

## ORIGINAL RESEARCH



# Data-informed decision-making for life-saving commodities investments in Malawi: A qualitative case study

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## Abstract

### Background

During the last 15 years, Malawi has made remarkable progress in reducing child mortality. However, maternal and newborn mortality remains persistently high. To help address these entrenched challenges, the Reproductive, Maternal, Newborn and Child Health (RMNCH) Trust Fund provided short-term catalytic financing of \$11.5 million (2013-2016) to support country plans to advance the RMNCH and commodity agenda.

### Objectives

(1) To document how Malawi (ministries, partners, working groups) used evidence to inform decision-making and RMNCH investments, (2) To identify barriers to utilizing information and evidence in the planning and prioritization process at national and sub-national levels, and (3) To assess the utility of the RMNCH Landscape Synthesis, which uses existing information to review life-saving RMNCH commodities and services.

### Methods

This was a qualitative case study utilizing a Rapid Appraisal (RA) approach, where semi-structured interviews were conducted with staff members from UN agencies, development partners and the Ministry of Health (MoH) at national and district level. The analysis enlists a framework approach for manual qualitative content analysis.

### Results

Led by the MoH, the RMNCH Trust Fund grant proposal utilized an evidence-based and equity-focused process for prioritization of investments. Data-informed decision-making permeates similar commodity-focused working groups. However, common health information system (HIS) weaknesses, such as data quality and collection burden, persist and are more prevalent at district-level. The collation of evidence in the RMNCH Landscape Synthesis was a useful and sustainable tool to support planning.

### Conclusions

The evidence-based, equity-focused decision-making process for the RMNCH Trust Fund proposal provides an effective model for inter-agency investment prioritization. Strengthening data-informed decision-making will require financial and political commitments to HIS and capacity building for data use, particularly at the district-level. New initiatives (e.g. Health Data Collaborative and QED Network to Improve Quality of Care) provide opportunities to further improve evidence-informed decision-making.

## Introduction

Malawi has experienced steady progress in reducing under-five mortality from 234 (per 1,000 live births) to 63 from 1992 to 2015, respectively<sup>1</sup>, an impressive 73% decline to reach the Millennium Development Goal (MDG). However, reductions in neonatal mortality have been more challenging – decreasing at a relatively slower pace of approximately 34% from 41 (per 1,000 live births) to 27 over the same 23 year period<sup>1</sup>. These rates vary widely across districts and the urban/rural divide, which may depict inequitable access to appropriate and timely health services<sup>1</sup>. In addition, maternal mortality is 439 (per 100,000 live births)<sup>1</sup>, which failed to reach the MDG target<sup>2</sup>. While institutional delivery varies widely by socioeconomic status<sup>3</sup>, on average, 91% of births are delivered in a health facility<sup>1</sup>. However, in 2013, only one-third of the facilities had recent relevant in-service training and 45% had insufficient stocks of essential medicines for delivery, such as injectable antibiotics (e.g. penicillin, gentamycin, ampicillin, or ceftriaxone)<sup>4</sup>. Inequitable access to essential services and quality of care contributes to this discrepancy between high rates of treatment seeking and

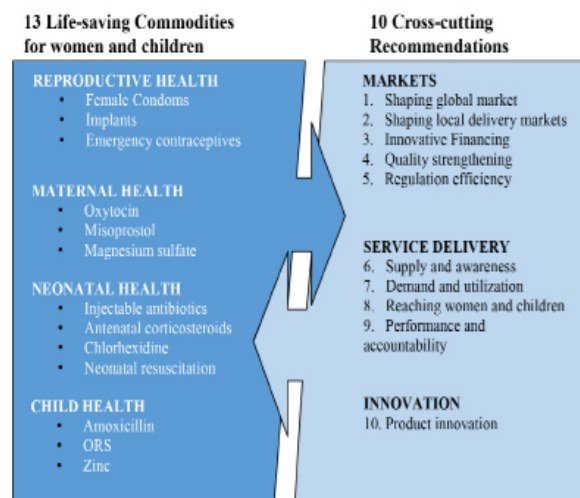
relatively low mortality reductions<sup>2</sup>.

An equity-based and data-informed approach to health investment decisions provides a constructive framework for addressing these service delivery disparities. In the context of maternal and child health, an equitable environment provides an opportunity for each woman, newborn and child to survive, thrive and reach their full potential<sup>5,6</sup>. United Nations Children's Fund (UNICEF) defines inequity as when certain groups are "unfairly deprived of the basic rights and opportunities available to others"<sup>7</sup>. Equity-based approaches focus investment on disadvantaged groups as well as the underlying factors creating the inequity. Investments in equity are both ethical and cost-effective<sup>8,9</sup>. Unfortunately, health services fail to reach the most vulnerable populations and often perpetuate socioeconomic, ethnic or gender differences<sup>9-11</sup>. In recent years, many UN agencies and partners have adopted an equity approach to public health and international development<sup>5,7,12-14</sup>.

Data-informed decision-making is "the consideration of data during program monitoring, review, planning, and improvement; advocacy; and policy development and review"<sup>15</sup>. Data-informed

decision-making enables any level of the healthcare system – individual, community, facility, district, regional, national and global – to respond to prioritized necessities<sup>16</sup>. Understanding the importance of data-informed decision-making, the Malawi Ministry of Health published guidelines on using evidence in health policy making<sup>17</sup>. Data-informed decision-making can facilitate equity-focused health system improvements. With disaggregated data by target population, decision-makers can incorporate an equity-based approach for national and sub-national planning and investment prioritization. In 2013, an opportunity for Malawi to undertake an equity-based, data-informed investment strategy for reproductive, maternal, newborn and child health (RMNCH) became available with short-term catalytic financing from the RMNCH Trust Fund. Malawi was awarded two grants from the RMNCH Trust Fund for \$3.9 million (USD) in 2013 and \$7.6 million (USD) in 2015 to support country RMNCH and commodity plans. Grant activities were defined by in-country stakeholders including the Ministry of Health, UN agencies and development partners. Therefore, this relatively flexible financing provided an opportunity to fill needed funding gaps and potentially prioritize equitable access to RMNCH services and life-saving commodities.

