed at reaching all women and encourage each one of them to deliver in a safe environment, hence all expecting months are potential beneficiaries. Our estimates stand out as being somewhat higher than estimates produced by prior economic analyses of RBF programs, including the prior cost-effectiveness analysis of the RBF4MNH Initiative, which detected lower unit costs for delivery services [7]. This discrepancy may seem particularly surprising considering that our analysis did not include the cost of providing care so we would have expected our estimates to be lower than previous estimates. However, it may also indicate that our work captured costs associated with RBF implementation, such as those related to design and human resource inputs by development partners, which can easily go unnoticed in studies focused on the cost-effectiveness of providing care under PBF. While this emerging hypothesis deserves further empirical verification, it would be aligned with the arguments postulated by Chi et al (2018) [6] in calling for the application of more rigorous cost tracing to determine the actual economic value of RBF.

The second finding of interest is the fact that domestic resources only accounted only for a very limited portion of the total costs of the intervention, while development and implementing partners contributed most resources. In line with literature on RBF programs [21,22] as well as other complex health interventions [23,24], this high reliance on donor funding has turned out to be a key challenge for the sustainability of the RBF4MNH Initiative. In spite of the positive effects reported by both the scientific literature [15–19] and by the implementation team [25], the Initiative was discontinued in 2018, once the relevant development cooperation agreement reached the end of its current funding cycle. Although the RBF4MNH Initiative was well-integrated within MoH structures and systems, the combination of human resource capacity constraints and very low operating budgets at the Reproductive Health Directorate (RHD) of the MoH, meant that only a very small portion of the human resources deployed towards managing the Initiative were contributed by staff already stationed at the RHD. Such reliance on external funding has been recognized before as a key challenge to the sustainability of RBF interventions [22,26–29].

Looking at findings in relation to the different activities which made up the RBF4MNH Initiative, we bring the reader’s attention again to the fact that the Supply Side Activity Cluster absorbed over 40% of all resources devoted to the project, albeit the incentives only represented approximately 10% of the total value of this activity while the infrastructural investment represented nearly half of its value. The high proportion of costs absorbed by the Supply Side Activity likely reflects the strong focus on improving the quality rather than the quantity of care at participating facilities. The fact that the value of the incentives relative to the total value of the Supply Side Activity Cluster
increased substantially over time suggests that as facilities become confident with working within the framework of a RBF intervention, their payoff increases, while the overall investments needed to operate the system (such as those in capacity building) decrease. While this pattern has been reported before in the literature [30], data from further implementation years would have been needed to confirm a trend towards increasing investments in incentives and decreasing investments in capacity building over time.

Nonetheless, the cost of the incentives compared to the overall cost of the intervention captured by our analysis is substantially lower than that observed in previous studies focused on supply-side RBF programs. In Zambia, for instance, incentives accounted for nearly half of all costs of the PBF program [8]. In a separate PBF program funded by USAID in Malawi, the SSDI-PBI program, incentives took up nearly one third of the overall cost of the intervention [30]. In Afghanistan, incentives were observed to absorb two-thirds of all economic costs [9]. Two factors may explain the differences observed between our findings and prior evidence. First, as discussed earlier, discrepancies may emerge as a consequence of different methodological approaches, specifically our focus on tracing and costing each and every activity making up the RBF program rather than solely estimating the costs of providing services under RBF. Second, the RBF4MNH Initiative included substantial capital investment in infrastructure and purchase of large amounts of equipment for participating health facilities which the other programs it has been compared to may have not.

The Demand Side Activity Cluster absorbed nearly 14% of the intervention value, with incentives in this case representing nearly one third of all activity-specific costs. The fact that the value of the demand-side incentives decreased in 2016 compared to 2015 is attributable to the fact that the program switched from offering CCT to all women delivering in an intervention facility to offering cash transfers only to the women most in need. This measure was introduced at the request of the MoH in order to align better with the government’s targeted social cash transfer program. Analyses conducted after the end of the official impact evaluation indicated that this shift did not affect utilization of delivery services, which remained high even once the universal cash transfers were discontinued.

Somewhat surprisingly, verification costs, referring exclusively to supply-side verification, only absorbed 6% of the overall value of the intervention. This value appears low considering that prior research has found verification costs to account for as much as 23% of overall costs of supply-side RBF programs [9] and that the costs associated with verification are often raised as an intrinsic challenge to the effective implementation of PBF programs [31–33]. The low verification cost observed in our study may be an indication that the verification processes within the framework of the RBF4MNH Initiative were managed efficiently. This was probably largely due to the fact that during the early stages of the intervention, the central management staff largely undertook the verification function (due to challenges in identifying and contracting a suitable verification strategy) while later the contract was awarded to a local agency, avoiding the high costs charged by international agencies in other settings.

Of additional interest is the fact that over the entire six-year period, design activities absorbed less than 5% of the total value of the initiative, with the cost being driven largely by the initial feasibility study (we had no beak down of the feasibility study in
specific cost categories) and by personnel costs. Comparatively, design activities absorbed one third of the total costs of the parallel RBF intervention being rolled out in Malawi [30]. The fact that costs were incurred over time for design activities is indicative of the adaptive and dynamic nature of the intervention, which as observed in the impact evaluation final report, represents one of its key success features. Still, the reduction in design costs observed overtime suggests that by 2015, the Initiative had reached its full form and did not necessitate substantial further adjustments. This element ought to be considered in light of a possible scale up, since design decisions may need to be made to expand geographical scope, but assuming that the experience of the four pilot districts is representative of the country, the intervention may not necessitate extensive re-shaping, hence design costs could be kept to a minimum.

