Progress towards the UN Commission on Life Saving Commodities recommendations after five years: a longitudinal assessment

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Background
In 2012, the UN Commission on Life Saving Commodities (UNCoLSC) articulated a series of recommendations to expand access to 13 life-saving reproductive, maternal, newborn and child health (RMNCH) commodities with the greatest potential to reduce preventable deaths. We conducted a five-year longitudinal assessment of progress towards achieving these recommendations among countries in sub-Saharan Africa and Southeast Asia.

Methods
Between 2013 and 2017, national reviews were undertaken at two time points among 14 countries with a high burden of preventable maternal-child deaths who were receiving support from a multi-UN agency RMNCH technical support and financing mechanism. Data were drawn from national health documentation (e.g. strategic plans, policies, guidelines); logistics management information systems; national household and health facility surveys; and interviews with governments and development partners.

Results
Over time, the percent of health facilities with stock availability showed a statistically significant increase of four percentage points from 69% to 73% (median). Recent training at health facility also displayed a significant increase of eight percentage points from 38% to 46% (median). National RMNCH coordination mechanisms, treatment guidelines, and national training curricula and job-aids were near fully redressed. However, countries continue to face persistent supply chain challenges including national stock-outs, tracking commodities throughout the supply chain, and strengthening medicine control laboratories.

Conclusions
While substantial progress has been made in improving access to life-saving commodities, including stock availability and workforce training at health facilities, additional efforts are required to improve regulatory efficiency, enhance commodity quality and safety, and reduce supply chain fragmentation.

INTRODUCTION
Over the past two decades, substantial declines in maternal, newborn and child mortality have been observed among least developed countries. However, preventable deaths take place far too commonly with maternal deaths underpinned by pregnancy-induced hypertension, post-partum bleeding and infection; newborn deaths linked to preterm birth complications, intrapartum events, and infection (sepsis / meningitis); and child mortality led by pneumonia and diarrhea incidence. Despite improved access to healthcare, the quality of these services often remains sub-
13 Life-saving Commodities

**Reproductive health**
- Female Condom (contraceptive)
- Implants (contraceptive: long-term)
- Emergency contraceptives (contraceptive)

**Maternal health**
- Oxytocin (post-partum hemorrhage)
- Misoprostol (post-partum hemorrhage)
- Magnesium Sulfate ( eclampsia, pre-eclampsia)

**Newborn health**
- Injectable Antibiotics (bacterial infection, sepsis)
- Antenatal Corticosteroids (pre-term respiratory distress syndrome)
- Chlorhexidine (newborn cord care)
- Resuscitation equipment (newborn asphyxia)

**Child health**
- Amoxicillin (pneumonia)
- Oral Rehydration Salts (ORS) (diarrhea)
- Zinc (diarrhea)

**Ten Recommendations**
1. Shaping global markets
2. Shaping local delivery markets
3. Innovative financing
4. Quality strengthening
5. Regulatory efficiency
6. Supply and awareness
7. Demand and utilization
8. Reaching women and children
9. Performance and accountability
10. Product innovation

Figure 1: UNCoLSC Recommendations to improve access to 13 Life-Saving Commodities (and primary condition)

**METHODS**

To assess the baseline status and progress towards the UNCoLSC recommendations, an RMNCH situation analysis was conducted in countries receiving support from the RMNCH Fund. This analysis included a synthesis of existing data sources including governmental and partner documents (e.g. national strategic plans, essential medicines lists, treatment guidelines, regulator and policy briefs, commodity registers, training curricula), and aggregated quantitative measures from various sources (e.g. health facility assessments, health and logistics management information systems). These data sources were complemented by semi-structured interviews with government officials, programme managers, regulatory and supply chain agencies and in-country partners. The situation analysis and performance indicators (Tables 1 and 2) were designed in consultation with the UNCoLSC technical resource teams (TRTs), a network of approximately 450 experts across 85 organizations, as well as the UNCoLSC Monitoring and Evaluation Advisory Group.12

Within each country, the situation analysis was typically completed over a 2-4 weeks by a trained facilitator, who collaborated with local ministries, UN country teams and in-country partners. These efforts were supported by a multi-UN agency Strategy and Coordination Team (SCT), which

ed additional support to address global barriers and facilitate country implementation.

The aim of this paper is to examine country-level progress against the UNCoLSC recommendations over a five-year period. The specific objectives are to profile availability and access to the 13 commodities and the status of key health systems enablers among high-burden countries; to document specific areas of progress and remaining bottlenecks; and to generate learning to inform the Sustainable Development Goal framework and Universal Health Coverage (UHC) agendas.

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facilitated engagement with in-country partners, trained enumerators, coordinated content review, and performed standardized analysis to provide consistency of results across countries and over time. The SCT conducted quality assurance on each country assessment and reviewed the results, data sources, and list of experts interviewed with country teams to ensure accuracy and completeness. While national ministries had discretion over the timing of data collection, this study includes countries where a baseline round of data collection was conducted within one year of program initiation (2014-2015; see Online Supplementary Document Table A) and where a repeat round took place during 2016 or 2017. Results from country assessments were entered into a relational database (MS Access, Microsoft Inc, Seattle, WA, USA), processed using R software (R version 3.2.0, Vienna, Austria), and uploaded to a web-based platform and documented in summary reports for review by country teams. Detailed methods and initial results were previously published. All statistical analyses with estimates were conducted in STATA software version 14 (College Station, TX, USA).