Globally, the RMNCH Trust Fund began operations in 2013 to complement the UN Commission on Life Saving Commodities for Women’s and Children’s Health (UNCoLSC)<sup>18</sup>, which emphasized 13 under-utilized, low-cost and high-impact commodities (Figure 1) across the RMNCH spectrum that could substantially reduce preventable deaths if implemented at scale. The UNCoLSC outlined 10 recommendations (Figure 1) for addressing key health system bottlenecks, such as improving regulatory efficiency (e.g. standard treatment guidelines<sup>19</sup>), shaping local markets, enhancing medicine quality and safety, strengthening supply chains, improving health worker performance, generating demand, and reaching vulnerable populations. These recommendations, coupled with the 13 commodities, provide an actionable focus to help identify and address barriers to effective delivery of critical health interventions.



Source: UN Every Woman Every Child. UN Commission on Life-Saving Commodities for Women and

Children: Commissioners’ Report 2012. New York, USA; 2012.

Figure 1: UNCoLSC: 13 Commodities and 10 Recommendations

With support of the RMNCH Trust Fund and its

coordinating team, the Strategy and Coordination Team (SCT) Malawi, completed multiple rounds of the RMNCH Landscape Synthesis monitoring tool (also known as the RMNCH Situation Analysis)<sup>20</sup>. The RMNCH Landscape Synthesis is a relatively new monitoring tool and approach, which can link to existing planning processes and facilitate data-informed decision-making around RMNCH policy and investments<sup>20</sup>. Guided by the 13 UNCoLSC commodities and recommendations, the RMNCH Landscape Synthesis uses existing information systems and expert interviews to review the state of commodity manufacturing, import, procurement, regulation, quality control, supply and utilization, to help identify in-country barriers to accessing life-saving RMNCH commodities and services.

This research assessed how Malawi (MoH, partners, working groups) used data to inform decision-making and investments in life-saving commodities and related services since 2013 (year of the initial request to the RMNCH Trust Fund), identified barriers and facilitators for utilizing information and evidence in the planning and prioritization process at national and sub-national levels, and assessed the utility and sustainability of the recently introduced RMNCH Landscape Synthesis monitoring tool.

**Methods**

This qualitative study was conducted in Malawi from 13 to 20 July 2016 and consisted of semi-structured interviews with staff members from UN agencies, development partners and the Ministry of Health at national and district levels. To maximize the short time period available for data collection, the research team utilized a Rapid Appraisal (RA) approach<sup>21,22</sup>. RA approaches are characterized as timely, cost-effective and less structured, but often have limited capacity to generalize the findings to a wider population<sup>22</sup>. RA can be utilized as a formative evaluation tool prior to the end of a project or activity<sup>22</sup>.

**Participants and Sampling**

Prior to the interview scheduling, a list of potential partners and individuals for interview were purposively selected based on participation in RMNCH or commodity-related working groups as well as district-level management staff. The composition of the interviewees was deliberately broad to ensure wide-ranging perspectives from various types of organizations and stakeholders as well as multiple levels of the healthcare system.

Table 1: Summary of Participants

Participant Category	# of Interviewees	# of Organizations / Departments
National Ministry of Health	4	3
UN Agencies	2	2
Development Partners	6	5
District Health Offices	6	2
<b>Total</b>	<b>18</b>	<b>12</b>

UNICEF contacted the interviewees via email or phone to schedule each meeting. Reasons for non-participation were limited to extended domestic and international travel or administrative leave during the data collection time period.

With the exception of one organization, an alternative interviewee was identified from each organization where non-participation occurred. In addition, the verbal informed consent process at the start of each interview notified the interviewee of their right to refuse the interview or end the interview at any time, but no interviewee exercised this opportunity to cancel or prematurely end the interview.

**Data Collection**

Interviews were conducted in Malawi over an 8-day period in July 2016. Interviews were scheduled at the convenience of the interviewee and conducted in the location selected by the interviewee, which was typically their respective office building. All interviews were conducted in English. BN, MM, and SC, conducted all of the interviews with multiple enumerators present during sessions with approximately half of the interviewees. The interviewer obtained verbal informed consent from the interviewee prior to initiation of the interview. A semi-structured interview guide was utilized during each interview. Based on the knowledge and experience of interviewee, the interviewer had the autonomy to delve more deeply into a specific topic or move to the next one. Different interview guides were utilized for the two primary types of interviewees national and district-level respondents. The development and use of the interview guide was an iterative process as the enumeration team discussed and made modest changes during the enumeration process.

**Data Analysis**

Interview discussions were recorded as typed notes and written summaries. Interviewees were asked questions about internal activities and external partners, which presented a risk of meaningful negative impact to the respondent. To promote openness, the interview was not audio recorded. Each interviewer entered written notes from the discussion into their respective password-protected computer. When multiple interviewers were present, the set of notes were compared post-interview for consistency and combined to ensure all relevant information was captured for analysis. This research enlists a framework approach for manual qualitative content analysis<sup>23-26</sup>. The researchers read through the interview notes to familiarize themselves with the key ideas. Using the a priori study objectives and experience during the interview process, the researchers identified recurrent themes and developed a thematic framework to organize the results of the interviews. Each interview transcript was annotated and results organized based on the thematic framework using Microsoft Excel software. Development of typologies and associations were based on the interview results mapped against the thematic framework. Data use for planning and prioritization was the analytic angle used for this study.

**Ethics**

The study required confidential interviews with respondents in various ministerial positions, UN agencies and partners. Given the nature of the questions and opinions solicited, disclosure of responses has a meaningful risk of negative impact on the respondent. All respondents were given informed consent prior to the interview. Each respondent was informed of the study’s benefits, risks, contact list and their right to stop the interview at any time. Interview notes were recorded on computers by the enumeration team (no audio recordings). All interview notes and

identifiable information on respondents were stored on password protected computers with the enumeration team. All interview and consent materials were presented to the National Health Science Research Committee of Malawi, which gave approval prior to undertaking the study.

**Findings**

In regards to data-derived decision-making, four main thematic findings were recognized, including:

1. RMNCH Trust Fund investment process was government-led and data-informed
2. Data-informed decision-making permeates other technical working groups
3. Common data challenges hamper progress and more pronounced at sub-national levels
4. RMNCH Landscape Synthesis added value and should be sustained

**1. RMNCH Trust Fund investment process was government-led and data-informed**

To make investment decisions for the two RMNCH Trust Fund grants, the Ministry of Health established the RMNCH Committee, which was led by the Ministry of Health and included UN agencies, development partners, civil society and implementing organizations. The investment decision-making process had two fundamental steps: selection of 12 districts for investment and selection of activities within those 12 districts (Figure 2).