Methodological considerations

Beyond its value as the first cost analysis carefully tracing all activities of a complex RBF intervention including both a supply-side and a demand-side component, we ought to recognize some important methodological limitations to our study. First, the retrospective nature of data collection made it impossible for us to trace resource consumption across activities as accurately as we would have wished to. Nonetheless, we engaged closely with the implementation team to reconstruct to the extent possible the roll-out of the intervention, complementing information from documents and financial data with information emerging from key informant interviews. This process was facilitated by the close relationship between the implementation and the research team, having worked together on the impact evaluation already. Second, given the paucity of similar studies focused specifically on the costs of RBF interventions, we recognize an inability to appraise our findings more comprehensively in relation to the experience of other settings. Third, since our study adopted a health system perspective, the resulting findings represent an underestimation of the total costs of the intervention, neglecting what costs might have been incurred at community level to enable its functioning (e.g., community leaders mobilization, identification of poor women, etc.). Fourth, we need to acknowledge that the computation of the cost per potential beneficiary is based on the estimated number of deliveries in the district. Hence, any imperfection in this population-based estimate is also reflected in our own cost estimate. Last, we need to acknowledge that due to the timing of our data collection, we could not include costs related to 2017 and 2018. Our research funding was aligned with the original funding of the intervention and we had no means to continue data collection once the intervention was unexpectedly extended with additional funding.

Conclusions

Our study represents the first comprehensive effort to assess the costs of setting up a RBF intervention, including both a demand and a supply-side component, examining all activity clusters and cost categories in detail. We have purposely not related these efforts to the benefits generated by the intervention, because, as documented by the literature, those have been very diverse and not easily reducible to a single matrix. Carefully tracing resource consumption across both start-up and design phases, our work suggests that the costs of bringing such an intervention into reality may be higher than what has been indicated by prior cost-effectiveness analyses. This observation calls for further research in the field, monitoring start-up and implementation costs of RBF programs as well as those of comparable health financing interventions, aimed at reforming purchasing structures. Furthermore, this observation inevitably draws
attention to the sustainability of such programs, when one considers that even excluding the costs of service delivery, for every woman served, the RBF4MNH Initiative absorbed more than half the annual per capita health budget available at country level. Last, we note that to overcome the challenges we have faced due to the retrospective nature of our work, we would argue in favour of integrating such research efforts in the infrastructure of the intervention evaluation from its very onset.
Acknowledgements
This would have not been possible had the staff at the Ministry of Health Malawi, the
RBF4MNH implementation unit, the consulting agency Options, and both German and
Norwegian cooperation agencies not supported us, sharing all documentation with us
and answering our frequent questions. The authors are indebted to Jobiba Chinkhumba
for his support with logistics and with data collection during the early phases of the
project and to Bjarne Robberstad for his valuable comments on our study design and
analytical approach.

Funding
This research was made possible by funding from the Ministry of Health Malawi and
the KfW, the German Development Bank.

Conflict of interest
Manuela De Allegri was the principal investigator of the impact evaluation of the
RBF4MNH Initiative, but funding for the two parallel studies was acquired and
managed independently of one another (different funding agencies). Corinne Grainger
and Elena Okada worked for the agency that supported the implementation of the
RBF4MNH Initiative, Options Consultancy Services (Options) during the data
collection phase of the study. Subsequent contributions to this work have been purely
voluntary and as such, the views expressed in this paper represent her own views and
not those of Options.

Authors’ contribution
MDA and AT were responsible for the initial study design, data collection strategy, and
analytical approach. AT, MDA, and EO shared the responsibility for data acquisition,
including both the retrieval of information from existing documents and the interviews
with key informants. AT and MDA were in charge of analysis, with contributions by
CG and EO. MDA drafted the manuscript, with support from all authors. All authors
read and approved of the final manuscript.

Data sharing statement
Given the sensitive nature of the data used for this analysis, the authors cannot share
the data used for analysis with third parties. Any request for data needs to be directed
to the Ministry of Health of Malawi and its partners.
References

1. Gautier L, De Allegri M, Ridde V. How is the discourse of performance-based financing shaped at the global level? A poststructural analysis. *Globalization and Health* 2019;15. doi:10.1186/s12992-018-0443-9

2. G.Carrin DOKX and. Conditional cash transfers: what’s in it for health? Technical Brief for Policy-Makers. *Geneva, World Health Organization* 2008;01.

3. Fritsche GB, Soeters R, Meessen B. *Performance-Based Financing Toolkit*. World Bank Publications 2014.

4. Oxman AD, Fretheim A. NIPH Systematic Reviews. In: *An Overview of Research on the Effects of Results-Based Financing*. Oslo, Norway: : Knowledge Centre for the Health Services at The Norwegian Institute of Public Health (NIPH)Copyright ©2008 by The Norwegian Institute of Public Health (NIPH). 2008.