QUANTITATIVE INDICATORS

Quantitative indicators derived from nationally-representative population- and facility-based surveys are defined in Table 1. To assess change-over-time, indicators from the most recent available survey (i.e. endline) were compared to an earlier data collection (defined as since 2010 and prior to RMNCH Fund initial implementation within each respective country). Selection of data pairs (baseline and endline data points) prioritized comparable indicator generation methods and recency of collection. If data prior to RMNCH Fund implementation was unavailable, then the earliest data source after implementation was used to illustrate trends. In order to identify all available population- and facility-based survey data sources, the SCT consulted with country teams, global UN agencies and development partners to ensure dataset completeness. Results from population- and facility-based surveys were included if available by June 2019. For quantitative indicators, non-parametric paired t-tests were used, due to skewness, to assess statistical significance between baseline and endline distributions.

CATEGORICAL INDICATORS

A range of categorical indicators for assessing well-known in-country health system and commodity-specific bottlenecks were defined through consultation with a global network of technical experts (Table 2). A standardized assessment criteria was developed (see Online Supplementary Document Table H) and dichotomous conditions to meet the minimum performance threshold were defined in Table 2 to ensure comparability across countries. These categorical indicators were collected during the country-specific situation analysis with baseline and endline time periods listed in Online Supplementary Document Table A. Indicators related to health systems are reported once per country, while commodity-specific indicators are reported once per commodity per country (i.e. up to 15 times per country). To evaluate statistical significant for categorical indicators, paired t-tests were used between average baseline and endline values.

RESULTS

Between January 2013 to December 2017, 14 countries in sub-Saharan Africa and Southeast Asia underwent two assessment rounds including Bangladesh, Benin, Burkina Faso, Cameroon, Democratic Republic of the Congo (DRC), Ethiopia, Malawi, Mali, Nigeria, Pakistan, Senegal, Sierra Leone, Tanzania and Zambia (see Online Supplementary Document Table A for complete list and timeline of data sources).

COMMODITY AVAILABILITY AND LOGISTICS MANAGEMENT

Analysis of stock availability – defined as commodity physically available at health facility at time of assessment – is profiled in Table 1 and disaggregated by commodity in Figure 2. Collectively, there was a statistically significant increase of four percentage points in stock availability of life-saving commodities over the observation period (69% to 75%, P<0.001, Table 1). Commodities with the largest improvement included Magnesium Sulfate (24 percentage point increase), Misoprostol (+17 pp) and injectable antibiotics for newborns (+11 pp). Notably, Misoprostol and Magnesium Sulfate had among the lowest baseline availability and thus greatest room for improvement. At most recent assessment, injectable antibiotics, oxytocin and implantable contraceptives were the most widely available (Figure 2). Conversely, a number of reproductive and child health commodities had declined in availability including female condoms (-9 pp), emergency contraceptives (-2 pp), and amoxicillin (-12 pp). In nearly half of facilities, Misoprostol, Chlorhexidine, and neonatal resuscitation equipment were unavailable at the most recent facility assessment.

Stock-outs at national warehouses occurred more often over time (Table 2) and were most prevalent at the most recent assessment for magnesium sulfate, chlorhexidine, and zinc (see Online Supplementary Document Table B). Conversely, female condom, contraceptive implants, and injectable antibiotics for newborns had the fewest national stock-outs by 2017. Across countries, only a handful of commodities (7%) were added into eLMIS to track distribution from central warehouses to service delivery points (Table 2). By 2017, just over half (57%) of life-saving commodity were tracked in eLMIS across countries (Table 2), while comprehensive monitoring platforms exist in less than half of countries.

HEALTH WORKER PERFORMANCE

Over the observation period, health facilities with a recently trained staff member rose by eight percentage points (P<0.005) to 46% (Table 1). In addition, availability of job-aids and/or checklists at health facilities increased to 66% (+15 pp). Moreover, to support workforce performance, 12% and 19% of life-saving commodities were added to national training curricula and job aids, respectively, across countries (Table 2).

REGULATORY EFFICIENCY AND QUALITY STRENGTHENING

Regulatory efficiency indicators were the strongest performers over time (Table 2). For example, across countries, an additional 20% of the life-saving commodities were collectively added to national essential medicines lists in the preferred formulation, 11% of commodities were incorporated into national treatment guidelines, and another 12% of commodities were fully registered in-country (each P<0.005). Collectively, regulatory indicators also had the fewest outstanding gaps by 2017.