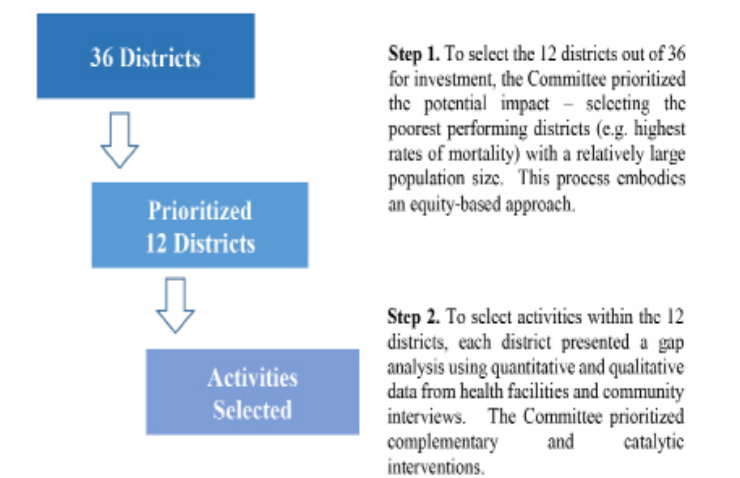


Fig 2: RMNCH Trust Fund investment process

To select the 12 districts for investment, the Committee used an equity-based approach to prioritize geographical areas with relatively weak health indicators. Primary impact indicators from the Health Sector Strategic Plan (HSSP), such as maternal, newborn and child mortality, were used to compare districts as well as service and commodity availability and partner presence to facilitate implementation, among others. The indicators were collated from various existing data sources (Table 2).

**Table 2: Data Sources and Reports used by RMNCH Committee**

Category	Information System	Related Analyses / Reports
Population-based Surveys	Demographic and Health Survey (DHS)	
Logistics Management Information Systems (LMIS)	OpenLMIS	Monthly stock status at health facilities (known as HTSS report)
	Central Medical Store Trust (CMST) information system	Inventory Management reports (e.g. stock levels, procurement, and distribution)
Health Facility Assessments	Emergency Obstetric Care (EmOC) Assessment	
	Service Provision Assessment (SPA)	
Health Management Information Systems (HMIS)	DHIS2	RMNCH Scorecard (ALMA)
Budgetary / Financial	Resource Mapping	
Other	RMNCH Landscape Synthesis	RMNCH Landscape Synthesis: Summary Report
	Health Program Data District Implementation Plans (DIP)	

Once collated across all districts, the Ministry of Health selected districts for investment based on the potential impact – the districts with the highest rates of mortality along with a relatively large population size. The process embodies an equity-based approach to health systems investment. The second step for the investment plan was selecting activities within those 12 districts. Once selected, each district presented a district gap analysis and activities for investment to the Committee. In addition to quantitative measures of impact, districts incorporated qualitative information from facility and community interviews to ensure voices of the community were an integral part of decision-making. Based on the available data, the Committee targeted specific catalytic and complementary activities in each district to approve for funding. To ensure consistent performance, the Committee met on a regular basis – typically monthly – to review performance and implementation rate. In addition, the Committee maintained continuous dialogue with districts to ensure favorable execution. The RMNCH Committee formulated a deliberate process led by the Ministry of Health to engage an array of partners and incorporate extensive sub-national input in order to develop a data-informed and

equity-based approach to RMNCH investment decisions.

## 2. Data-informed decision-making permeates other technical working groups

A common thread across RMNCH-related technical working groups is data-informed decision-making. In Malawi, most essential medicines are procured and distributed through the Central Medical Store Trust (CMST). However, multiple partners manage parallel supply chain systems. The Drug and Medical Supplies Technical Working Group (DMS TWG) provides a forum for the government and partners to coordinate drug management decisions as well as related infrastructure, workforce and training activities. The DMS TWG wants “decisions to be evidence-based” and utilizes an array of LMIS and HMIS data sources (see Table 2) as well as the ‘Pipeline’ report, which collates data from multiple supply chain sources for a comprehensive view of commodity availability at national level. When a prospective commodity gap is identified in out-months – typically using the Pipeline report – the Ministry of Health, acting as the DMS TWG Chair, requests partner support to fill the pending shortfall. Partners determine how procurement and resource allocation can be augmented to meet upcoming needs. For partners, final decisions are made outside the DMS TWG forum after confirmation with the partners’ internal teams – the decision is “left to partners to see what their budget can carry” – while official MoH decisions typically require endorsement from Senior Managers outside of DMS TWG. When available resources cannot meet the demand across commodities, the DMS TWG prioritizes commodities and supplies with the highest impact. In particular, the essential health package (EHP)<sup>2,27</sup> and other “must have” commodities for hospitals and health facilities with high impact and high consumption rates, such as amoxicillin, are prioritized. In a similar fashion, when commodity storage at health facilities was identified as an issue, DMS TWG commissioned an assessment to identify the projected storage gap over the next 10 years for each facility. Infrastructure investments were made for health facilities with the largest projected gap. In addition, the Reproductive Health Commodities Sub-committee and the Health Sector Strategic Plan (HSSP) undertakes similar data-informed decision-making processes and tries to “work as a team, not in isolation”. In the case of HSSP, the process is similar to the RMNCH Committee including developing a situation analysis from a broad set of data sources and incorporating district improvement plans (DIP). In Malawi, establishing broad collaboration amongst partners – led by the MoH – to undertake data-informed decision-making is the norm.

## 3. Data challenges hamper progress and more pronounced at sub-national levels

An array of challenges – data collection burden, processing and analysis, use, communication, quality, timeliness, and capacity – were identified across data systems and decision-making processes.

- *Data collection burden:* The incredible demand for data from health facilities creates a significant burden on health personnel. By some accounts, due to the plethora of government and partner-supported programs, health facilities are required to tabulate – usually with no automated tools (i.e. ‘by hand’) – more than 800 indicators each

month. Moreover, with most of facility-level data collected on paper forms (e.g. LMIS, DHIS2), the production and timely transport of paper to and from facilities is resource intensive. One respondent summarized this problem as a longlasting need to identify critical data points for maternal and newborn health and make [data collection] routine.

- *Data Processing and Analysis:* While district level health information systems have improved in recent years, the tools lack specific utility for the District Health Officer (DHO). In DHIS2, denominators for most indicators are not readily available; therefore, the DHO must export the data to Excel for proper analysis. Dashboards are limited and while the DHO can create their own dashboard, the tool is rarely used. In addition, multiple automated reports in the DHO LMIS (Supply Chain Manager software) fail to generate on a regular basis, which occurred during one interview. At the national level, one respondent drew attention to the multiple and often uncoordinated planning processes, which led to redundant data processing and analyses.