5. Bowser D, Gupta J, Nandakumar A. The effect of demand-and supply-side health financing on infant, child, and maternal mortality in low-and middle-income countries. *Health Systems and Reform* 2016;2:147–59. doi:10.1080/23288604.2016.1166306

6. Chi YL, Gad M, Bauhoff S, et al. Mind the costs, too: towards better cost-effectiveness analyses of PBF programmes. *BMJ Glob Health* 2018;3:e000994. doi:10.1136/bmjgh-2018-000994

7. Chinkhumba J, De Allegri M, Brenner S, et al. The cost-effectiveness of using results-based financing to reduce maternal and perinatal mortality in Malawi. *BMJ Global Health* 2020;5. doi:10.1136/bmjgh-2019-002260

8. Zeng W, Shepard DS, Nguyen H, et al. Cost-effectiveness of results-based financing, Zambia: a cluster randomized trial. *Bull World Health Organ* 2018;96:760–71. doi:10.2471/blt.17.207100

9. Salehi AS, Borghi J, Blanchet K, et al. The cost-effectiveness of using performance-based financing to deliver the basic package of health services in Afghanistan. *BMJ Global Health* 2020;5:e002381. doi:10.1136/bmjgh-2020-002381

10. WHO. Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. *Geneva: World Health Organization* 2019;;104.

11. WHO. Malawi. 2010.

12. National Statistical Office Malawi; DHS Program. Malawi Demographic and Health Survey 2015-16 Key Indicators Report. 2016.

13. Mueller DH, Lungu D, Acharya A, et al. Constraints to implementing the Essential Health Package in Malawi. *PLoS One* 2011;6:e20741. doi:10.1371/journal.pone.0020741
14 Organization WH. Global Health Expenditure Database. 2020.

15 Lohmann J, Muula AS, Houlfort N, et al. How does performance-based financing affect health workers’ intrinsic motivation? A Self-Determination Theory-based mixed-methods study in Malawi. Social Science and Medicine 2018;208. doi:10.1016/j.socscimed.2018.04.053

16 Brenner S, Mazalale J, Wilhelm D, et al. Impact of results-based financing on effective obstetric care coverage: Evidence from a quasi-experimental study in Malawi. BMC Health Services Research 2018;18. doi:10.1186/s12913-018-3589-5

17 Kambala C, Lohmann J, Mazalale J, et al. How do Malawian women rate the quality of maternal and newborn care? Experiences and perceptions of women in the central and southern regions. BMC Pregnancy and Childbirth 2015;15. doi:10.1186/s12884-015-0560-x

18 Brenner S, Wilhelm D, Lohmann J, et al. Implementation research to improve quality of maternal and newborn health care, Malawi. Bulletin of the World Health Organization 2017;95. doi:10.2471/BLT.16.178202

19 De Allegri M, Chase RP, Lohmann J, et al. Effect of results-based financing on facility-based maternal mortality at birth: An interrupted time-series analysis with independent controls in Malawi. BMJ Global Health 2019;4. doi:10.1136/bmjgh-2018-001184

20 Drummond MF, Drummond MFM, Sculpher MJ, et al. Methods for the Economic Evaluation of Health Care Programmes. Oxford University Press 2005.

21 Witter S, Bolton L. Towards sustainability of RBF in the health sector – learning from experience in high and middle income countries. TASRI Report for the World Bank. 2015. doi:10.13140/RG.2.2.17093.86246

22 Seppey M, Ridde V, Touré L, et al. Donor-funded project’s sustainability assessment: a qualitative case study of a results-based financing pilot in Koulikoro region, Mali. Globalization and Health 2017;13:86. doi:10.1186/s12992-017-0307-8

23 Muluh G, Kimengsi J, Azibo N. Challenges and Prospects of Sustaining Donor-Funded Projects in Rural Cameroon. Sustainability 2019;11:6990. doi:10.3390/su11246990

24 Bossert TJ. Can they get along without us? Sustainability of donor-supported health projects in Central America and Africa. Social Science & Medicine 1990;30:1015–23. doi:https://doi.org/10.1016/0277-9536(90)90148-L

25 Development FM for EC and. How rewards improve health practice in Malawi. 2017.

26 Bertone MP, Wurie H, Samai M, et al. The bumpy trajectory of performance-based financing for healthcare in Sierra Leone: agency, structure and frames
shaping the policy process. *Globalization and Health* 2018;14:99. doi:10.1186/s12992-018-0417-y

27 Ridde V, Yaogo M, Zongo S, et al. Twelve months of implementation of health care performance-based financing in Burkina Faso: A qualitative multiple case study. *The International Journal of Health Planning and Management* 2018;33:e153–67. doi:10.1002/hpm.2439

28 Bertone MP, Falisse J-B, Russo G, et al. Context matters (but how and why?) A hypothesis-led literature review of performance based financing in fragile and conflict-affected health systems. *PLoS One* 2018;13:e0195301. doi:10.1371/journal.pone.0195301

29 McMahon SA, Muula AS, De Allegri M. “I wanted a skeleton … they brought a prince”: A qualitative investigation of factors mediating the implementation of a Performance Based Incentive program in Malawi. *SSM - Population Health* 2018;5. doi:10.1016/j.ssmph.2018.04.006

30 De Allegri M, Makwero C, Torbica A. At what cost is performance-based financing implemented? Novel evidence from Malawi. *Health Policy and Planning* 2019;34. doi:10.1093/heapol/czz030