- *Data Use:* The demand for and use of data is a complex and discordant effort. The high data collection burden is not matched with effective data use, which ultimately under-utilizes the health information system. Respondents articulated that “we need to continue escalating the use of data” and some lamented that the demand within technical working groups for processed and packaged data analysis across the breadth of available indicators remains low. For example, fill rates and distribution performance metrics are available within the LMIS, but are not processed, analyzed and presented to the DMS TWG. At sub-national level, DHOs send the data upwards to the national-level, but it has limited capacity to provide feedback to health facilities (outside of infrequent supervision visits or poorly attended district review meetings), which in turn weakens data use capacity at facility levels. There is a perception that district, facility and community stakeholders “do not have sufficient access to data to make decisions”. The DHO struggles to maximize use of available quantitative information for the DIP process. To ameliorate this shortfall, DHOs conduct qualitative interviews and focus groups with communities; however, due to funding constraints the process often happens only once per year in one community. Limited use of available data undermines the value of health information systems and the potential of subsequent decision-making.

- *Communication:* From the national to the community level, effectively presenting and communicating findings from the health information systems was a perceived challenge by respondents. At the national level, access to user-friendly data presentations was a common complaint. Moreover, there is a perception that “communication is too high-level” where advocacy and communication packages do not respond to district or community needs. Within the DHO, report-writing skills of staff were an area for improvement. While training on data management was common, skill building around writing, presentation and communication of results was limited.

- *Data quality:* While not uniform, a perception of poor data quality existed for some data sources. For example, in LMIS, there is no routine audit mechanism for data quality. Supervisor visits are held to support capacity building and review data submissions; however, these visits

can be infrequent (after more than a year in some cases). Moreover, funding shortfalls or ‘push’ supply systems often provide commodity replenishment that is inconsistent with current stock status or requested quantities, which creates less incentive to maintain accurate data submissions. Within DHIS2, the quality of many RMNCH indicators is deemed insufficient for commodity quantification analyses; therefore, estimates are used.

- *Data timeliness:* The timeliness of data reporting has improved in recent years but remains restrained. For example, within the monthly stock status reports (known as HTSS report), reporting rates increased from approximately 60% in 2013 to more than 90% in 2016. However, if a health facility reports before the monthly deadline, but reports on only a small fraction of the commodities stocked in the facility, then the submission is still considered sufficient and timely.

- *Capacity:* A common challenge at all levels of the health system relates to human resource and technical capacity. Each challenge listed above within the health information system (e.g. data collection, analysis, use, communication, etc.) is affected by human resource capacity. Training of sub-national personnel across these technical skill sets has been undertaken; however, high turnover has destabilized these foundational steps.

## 4. RMNCH Landscape Synthesis added value and should be sustained

The RMNCH Landscape Synthesis was considered a valuable addition to the data use and planning processes. Respondents appreciated the type of information collated and the presentation format. The breadth of information on RMNCH services and commodities facilitated the engagement of multiple ministerial departments (e.g. regulatory, supply chain, quality control) and partners to help illustrate their interconnected objectives. The approach of using available quantitative data complemented with expert interviews was perceived as an efficient use and showcase of existing health information systems. The perceived limitations of RMNCH Landscape Synthesis included the possibility of adding commodities, indicators or improving the presentation format, but most critiques focused on the sub-national data. While the RMNCH Landscape Synthesis was a useful tool for national level decision-making, disaggregated district-level data was absent and thus utility at the sub-national level is minimal. Expansion of the RMNCH Landscape Synthesis to district-, facility- and community-level information was a common suggested improvement. Given the utility of the RMNCH Landscape Synthesis, respondents overwhelmingly supported sustaining the RMNCH Landscape Synthesis. Most respondents proposed integrating the RMNCH Landscape Synthesis into similar Ministry of Health data management processes – possibly in the Department of Planning and Policy Development. However, “sustainability for next 5-10 years will depend on partnership arrangements”, thus partner support would likely be needed to ensure sufficient capacity was available for the immediate transition and the longer-term.

## Discussion

In the last two Health Sector Strategic Plans dating back to 2011<sup>2,28</sup>, the Malawi Ministry of Health has advocated

for equity-based investments and data-informed decision-making. This study illustrates the MoH putting these principles into practice – not simply with the HSSP, but extending to other funding sources and technical working groups. This parallels attempts across other developing countries towards equity-based investment approaches<sup>29–32</sup>. While socio-political influences have the potential to impact decision-making in Malawi<sup>33</sup>, these findings showcase a data-driven investment process for equitable health systems strengthening. However, strides to ameliorate the persistent challenges found in this study surrounding HIS and decision-making are paramount for effective and sustainable planning and implementation.

### Linking Data Use and Quality

Malawi is constrained by the interlocking forces of data quality and data use. The results of this study are consistent with experiences in other countries where perception of data quality is intertwined with insufficient data use<sup>34–41</sup>. For example, Nicol and colleagues<sup>34</sup> illustrated how a lack of trust in the quality of HIV-related data source in South Africa was a barrier to information use from national program managers down to facility managers. Data use and data quality constitute a mutually reinforcing cycle<sup>34,38,39,42,43</sup>. The perception of low data quality reduces use. Conversely, low use reduces the incentives to maintain data quality. In Malawi, reasons abound for these circumstances including unreasonable data collection burden at sub-national level, low analytic capacity, insufficient supervision, and lack of a clear champion or “big sponsor” among stakeholders to continually drive progress in DHIS2<sup>44,45</sup>. Collectively, stakeholders in Malawi must facilitate upward momentum within this cycle – accelerating data use to improve quality or vice versa. Even when data quality is perceived as poor for a specific data source, using the data is an effective approach to improving quality<sup>34</sup>. Moreover, to improve data quality and use, Harrison and Nutley<sup>38</sup> recommend, among other activities to institutionalize data quality assurance, build capacity around data analysis and interpretation, and harmonize reporting procedures across donors.

These substantive barriers and corresponding tasks will require a collaborative approach to health information system (HIS) strengthening. To this end, Malawi recently initiated a country-led collaborative approach to HIS planning and investment around a proverbial ‘one country’ monitoring and evaluation platform. An MOH-led monitoring and evaluation taskforce was created to guide a process of coordinated investments in HIS, rationalization of indicators, and reduced HIS fragmentation, among other activities<sup>46</sup>. Furthermore, Malawi is undertaking an ambitious long-term effort to establish a national interoperable HIS<sup>45,47</sup>. Along with the new Health Sector Strategic Plan (HSSP)<sup>2</sup>, Malawi is setting a foundation to make coordinated and substantive improvements to HIS in the coming years.

### Extending utility to sub-national levels: district, facility and community

While some improvements are needed, this study illustrates that national-level planners and managers successfully use the HIS to make data-informed decisions and investments. However, sub-national personnel have fewer tools, technical capacity and resources to effectively institutionalize data-

driven decision-making. These findings parallel other studies that identify similar challenges with a high local data collection burden<sup>38,48–50</sup>, poor local data use<sup>34,51</sup>, insufficient subnational capacity<sup>34,37,38</sup>, and lack of a data-oriented culture<sup>34,38,52,53</sup>. First, excessive data collection burden on health is a common problem – a recent study in Tanzania found that facility-based health staff spent 25-30% of their time completing reporting forms<sup>48</sup>. The MoH can look to reduce the data collection burden at sub-national levels by working with health programs and partners to match prioritized data use needs to a limited, rationalized set of data collection demands. The goal is to ensure each level has sufficient resources to capture this rationalized list of indicators (without jeopardizing quality of care) and remove the rest. Indicator harmonization is consistent with the principle and practice of the Health Data Collaborative<sup>46,54,55</sup>, which includes membership of key partners, such as UNICEF, World Health Organization (WHO), The World Bank Group, United States Agency for International Development (USAID) and the United Nations Population Fund (UNFPA).

Second, in terms of local data use, HIS improvements are typically targeted at district or regional level, which overlook local decision-makers and their data needs<sup>49,51</sup>. Moreover, Chaulagai and colleagues<sup>33</sup> found that accountability for public servants within Malawi was constrained by limited access to and interpretation skills for health data. Therefore, organizations must push efforts at the community-level to provide relevant and user-friendly information to local decision-makers, improve social accountability and engagement with civil society organizations, for example, implementing community-level scorecards<sup>56</sup> between health providers and community members to outline expectations from each party and develop corresponding improvements plans in an open and collective manner. Third, these findings indicate that district- and facility-level managers need enhanced capacity and tools to effectively utilize information to improve healthcare delivery. This is consistent with the 2005 findings from Chaulagai and colleagues<sup>33</sup> in Malawi where managers throughout the healthcare system had limited capacity to use data for decision-making. As outlined by the Health Metrics Network<sup>50</sup>, district-level decision-makers need a variety of data tools and reports to consolidate information across multiple sources to effectively manage the health system. Creating harmonized district-level scorecards (or dashboards) – similar to the Malawi’s national RMNCH Scorecard<sup>57</sup> – is a productive start. Moreover, in recent years, MoH and partners have supported the District Health Performance Improvement (DHPI)<sup>58</sup> approach in select districts, which builds capacity on local data use for equity-based bottleneck analyses and strategic planning. In a decentralized health system, extending these capabilities to all districts will improve local governance and long-term, evidence-based planning across the country.

Lastly, the results of this study indicate Malawi has taken critical steps to build a data-oriented culture within its national leadership. As Lorenzi and Riley<sup>59</sup> proffer, leadership sets the pace for cultural shifts in an organization. However, like many other countries<sup>38,52</sup>, Malawi needs to improve the data use culture at sub-national levels. To this end, Malawi is undertaking a new initiative to strengthen health services with the Quality, Equity, Dignity (QED) Network to Improve

Quality of Care for Maternal, Newborn and Child Health<sup>60,61</sup>. The approach focuses on strengthening quality improvement (QI) culture and establishing QI teams of existing personnel at district and facility levels. As outlined by Green and de Kock<sup>62</sup>, QI teams undertake short cycles of improvement where they will identify urgent problems (e.g. low utilization of oxytocin), test new ways of working (e.g. ensure oxytocin’s availability and readiness at frontline), measure and study the results, and sustain successful changes to operation. This approach has the potential to fundamentally change how sub-national (and national) personnel successfully use and engage with health information systems in more efficient and cost-effective ways.

### National-level capacity building and sustainability of the Landscape Synthesis

One of the most frequently mentioned and most intractable challenges is capacity building for information-use across all levels of the healthcare delivery system<sup>16,38,50,51,63</sup>. In this study, respondents anticipated the need for capacity building in Malawi MoH at the national level in order to sustain the RMNCH Landscape Synthesis. This is consistent with the additional support for other recent data-use initiatives, such as the Resource Mapping<sup>64</sup> and RMNCH Scorecard<sup>57</sup>. Capacity is typically provided by partners on an ongoing basis, but to ensure more sustainable operations, any partner arrangements should require clear deliverables on governmental capacity building and handover.

Transitioning the RMNCH Landscape Synthesis to local institutions provides an opportunity to more fully adapt the tool to the Malawian context – both nationally and sub-nationally. The tool was originally designed to track progress for the 13 life-saving commodities as “tracers” for the wider supply chain, but various public health practitioners, such as Bhutta<sup>65</sup>, have proposed adjustments to this list. Malawi can modify the list of commodities or related indicators to fulfill the vacillating monitoring needs of the Malawian health system, such as incorporating recent evidence on antenatal corticosteroids<sup>66</sup>. As advocated by Nutley and Reynolds<sup>39</sup>, engaging the data users and data producers at multiple levels of the healthcare system will ultimately increase the demand for and use of the RMNCH Landscape Synthesis in Malawi.

### Study Limitations

This study has several limitations. Due to the rapid assessment (RA) approach, the study team had limited time for an in-depth examination of the subject matter. The short time window may have restricted interview participants based on scheduling availability, although only one organization on the interview list was not available. UNICEF provided the interview list, which may have unintentionally biased the respondent selection towards favorable opinions. No facility-based personnel or community members were interviewed; therefore, the perceptions of facility or community issues were not corroborated and could present an area for further research. In addition, some questions asked were about experiences over the past 2-3 years; therefore, recall bias is possible. Lastly, to improve openness of the respondent, a tape recorder was not used during the expert interviews, which may have resulted in lost or misinterpreted information and limits the interviewer’s ability to document verbatim quotes. While every effort was made to instill an

open yet confidential environment for the expert interviews, participants may have been reluctant to provide negative information about the process or partners.