31 Gergen J, Josephson E, Vernon C, et al. Measuring and paying for quality of care in performance-based financing: Experience from seven low and middle-income countries (Democratic Republic of Congo, Kyrgyzstan, Malawi, Mozambique, Nigeria, Senegal and Zambia). *J Glob Health* 2018;8:21003. doi:10.7189/jogh.08.021003

32 Antony M, Bertone MP, Barthes O. Exploring implementation practices in results-based financing: the case of the verification in Benin. *BMC Health Serv Res* 2017;17:204. doi:10.1186/s12913-017-2148-9

33 Grover D, Bauhoff S, Friedman J. Using supervised learning to select audit targets in performance-based financing in health: An example from Zambia. *PLoS One* 2019;14:e0211262. doi:10.1371/journal.pone.0211262
Table 1. Total costs by activity over time in 4 districts (real values in €, base year 2016)

| Activity cluster | 2011   | 2012   | 2013   | 2014   | 2015   | 2016   | TOTAL   |
|------------------|--------|--------|--------|--------|--------|--------|---------|
| Design           | 261,684| 228,319| 52,619 | 26,289 | 9,627  | 0      | 578,537 |
| Management       | 3,112,263|        |        |        |        |        | 3,112,263|
| **Contracted implementation unit (set within MOH)** | 69,095 | 355,224 | 347,065 | 477,790 | 537,819 | 830,828 | 2,617,821 |
| **MoH own resources** | 1,425 | 882 | 737 | 689 | 662 | 515 | 4,909 |
| **Development partners (KfW, Norad)** | 88,260 | 82,464 | 81,439 | 80,000 | 78,838 | 78,532 | 489,533 |
| Promotion        | 2,246  | 3,703  | 40,300 | 58,478 | 238,202 | 278,128 | 621,058 |
| Operations research | 15,024 | 14,862 | 17,263 | 12,164 | 11,987 | 43,304 | 114,604 |
| M&E              | 25,417 | 115,859 | 179,822 | 154,114 | 156,171 | 107,590 | 738,973 |
| Verification     | 0      | 0      | 59,803 | 157,818 | 321,833 | 207,956 | 747,410 |
| Demand side      | 8,103  | 45,752 | 269,044 | 290,987 | 574,657 | 507,354 | 1,695,897 |
| Supply side      | 30,136 | 173,001 | 1,105,949 | 1,340,743 | 1,423,795 | 1,104,558 | 5,178,181 |
| **Totals by year** | 501,390 | 1,020,064 | 2,154,041 | 2,599,073 | 3,353,592 | 3,158,765 | 12,786,924 |
Table 2. Total start-up and implementation costs by year in 4 districts (real values €, base year 2016)

|                      | 2011    | 2012    | 2013    | 2014    | 2015    | 2016    | TOTAL   |
|----------------------|---------|---------|---------|---------|---------|---------|---------|
| Start-up costs       | 501,390 | 1,020,064 |         |         |         |         | 1,521,454 |
| Implementation costs |         |         | 2,154,041 | 2,599,073 | 3,353,592 | 3,158,765 | 11,265,470 |
| N. of expected births (beneficiaries) | 111,181 | 114,739 | 118,283 | 121,838 |         |         | 466,041 |
| No. of women served per year | 28042   | 41801   | 52399   | 57948   |         |         | 180,190 |
| Implementation cost by potential beneficiary | 19.37   | 22.65   | 28.35   | 25.93   |         |         | 24.17   |
| Implementation cost by actual beneficiary | 76.81   | 62.18   | 64.00   | 54.51   |         |         | 62.52   |
Table 3 Costs by activity cluster, cost category and by year (real values in €, base year 2016)