### Conclusion

The data-informed, equity-focused decision-making process for the RMNCH Trust Fund proposal provides an effective model for inter-agency investment prioritization. Strengthening data-informed decision-making will require financial and political commitments to HIS and capacity building for data use, particularly at sub-national levels. New initiatives (e.g. M&E Taskforce / Health Data Collaborative and QED Network to Improve Quality of Care for Maternal, Newborn and Child Health) provide opportunities to further improve data-informed decision-making.

### References

1. National Statistical Office (NSO) [Malawi], ICF International. Malawi Demographic and Health Survey 2015-16. Zomba, Malawi, and Rockville, Maryland, USA.; 2017. <https://dhsprogram.com/pubs/pdf/FR319/FR319.pdf>.
2. Ministry of Health (MoH) [Malawi]. Malawi Health Sector Strategic Plan II 2017-2022. Lilongwe, Malawi; 2017. [http://www.nationalplanningcycles.org/sites/default/files/planning\\_cycle\\_repository/malawi/health\\_sector\\_strategic\\_plan\\_ii\\_030417\\_smt\\_dps.pdf](http://www.nationalplanningcycles.org/sites/default/files/planning_cycle_repository/malawi/health_sector_strategic_plan_ii_030417_smt_dps.pdf).
3. UNICEF, WHO. A Decade of Tracking Progress for Maternal, Newborn, and Child Survival: 2015 Report. Vol 6736. Geneva, Switzerland; 2015. doi:10.1016/S0140-6736(15)00519-X.
4. Ministry of Health (MoH) [Malawi], ICF International. Malawi Service Provision Assessment (MSPA) 2013-14. Lilongwe, Malawi, and Rockville, Maryland, USA: MoH and ICF International; 2014. <https://dhsprogram.com/pubs/pdf/SPA20/SPA20%255BOct-7-2015%255D.pdf>.
5. Bamberger M, Segone M. How to Design and Manage Equity-Focused Evaluations. New York, USA; 2011. [http://www.pol.ulaval.ca/perfeval/upload/publication\\_319.pdf](http://www.pol.ulaval.ca/perfeval/upload/publication_319.pdf).
6. The Global Strategy for Women’s and Children’s and Adolescents’ Health (2016-2030): Survive, Thrive, Transform. Vol 1. New York, USA; 2015. doi:10.1017/CBO9781107415324.004.
7. Bocqueten G, Chaiban T, Cook S. The State of the World’s Children 2016: A Fair Chance for Every Child. New York, USA; 2016. doi:10.18356/4fb40cfa-en.
8. United Nations Children’s Fund (UNICEF). Narrowing the Gaps: The Power of Investing in the Poorest Children. New York, USA; 2017. [https://www.unicef.org/publications/index\\_96534.html](https://www.unicef.org/publications/index_96534.html).
9. Carrera C, Azrack A, Begkoyian G. The comparative cost-effectiveness of an equity-focused approach to child survival, health, and nutrition: a modelling approach. Lancet (London, England). 2012;380(9850):1341-1351. doi:10.1016/S0140-6736(12)61378-6.
10. Bryce J, Requejo JH, Moulton LH, Ram M, Black RE. A common evaluation framework for the African Health Initiative. BMC Health Serv Res. 2013;13 Suppl 2(2):S10. doi:10.1186/1472-6963-13-S2-S10.
11. Victora CG, Requejo JH, Barros AJD, Countdown to 2015: A decade of tracking progress for maternal, newborn, and child survival. Lancet. 2016;387(10032):2049-2059. doi:10.1016/S0140-6736(15)00519-X.
12. FP2020 Partnership in Progress: 2013-2014. Washington, D.C.; 2014.
13. WHO. Every Newborn: An Action Plan To End Preventable Deaths. Geneva, Switzerland; 2014. [www.who.int/about/licensing/copyright\\_form/en/index.html%255Cnhhttp://apps.who.int/iris/](http://www.who.int/about/licensing/copyright_form/en/index.html%255Cnhhttp://apps.who.int/iris/)

handle/10665/127938.

14. UNICEF. Committing to Child Survival: A Promise Renewed: UNICEF Progress Report 2013. New York, USA; 2013. doi:978-92-806-4706-8.

15. Nutley T, Gnassou L, Traore M, Bosso AE, Mullen S. Moving data off the shelf and into action: an intervention to improve data-informed decision making in Cote d'Ivoire. *Glob Health Action*. 2014;7(25035):1-10. doi:10.3402.

16. Nutley T. Improving Data Use in Decision Making : An Intervention to Strengthen Health Systems. Chapel Hill, NC; 2012. <https://www.measureevaluation.org/resources/publications/sr-12-73>.

17. Ministry of Health (MoH) [Malawi]. Guidelines for Evidence Use in Policy-Making. Lilongwe, Malawi; 2016. [https://www.afiddep.org/?wpfb\\_dl=173](https://www.afiddep.org/?wpfb_dl=173).

18. UN Every Woman Every Child. UN Commission on Life-Saving Commodities for Women and Children: Commissioners' Report 2012. New York, USA; 2012. [https://www.unicef.org/media/files/UN\\_Commission\\_Report\\_September\\_2012\\_Final.pdf](https://www.unicef.org/media/files/UN_Commission_Report_September_2012_Final.pdf).

19. Ministry of Health (MoH) [Malawi]. Malawi Standard Treatment Guidelines (MSTG) 5th Edition 2015. Incorporating Malawi Essential Medicines List (MEML) 2015. Lilongwe, Malawi; 2015. <http://apps.who.int/medicinedocs/documents/s23103en/s23103en.pdf>.

20. Pronyk PM, Nemsler B, Maliqi B, The UN Commission on Life Saving Commodities 3 years on: Global progress update and results of a multicountry assessment. *Lancet Glob Heal*. 2016;4(4):e276-e286. doi:10.1016/S2214-109X(16)00046-2.

21. Vondal P. USAID Performance Monitoring and Evaluation TIPS: Rapid Appraisal Methods. Washington, D.C.; 2010. [http://pdf.usaid.gov/pdf\\_docs/Pnadw105.pdf](http://pdf.usaid.gov/pdf_docs/Pnadw105.pdf).

22. Zembe-Mkabile WZ, Jackson D, Sanders D, The "community" in community case management of childhood illnesses in Malawi. *Glob Health Action*. 2016;9(1):1-9. doi:10.3402/gha.v9.29177.