| Activity cluster | Analysis Cost category | 2011  | 2012  | 2013  | 2014  | 2015  | 2016  | TOTAL  | % of total cost |
|------------------|------------------------|-------|-------|-------|-------|-------|-------|--------|-----------------|
| Design           | Personnel              | 58,541| 228,319| 52,619| 26,289| 9,627 | 0     | 375,394|                 |
|                  | Feasibility study      | 203,143| 0     | 0     | 0     | 0     | 0     | 203,143|                 |
|                  | Total by year          | 261,684| 228,319| 52,619| 26,289| 9,627 | 0     | 578,537| 4.52%           |
| Management       | Personnel              | 83,069| 167,956| 195,200| 180,326| 172,410| 187,107| 986,069|                 |
|                  | External Audit         | 0     | 0     | 0     | 0     | 0     | 0     | 3,760  | 0.34%           |
|                  | Capacity building      | 18,584| 97,812| 41,899| 46,385| 49,342| 103,218| 357,241|                 |
|                  | General management     | 17,916| 12,810| 62,575| 105,746| 150,134| 140,438| 489,619|                 |
|                  | Transport/ Accommodation| 39,211| 159,992| 108,862| 141,118| 91,604| 80,689| 621,475|                 |
|                  | Total by year          | 158,780| 438,570| 429,240| 558,479| 617,319| 909,875| 3,112,263| 24.34%         |
| Promotion        | Personnel              | 2,246 | 3,703 | 35,600| 40,685| 47,884| 54,400| 184,519|                 |
|                  | Awareness campaign     | 0     | 0     | 4,700 | 17,793| 190,318| 223,728| 436,540|                 |
|                  | Total by year          | 2,246 | 3,703 | 40,300| 58,478| 238,202| 278,128| 621,058| 4.86%           |
| Operation        | Personnel              | 15,024| 14,862| 14,677| 12,164| 11,987| 11,804| 80,518 |                 |
|                  | Operation research     | 0     | 0     | 2,586 | 0     | 0     | 31,500| 34,086 |                 |
|                  | Total by year          | 15,024| 14,862| 17,263| 12,164| 11,987| 43,304| 114,604| 0.90%           |
| M&E              | Personnel              | 25,417| 115,859| 79,251| 87,514| 66,147| 65,790| 439,977|                 |
|                  | Baseline assessment    | 0     | 0     | 72,622| 16,399| 17,480| 0     | 106,502|                 |
|                  | Capacity building      | 0     | 0     | 27,949| 50,201| 72,543| 41,800| 192,494|                 |
|                  | Total by year          | 25,417| 115,859| 179,822| 154,114| 156,171| 107,590| 738,973| 5.78%           |
| Verification     | Personnel              | 0     | 0     | 38,452| 34,104| 35,275| 37,192| 145,023|                 |
|                  | Agent                  | 0     | 0     | 20,628| 123,715| 82,167| 159,347| 385,857|                 |
|                  | Internal Audit         | 0     | 0     | 722   | 0     | 204,391| 11,417| 216,531|                 |
|                  | Total by year          | 0     | 0     | 59,803| 157,818| 321,833| 207,956| 747,410| 5.85%           |
| Demand side      | Personnel              | 8,103 | 45,752| 89,982| 104,773| 111,471| 123,972| 484,053|                 |
|                     | Year 1  | Year 2  | Year 3  | Year 4  | Year 5  | Year 6  | Year 7  |
|---------------------|---------|---------|---------|---------|---------|---------|---------|
| **Incentives**      | 0       | 0       | 42,701  | 128,158 | 246,210 | 159,750 | 576,819 |
| **Capacity building** | 0       | 0       | 17,882  | 58,056  | 204,592 | 136,060 | 416,590 |
| **General management** | 0       | 0       | 118,479 | 0       | 12,385  | 87,571  | 218,435 |
| **Total by year**   | 8,103   | 45,752  | 269,044 | 290,987 | 574,657 | 507,354 | 1,695,897 |
| **Supply side**     |         |         |         |         |         |         |         |
| **Personnel**       | 30,136  | 173,001 | 165,311 | 108,437 | 81,060  | 85,021  | 642,964 |
| **Infrastructure Investments** | 0       | 0       | 698,783 | 796,371 | 583,137 | 334,021 | 2,412,312 |
| **Equipment Investment** | 0       | 0       | 52,372  | 170,323 | 142,342 | 99,138  | 464,174 |
| **Incentives**      | 0       | 0       | 0       | 11,605  | 66,709  | 427,057 | 505,571 |
| **Capacity building** | 0       | 0       | 189,484 | 253,807 | 550,548 | 159,322 | 1,153,161 |
| **Total by year**   | 30,136  | 173,001 | 1,105,949 | 1,340,743 | 1,423,795 | 1,104,558 | 5,178,181 |
| **GRAND**           | 413,130 | 937,600 | 2,072,602 | 2,519,072 | 3,274,753 | 3,080,233 | 12,786,924 |

**Note:** The table provides a summary of financial data categorized under different sections such as Incentives, Capacity building, General management, Personnel, Infrastructure Investments, and Equipment Investment for various years. The total expenditures are calculated and presented for each category, giving a comprehensive view of the financial planning and resource allocation.
Table 4 Overall distribution of costs across cost categories (all years and all activities together; real values in €, base year 2016)

| Cost Category                                | 2011          | 2012          | 2013          | 2014          | 2015          | 2016          | Total       | %          |
|----------------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|-------------|------------|
| Personnel_RBF4MNH                            | 145,009       | 673,219       | 595,924       | 522,482       | 465,107       | 489,735       | 2,891,476   | 22.61%     |
| Structural Investment - Infrastructure       | 0             | 0             | 698,783       | 796,371       | 583,137       | 334,021       | 2,412,312   | 18.87%     |
| Supply side incentives                       | 0             | 0             | 103,551       | 171,450       | 516,356       | 479,811       | 1,271,168   | 9.94%      |
| Capacity building - management               | 0             | 0             | 63,714        | 160,482       | 338,841       | 407,933       | 970,969     | 7.59%      |
| Transport / accommodation                    | 39,211        | 159,992       | 108,862       | 141,118       | 91,604        | 80,689        | 621,475     | 4.86%      |
| Demand-side incentives                       | 0             | 0             | 42,701        | 128,158       | 246,210       | 159,750       | 576,819     | 4.51%      |
| General management                           | 0             | 0             | 53,631        | 94,107        | 169,957       | 247,362       | 565,056     | 4.42%      |
| Structural Investment - Equipment            | 0             | 0             | 52,372        | 170,323       | 142,342       | 99,138        | 464,174     | 3.63%      |
| Communications                               | 18,584        | 97,812        | 41,899        | 46,385        | 49,342        | 190,318       | 223,728     | 3.41%      |
| Supply side verification                     | 0             | 0             | 20,628        | 123,715       | 82,167        | 159,347       | 385,857     | 3.02%      |
| Office and equipment                         | 61,264        | 60,603        | 59,850        | 59,048        | 57,300        | 130,143       | 357,241     | 2.79%      |
| Personnel (DP)                               | 0             | 0             | 52,372        | 170,323       | 142,342       | 99,138        | 254,625     | 1.99%      |
| Capacity building - supportive supervision   | 0             | 0             | 69,140        | 73,004        | 43,223        | 69,258        | 254,625     | 1.99%      |
| Internal data audit                          | 0             | 0             | 722           | 0             | 11,417        | 216,531       | 216,531     | 1.69%      |
| Initial feasibility study                    | 203,143       | 0             | 0             | 0             | 0             | 203,143       | 203,143     | 1.59%      |
| Operations/Administration                    | 0             | 118,479       | 123,715       | 82,167        | 159,347       | 385,857       | 130,864     | 1.02%      |
| Governance                                   | 0             | 1,741         | 1,651         | 10,577        | 92,029        | 105,998       | 105,998     | 0.83%      |
| Baseline assessment                          | 0             | 72,622        | 16,399        | 17,480        | 0             | 106,502       | 106,502     | 0.83%      |
| Fraud mitigation                             | 0             | 0             | 36,831        | 43,070        | 13,757        | 93,658        | 93,658      | 0.73%      |
| General management (DP)                      | 17,730        | 12,695        | 12,537        | 12,021        | 11,847        | 12,566        | 79,395      | 0.62%      |
| Consultancy (supportive)                     | 15,024        | 14,862        | 14,677        | 12,164        | 11,987        | 17,804        | 86,518      | 0.68%      |
| Investment - Human Resources                 | 0             | 0             | 0             | 39,037        | 22,323        | 61,360        | 61,360      | 0.48%      |
| Capacity building - Data collection & analysis | 0            | 0             | 1,737         | 17,342        | 36,806        | 55,885        | 55,885      | 0.44%      |
| Operations research                          | 0             | 2,586         | 0             | 0             | 31,500        | 34,086        | 34,086      | 0.27%      |
| Quality assurance                            | 0             | 13,105        | 13,144        | -47           | 0             | 26,201        | 26,201      | 0.20%      |
|                               |   |   |   |   |   |   |   |
|-------------------------------|---|---|---|---|---|---|---|
| Capacity building - Financial Management | 0 | 0 | 1,080 | 0 | 8,066 | 5,001 | 14,147 | 0.11% |
| Personnel (MoH)               | 1,239 | 767 | 641 | 599 | 575 | 448 | 4,268 | 0.03% |
| Audit                         | 0 | 0 | 0 | 0 | 0 | 3,760 | 3,760 | 0.03% |
| Management (MoH)              | 186 | 115 | 96 | 90 | 86 | 67 | 640 | 0.01% |

Figure 1 Caption: Activity-based Costing Approach
## Appendix 1 Mapping from micro-level activities to Cost Categories to Main Activities