23. Gale NK, Heath G, Cameron E, Rashid S, Redwood S. Using the framework method for the analysis of qualitative data in multi-disciplinary health research. *BMC Med Res Methodol*. 2013;13:117. doi:10.1186/1471-2288-13-117.

24. Pope C, Ziebland S, Mays N. Qualitative research in health care Analysing qualitative data. *BMJ*. 2000;320(January):114-116. doi:10.1136/bmj.320.7227.114.

25. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today*. 2004;24(2):105-112. doi:10.1016/j.nedt.2003.10.001.

26. Ritchie J, Lewis J. Qualitative Research Practice: A Guide for Social Science Students and Researchers. London: Sage Publications; 2003. doi:10.4135/9781452230108.

27. Ochalek JM, Claxton CP, Revill P, Sculpher MJ, Rollinger A. Supporting the Development of an Essential Health Package: Principles and Initial Assessment for Malawi. York, UK; 2016. [https://pure.york.ac.uk/portal/en/publications/supporting-the-development-of-an-essential-health-package-principles-and-initial-assessment-for-malawi\(8198e8f1-e7f5-4518-9127-9a3f5630d6fd\).html](https://pure.york.ac.uk/portal/en/publications/supporting-the-development-of-an-essential-health-package-principles-and-initial-assessment-for-malawi(8198e8f1-e7f5-4518-9127-9a3f5630d6fd).html).

28. Ministry of Health (MoH) [Malawi]. Malawi Health Sector Strategic Plan 2011-2016. Lilongwe, Malawi; 2012. [http://www.nationalplanningcycles.org/sites/default/files/country\\_docs/Malawi2\\_malawi\\_hssp\\_2011\\_2016\\_final\\_document\\_1.pdf](http://www.nationalplanningcycles.org/sites/default/files/country_docs/Malawi2_malawi_hssp_2011_2016_final_document_1.pdf).

29. UNICEF. Formative Evaluation of UNICEF's Monitoring Results for Equity System (MoRES). MoRES From Evidence to Equity? New York, USA; 2014. [https://www.unicef.org/evaldatabase/files/2120-UNICEF-MoRES\\_pubs-Main.pdf](https://www.unicef.org/evaldatabase/files/2120-UNICEF-MoRES_pubs-Main.pdf).

30. International Health Partnership (IHP). Uganda: Strengthening Monitoring and Evaluation Practices in the Context of Scaling-up the

IHP+ Compact and Country Health Systems Surveillance. Geneva, Switzerland; 2014. [https://www.uhc2030.org/fileadmin/uploads/ihp/Documents/Country\\_Pages/Uganda/Uganda\\_strengthening\\_M%2526E2011\\_report\\_final.pdf](https://www.uhc2030.org/fileadmin/uploads/ihp/Documents/Country_Pages/Uganda/Uganda_strengthening_M%2526E2011_report_final.pdf).

31. International Health Partnership (IHP). Joint Assessment of Rwanda ' S Third Health Sector Strategic Plan ( HSSP III ). Geneva, Switzerland; 2012. [https://www.uhc2030.org/fileadmin/uploads/ihp/Documents/Country\\_Pages/Rwanda/Joint\\_Assessment\\_of\\_Rwanda\\_HSSP\\_III\\_Jun2012.pdf](https://www.uhc2030.org/fileadmin/uploads/ihp/Documents/Country_Pages/Rwanda/Joint_Assessment_of_Rwanda_HSSP_III_Jun2012.pdf).

32. Paul E. Benin Case Study: Documenting the Results of Implementing Aid Effectiveness Principles in the Health Sector. Geneva, Switzerland; 2011. [https://www.uhc2030.org/fileadmin/uploads/ihp/Documents/Country\\_Pages/Benin/benin\\_case\\_study\\_October\\_2011.pdf](https://www.uhc2030.org/fileadmin/uploads/ihp/Documents/Country_Pages/Benin/benin_case_study_October_2011.pdf).

33. Chaulagai CN, Moyo CM, Koot J, Design and implementation of a health management information system in Malawi: Issues, innovations and results. *Health Policy Plan*. 2005;20(6):375-384. doi:10.1093/heapol/czi044.

34. Nicol E, Bradshaw D, Uwimana-Nicol J, Dudley L. Perceptions about data-informed decisions: An assessment of information-use in high HIV-prevalence settings in South Africa. *BMC Health Serv Res*. 2017;17(Suppl 2). doi:10.1186/s12913-017-2641-1.

35. Mutale W, Chintu N, Amoroso C, Improving health information systems for decision making across five sub-Saharan African countries: Implementation strategies from the African Health Initiative. *BMC Health Serv Res*. 2013;13(SUPPL.2):S9. doi:10.1186/1472-6963-13-S2-S9.

36. Chilundo B, Sundby J, Aanestad M. Analysing the quality of routine malaria data in Mozambique. *Malar J*. 2004;3:1-11. doi:10.1186/1475-2875-3-1.

37. Piette JD, Lun KC, Moura LA, Impacts of e-health on the outcomes of care in low- and middle-income countries: Where do we go from here? *Bull World Health Organ*. 2012;90(5):365-372. doi:10.2471/BLT.11.099069.

38. Harrison T, Nutley T. A Review of Constraints to Using Data for Decision Making: Recommendations to Inform the Design of Interventions. Chapel Hill, NC; 2010. <https://www.measureevaluation.org/resources/publications/tr-10-77>.

39. Nutley T, Reynolds HW. Improving the use of health data for health system strengthening. *Glob Health Action*. 2013;6(1):1-10. doi:10.3402/gha.v6i0.20001.

40. Bosch-Capblanch X, Ronveaux O, Doyle V, Remedios V, Bchir A. Accuracy and quality of immunization information systems in forty-one low income countries. *Trop Med Int Heal*. 2009;14(1):2-10. doi:10.1111/j.1365-3156.2008.02181.x.

41. Braa J, Heywood A, Sahay S. Improving quality and use of data through data-use workshops: Zanzibar, United Republic of Tanzania. *Bull WHO*. 2012;90(5):379-384. doi:10.2471/BLT.11.099580.

42. Foreit K, Moreland S LA. Data Demand and Information Use in the Health Sector: Conceptual Framework. Chapel Hill, NC, USA; 2006. <https://www.measureevaluation.org/resources/publications/ms-06-16a>.