| Main Activity | Analysis Cost Categories | Cost Categories | Original description of micro-level activities |
|---------------|--------------------------|-----------------|-----------------------------------------------|
| Demand side   | Personnel                | Personnel       |                                               |
| Demand side   | Demand side incentives   | Demand-side incentives | Cash Transfers to districts and facilities |
| Demand side   | Capacity building        | Capacity building - management | Institutionalisation of the RBF Initiative |
| Demand side   | Demand side incentives   | Demand-side incentives | Demand side cash transfers |
| Demand side   | Capacity building        | Capacity building - management | Development of manual for operation, key guidelines |
| Demand side   | General management       | Operations/Administration | Operational Costs/Admin - Demands Side Related |
| Demand side   | General management       | General management | Print and distribute eligibility cards |
| Demand side   | Capacity building        | Capacity building - management | Capacity building (demand side structures and processes) |
| Demand side   | Capacity building        | Capacity building - management | Capacity building (demand side structures and processes) |
| Demand side   | Capacity building        | Capacity building - financial management | In conjunction with NLGFC train district accountants on RBF financial management and reconciliation |
| Design        | Personnel                | Personnel       |                                               |
| Design        | Initial Feasibility Study| Initial feasibility study | Initial feasibility study |
| M&E           | Personnel                | Personnel RBF   |                                               |
| M&E           | Capacity building        | Capacity building - management | Improve quality of data |
| M&E           | Baseline assessment      | Baseline assessment | Baseline Assessment AND Facility Readiness Assessment |
| M&E           | Capacity building        | Capacity building - Data collection & analysis | Conduct regular data collection and analysis |
| M&E           | Capacity building        | Capacity building - Data collection & analysis | Train and orient district teams and facilities on the data collection tools and equipment provided |
| M&E           | Capacity building        | Capacity building - Data collection & analysis | Provide data collection tools and equipment to RBF health facilities |
| M&E | Capacity building | Capacity building - management | Support partnership and collaboration for M&E (capacity building) |
|-----|-------------------|--------------------------------|----------------------------------------------------------------|
| M&E | Capacity building | Capacity building - management | Quality Assessment Contributions |
| M&E | Capacity building | Capacity building - Data collection & analysis | Modify the database |
| M&E | Baseline assessment | Baseline assessment | Conduct Baseline Reassessments |
| M&E | Baseline assessment | Baseline assessment | SHOULD BE: Baseline Assessment and Facility Readiness Assessment |
| M&E | Baseline assessment | Baseline assessment | Printing of MoH key guidelines and tools (MNH Guidelines / Internal Supervision Tools) |
| M&E | Baseline assessment | Baseline assessment | Orient district M&E officers on collection tool for missing data |
| M&E | Baseline assessment | Baseline assessment | Collect baseline data from RBF health facilities |
| M&E | Baseline assessment | Baseline assessment | Collect missing baseline data for continuous monitoring |
| Management | Personnel | Personnel RBF | |
| Management | Capacity building | Capacity building - management | Orientation and re-orientation of facility and district staff |
| Management | General management | General management | RBF Coordination |
| Management | Transport & Accommodation | Transport/accommodation | International and local travel for foreign personnel |
| Management | Transport & Accommodation | Transport/accommodation | Local Transport |
| Management | Office & equipment | Office and equipment | Project Office |
| Management | Transport & Accommodation | Transport/accommodation | Allowance and accommodation costs for foreign personnel |
| Management | General management | General management | RBF COORDINATION |
| Management | Office & equipment | Office and equipment | Equipment |
| Management | Office & equipment | Office and equipment | Project Office |
| Management | Transport & Accommodation | Transport/accommodation | Local Transport |
| Management | Capacity building | Governance | Support the creation of a RBF steering committee on MoH level (D 2.2) |
| Management | General management | General management | Develop structure of the Initiative |
| Management | Transport & Accommodation | Transport/accommodation | Allowance and accommodation costs for foreign personnel |
|------------|--------------------------|-------------------------|-----------------------------------------------------|
| Management | General management        | General management       | RBF COORDINATION                                    |
| Management | Office & equipment        | Office and equipment     | Office and Equipment                                 |
| Management | Capacity building         | Fraud mitigation         | Set up monitoring system for fraud control          |
| Management | Capacity building         | Capacity building - management | Briefing District Councils and DHMTs on RBF4MNH Phase II Extension |
| Management | Capacity building         | General management       | District Coordination Support                        |
| Management | Capacity building         | Capacity building - management | Conduct meetings to increase cooperation with other players like CHAM, Government ministries |
| Management | Capacity building         | Capacity building - management | Consultations with key stakeholders (MoH, MoF, MoLGaRD, NLGFC, …) |
| Management | Transport & Accommodation | Transport/accommodation | International and local ravel for foreign personnel |
| Management | Capacity building         | Governance               | Develop steering processes of the initiative        |
| Management | Capacity building         | Capacity building - management | Coordinate with partners and stakeholders            |
| Management | Capacity building         | Fraud mitigation         | Set up monitoring systems for fraud control (see S14) |
| Management | Capacity building         | Fraud mitigation         | Strengthen monitoring systems for fraud control     |
| Management | Capacity building         | Capacity building - management | Provide capacity building and promote innovation for partners of RBF4MNH |
| Management | General management        | General management       | Link RBF4MMH with other related initiatives         |
| Management | Capacity building         | Capacity building - management | Briefing of MoH officials and partners at National level |
| Management | Capacity building         | Capacity building - financial management | Strengthen RBF disbursement and accounting procedures at health facility level |
| Management | Transport & Accommodation | Transport/accommodation | Allowance and accommodation costs for local personnel |
| Management | Capacity building         | Capacity building - management | Develop the RBF4MNH Options Office to a centre of excellence |
| Management | Capacity building         | Capacity building - management | Briefing MoH top officials (Directors) and CHAM officials |
| Management | Audit | Audit | RBF Audit & external Evaluation |
|------------|-------|-------|-------------------------------|
| Management | Capacity building | Capacity building - financial management | Establish RBF disbursement and accounting procedures at HF level |
| Management | Personnel | Personnel _MoH | Director RH unit |
| Management | Office & equipment | Office and equipment | Reports and Documents |
| Management | Personnel | Personnel _MoH | Senior officer RH unit |
| Management | Capacity building | Capacity building - financial management | Discuss and develop expenditure guidelines with HF staff |
| Management | Capacity building | Capacity building - financial management | Establish bank accounts at district and facility level |
| Management | Capacity building | Capacity building - financial management | SHOULD BE - Support the establishment and management of bank account at district and facility level |