43. Hotchkiss D, Diana M, Foreit K. How Can Routine Health Information System Improve Health System Function in Low-Resource Setting: Assessing the Evidence Base. Chapel Hill, NC; 2012. <https://www.measureevaluation.org/resources/publications/sr-11-65>.

44. Smith T. Achieving a Unified System for Monitoring and Evaluation of the Health Sector in Malawi.; 2015. [https://www.healthdatacollaborative.org/fileadmin/uploads/hdc/Documents/Country\\_documents/Achieving\\_Unified\\_ME\\_System\\_Malawi\\_01April2016\\_GF\\_Smith.pdf](https://www.healthdatacollaborative.org/fileadmin/uploads/hdc/Documents/Country_documents/Achieving_Unified_ME_System_Malawi_01April2016_GF_Smith.pdf).

45. Vital Wave. Data Use Partnership: Malawi - Final Report (Unpublished). Palo Alto, CA, USA; 2016.

46. Health Data Collaborative. Health Data Collaborative (HDC): Progress Report 2016-2017.; 2017. doi:10.1371/journal.pone.0079777.

47. Vital Wave. Improving Data Use in Sub-Saharan Africa. Palo Alto, CA, USA; 2015. <http://vitalwave.com/wp-content/uploads/2017/10/Data-Use-Partnership-Case-Study.pdf>.

48. Development Gateway. Results Data Initiative: Findings from Tanzania. Washington, D.C., USA; 2016. <http://www.developmentgateway.org/assets/post-resources/RDI-Tanzania.pdf>.

49. USAID/MEASURE. Easing the Data Collection Burden on Healthcare Providers by Strengthening Health Information Systems. Chapel Hill, NC; 2017. [https://www.measureevaluation.org/resources/publications/tr-17-211\\_en](https://www.measureevaluation.org/resources/publications/tr-17-211_en).

50. Health Metrics Network. Framework and Standards for Country Health Information Systems. Vol 2nd Editio. Geneva, Switzerland; 2008. doi:10.4018/978-1-60566-988-5.

51. Aqil A, Lippeveld T, Hozumi D. PRISM framework: A paradigm shift for designing, strengthening and evaluating routine health information systems. *Health Policy Plan*. 2009;24(3):217-228. doi:10.1093/heapol/czp010.

52. Ledikwe J, Grignon J, Lebelonyane R, Improving the quality of health information: a qualitative assessment of data management and reporting systems in Botswana. *Heal Res Policy Syst*. 2014;12:7. doi:10.1186/1478-4505-12-7.

53. MEASURE Evaluation. PRISM Case Studies : Strengthening and Evaluating RHIS. Chapel Hill, NC, USA; 2008. PRISM case studies. Strengthening and evaluating RHIS.

54. World Bank Group (WBG), US Agency for International Development (USAID), World Health Organization (WHO). The Roadmap for Health Measurement and Accountability.; 2015. [http://www.who.int/hrh/documents/roadmap4health\\_measurent\\_account/en/](http://www.who.int/hrh/documents/roadmap4health_measurent_account/en/).

55. World Bank Group (WBG), US Agency for International Development (USAID), World Health Organization (WHO). Health Measurement and Accountability Post 2015 : Five-Point Call to Action.; 2015. [https://live.worldbank.org/sites/default/files/call\\_to\\_action\\_6-4-15\\_web.pdf](https://live.worldbank.org/sites/default/files/call_to_action_6-4-15_web.pdf).

56. Gullo S, Galavotti C, Altman L. A review of CARE's Community Score Card experience and evidence. *Health Policy Plan*. 2016;31(10):1467-1478. doi:10.1093/heapol/czw064.

57. ALMA 2030. RMNCH Country Scorecard Management Tool Workshops: October 2013. New York, USA; 2013. [http://alma2030.org/sites/default/files/initiatives/rmnch\\_workshop\\_summary\\_](http://alma2030.org/sites/default/files/initiatives/rmnch_workshop_summary_)

october\_2013.pdf.

58. Manthalu G. District Health Performance Improvement Evaluation Report. Lilongwe, Malawi; 2016. [https://www.unicef.org/evaldatabase/files/Evaluation\\_of\\_District\\_Health\\_Performance\\_Improvement\\_DHPI\\_Malawi\\_2016-003.pdf](https://www.unicef.org/evaldatabase/files/Evaluation_of_District_Health_Performance_Improvement_DHPI_Malawi_2016-003.pdf).

59. Lorenzi NM, Riley RT. Managing Change: An Overview. *J Am Med Informatics Assoc*. 2000;7(2):116-124. doi:10.1136/jamia.2000.0070116.

60. WHO. Quality, Equity, Dignity (QED): A Network for Improving Quality of Care for Maternal, Newborn and Child Health: Monitoring Framework. Geneva, Switzerland; 2017. [http://www.who.int/maternal\\_child\\_adolescent/topics/quality-of-care/quality-of-care-brief-m-e.pdf?ua=1](http://www.who.int/maternal_child_adolescent/topics/quality-of-care/quality-of-care-brief-m-e.pdf?ua=1).

61. Tunçalp Ö, Were W, MacLennan C, et al. Quality of care for pregnant women and newborns-the WHO vision. *BJOG An Int J Obstet Gynaecol*. 2015;1045-1049. doi:10.1111/1471-0528.13451.

62. Green C, de Kock L. How To Guide for Quality Improvement. Johannesburg, South Africa; 2016. <https://www.auruminstitute.org/index.php/media-centre-main/resource-centre/download/11-quality-improvement/59-guide-for-quality-improvement>.

63. Rodríguez DC, Hoe C, Dale EM, et al. Assessing the capacity of ministries of health to use research in decision-making: Conceptual framework and tool. *Heal Res Policy Syst*. 2017;15(1):1-13. doi:10.1186/s12961-017-0227-3.

64. Clinton Health Access Initiative. Case Study: Improving efficiency and effectiveness of HIV spending through resource mapping in Malawi. 2015. <https://clintonhealthaccess.org/case-study-hf-malawi/>.

65. Bhutta ZA. Using life saving commodities to save lives globally. *Lancet Glob Heal*. 2016;4(4):e221-e222. doi:10.1016/S2214-109X(16)00062-0.

66. Althabe F, Belizán JM, McClure EM, et al. A population-based, multifaceted strategy to implement antenatal corticosteroid treatment versus standard care for the reduction of neonatal mortality due to preterm birth in low-income and middle-income countries: The ACT cluster-randomised trial. *Lancet*. 2015;385(9968):629-639. doi:10.1016/S0140-6736(14)61651-2.