| Management | Capacity building | Capacity building - financial management | Support the establish and management of bank account at district and facility level |
| Management | General management | General management | Bank Charges |
| Management | General management | Management | Overheads MoH |
| Management | General management | General management | Bank Charges |
| Management | Audit | Audit | - |
| Management | Capacity building | Capacity building - financial management | Strengthen district accounts oversight |
| Management | Capacity building | General management | Support MoH organize technical and steering committee meetings |
| Management | Capacity building | Governance | Support regular meetings of the RBF steering committee on MoH level (D 2.2) |
| Management | Capacity building | General management | Support regular meetings of the district RBF steering committee on district level (ME 8.1) |
| Management | General management | General management | Miscellaneous (local) |
| Operations research | Personnel | Consultancy (supportive) | Phase I consultancies |
| Operations research | Personnel | Consultancy (supportive) | Phase II consultancies |
| Operations research | Operation research | Operations research | Conduct workload analysis in RBF facilities in 2016/17 |
| Operation research | Operation research | Operation research | Disseminate workload analysis results to stakeholders in the RBF participating districts |
|---------------------|--------------------|--------------------|----------------------------------------------------------------------------------------|
| Operation research  | Operation research | Operation research | Operational Research                                                                     |
| Operation research  | Operation research | Operation research | utilisation of payments; why women are not delivering at RBF participating HF            |
| Promotion Personnel | Personnel          | Personnel          | Do Awareness Campaign for communities                                                     |
| Promotion Awareness campaign | Communications | Communication strategy | SHOULD BE - Community Awareness Campaigns                                                 |
| Promotion Awareness campaign | Communications | Communication strategy | Develop promotional products                                                              |
| Promotion Awareness campaign | Communications | Communication strategy | Community Awareness Campaigns                                                             |
| Promotion Awareness campaign | Communications | Communication strategy | Develop leaflet (brochure) in English and Chichewa                                       |
| Promotion Awareness campaign | Communications | Communication strategy | Make use of promotional products to market the initiative                                |
| Promotion Awareness campaign | Communications | Communication strategy | Use the launch of the initiative for promotion                                             |
| Promotion Awareness campaign | Communications | Communication strategy | SHOULD BE: Launch of the initiative for promotion                                         |
| Promotion Awareness campaign | Communications | Communication strategy | Make use of promotional products to market the initiative                                |
| Promotion Awareness campaign | Communications | Communication strategy | Develop communication strategy                                                          |
| Promotion Personnel | Consultancy (supportive) | Consultancy for dissemination workshop | Consultancy for dissemination workshop                                                  |
| Promotion Awareness campaign | Communications | Communication strategy | Develop communication strategy                                                          |
| Promotion Awareness campaign | Communications | Communication strategy | Community Awareness Campaigns                                                             |
| Promotion Awareness campaign | Communications | Communication strategy | Give the initiative a nationally recognised name and logo                               |
| Promotion Awareness campaign | Communications | Communication strategy | Open days to market the initiative at community level (dramatization etc.)               |
| Promotion Awareness campaign | Communications | Communication strategy | Create RBF newsletter                                                                   |
| Promotion | Awareness campaign | Communications | Advertising |
|-----------|--------------------|---------------|-------------|
| Promotion | Awareness campaign | Communications | Roll out the RBF4MNH Communication strategy |
| Supply side | Infrastructure Investment | structural investment - infrastructure | Provide Infrastructure Investment (IE) |
| Supply side | Capacity building | Supply side incentives | Supply Side Incentives |
| Supply side | Personnel | Supply side incentives | Supply Side Incentives |
| Supply side | Supply side incentives | Supply side incentives | Supply Side Incentives |
| Supply side | Equipment investment | structural investment - equipment | Provide Procurement of equipment (IE) |
| Supply side | Capacity building | Capacity building - supportive supervision | Provide capacity building and training for staff |
| Supply side | Infrastructure Investment | structural investment - infrastructure | Provide Infrastructure Investment (IE) |
| Supply side | Capacity building | Investment - Human Resources | Support DHMTs to ensure health facility staff are well staffed and new staff have orientation towards RBF |
| Supply side | Capacity building | Capacity building - supportive supervision | DHMT Bi-monthly supportive supervision |
| Supply side | Capacity building | Capacity building - supportive supervision | Provide Capacity building and training for Health workers |
| Supply side | Equipment investment | structural investment - equipment | Provide Procurement of equipment (IE) |
| Supply side | Capacity building | Capacity building - supportive supervision | Conduct RBF supportive supervision and MNH mentorship |
| Supply side | Capacity building | Capacity building - management | Support Facilities & DHMTs |
| Supply side | Capacity building | General management | Ensure sufficient staffing levels in facilities according to MoH guidelines as a precursor to signing Quality and Performance Contracts |
| Supply side | Capacity building | Quality assurance | Establish quality assurance and improvement system |
| Supply side | Capacity building | Quality assurance | Establish quality assurance and improvement system |
| Supply side | Capacity building | General management | Ensure sufficient staffing levels in facilities according to MoH guidelines as a precursor to signing Quality and Performance Contracts |
| Supply side | Capacity building | Capacity building - management | Support facilities and DHMT in complying to the RBF SOPs and requirements |
|-------------|-------------------|--------------------------------|---------------------------------------------------------------------|
| Supply side | Capacity building | General management            | Ensure sufficient staffing levels in facilities according to MoH guidelines as a precursor to signing Quality and Performance Contracts |
| Supply side | Capacity building | Capacity building - supportive supervision | Make protocols available for 7-9 signal functions |
| Supply side | Capacity building | Capacity building - management | Capacity assessment and re-assessment of new and old facilities |
| Supply side | Capacity building | Capacity building - supportive supervision | Quarterly Zone supervision |
| Verification | Verification agent | Supply side verification | Identify, contract Verification agent, and conduct verification |
| Verification | Verification audit | Internal data audit            | Internal Data Verification by RBF Team and MoH Team |
| Verification | Verification agent | Supply side verification | Identify and contract verification agent |
| Verification | Personnel |                             | |
| Verification | Verification audit | Internal data audit            | Data verification (RBF and MoH team) |
| Verification | Verification agent | Supply side verification | Support to External Data Verification Teams by RBF Team and MoH Team |

**Verification**

- **Supply side verification**
- **Internal data audit**
  - Data verification (RBF and MoH team)
  - **SHOULD BE** - Internal Data Verification by RBF Team and MoH Team