In this study, countries strengthened the sampling and quality testing of drugs (i.e. post-market surveillance) and nearly all countries procured drugs from good manufacturing practice (GMP) accredited manufacturers (Table 2).
Table 1: Median percentage change over time for quantitative UNCoLSC indicators derived from health facility and population-based surveys - cumulative across 14 countries and commodities

| UNCoLSC RECOMMENDATION | Indicator and Definition to meet minimum threshold | n     | Baseline Median % (95% CI) | Endline Median % (95% CI) | Change Median | P-value |
|-------------------------|--------------------------------------------------|-------|-----------------------------|----------------------------|--------------|---------|
| Supply and Awareness    | Percentage of facilities with stock available: % of health facilities with no commodity stock-out at time of assessment (for facilities authorized to provide the commodity) | 113   | 69.0 (61.0-76.9)            | 73.0 (68.1-77.9)           | ▲ 4.0        | 0.001 **|
| Performance and accountability | Percentage of facilities with recent training: % of health facilities with a health worker trained in service delivery within the past 12 or 24 months [1,2] | 31    | 38.0 (28.7-47.3)           | 46.0 (30.5-61.5)           | ▲ 8.0        | 0.003 **|
|                         | Percentage of facility with job aids or check lists: % of health facilities where relevant job aids / check lists exist at the time of assessment [1] | 18    | 53.3 (39.7-66.9)           | 66.1 (56.6-75.5)           | ▲ 12.8       | 0.071   |
| Demand & Utilization    | Population coverage rate: % of affected population with specified medical condition receiving treatment with appropriate life-saving commodity | 32    | 8.6 (3.7-20.9)             | 19.5 (10.4-28.5)           | ▲ 10.9       | 0.106   |

P-value: ** P-value < 0.01 * P-value < 0.05
Notes:[1] Reported by the four service delivery areas (reproductive, maternal, newborn or child).
[2] Recent training defined as during 12 or 24 months preceding assessment depending on data source. SARA and SPA is 24 months while all other sources, such as SDP, recent training defined as ‘during 12 months preceding assessment’.

Unfortunately, the capacity of national control laboratories has declined over time and patient safety monitoring remains low.

GENERATING DEMAND AND REACHING WOMEN AND CHILDREN

In this study, modest gains were made in establishing national demand generation and behavior change plans for life-saving commodities that included domestic budget allocations (Table 2). During the observation period, small improvements were seen for removing financial access barriers (i.e. user fees); however, gaps still exist in approximately half of service delivery areas across countries (Table 2). Where data were available, coverage rates (i.e. percent of affected population receiving appropriate treatment) increased two-fold over the observation period (P=.106), but remains low for many commodities (Table 1), such as ORS (median 37%), Zinc (22%), and contraceptive implants (5%) (Online Supplementary Document Figure F).

OTHER HEALTH SYSTEM ENABLERS

Over time, results-based financing programs were more prevalent and all 14 countries had RMNCH coordinating mechanisms by 2017 (Table 2). However, countries struggled to finalize national costed RMNCH plans with secured domestic budget allocation as well as develop commodity security strategies.
Figure 2: Median percentage of health facilities with stock availability at time of assessment by commodity across countries (number of countries with available survey result)

* In facility assessments, neonatal resuscitation is typically reported as availability of neonatal resuscitation "bag and mask".

| Commodity                        | Minimum (left) | Maximum (right) |
|---------------------------------|----------------|-----------------|
| Reproductive                    |                |                 |
| Female Condom (8)               | 0%             | 84%             |
| Implant (9)                     | 73%            | 95%             |
| Emergency contraceptives (7)    | 73%            | 95%             |
| Maternal                        |                |                 |
| Mifepristol (12)                | 28%            | 92%             |
| Misoprostol (12)                | 64%            | 92%             |
| Magnesium Sulfate (12)          | 53%            | 92%             |
| Newborn                          |                |                 |
| Injectable antibiotics (12)     | 28%            | 89%             |
| Neosporin (10)                  | 55%            | 89%             |
| Chlorhexidine (3)               | 37%            | 89%             |
| Neosporin (3)                   | 46%            | 89%             |
| Neonatal Resuscitation * (7)    | 55%            | 89%             |
| Child                            |                |                 |
| Amoxicillin (7)                 | 55%            | 81%             |
| ORS (7)                         | 69%            | 79%             |
| Zinc (7)                        | 66%            | 83%             |
| Overall Median (113)            | 69.0%          | 73.0%           |

Change Over Time:

- -11% for Female Condom (8)
- -2% for Implant (9)
- 3% for Misoprostol (12)
- 24% for Magnesium Sulfate (12)
- 11% for Injectable antibiotics (12)
- 3% for Neosporin (10)
- 9% for Chlorhexidine (3)
- 9% for Neosporin (3)
- -12% for Amoxicillin (7)
- 4% for ORS (7)
- 4% for Zinc (7)
- 4% for Overall Median (113)

* Minimum (left) and Maximum (right) values reported by a country for the commodity.
| UNCoLSC Recommendation | Indicator and Definition to meet minimum threshold | n   | Baseline (2013-16) Mean | Endline (2016-17) Mean | Change | P-value |
|-------------------------|----------------------------------------------------|-----|------------------------|------------------------|--------|---------|
| Regulatory Efficiency   | National Essential Medicines List: Commodity is included in the national EML with a context-appropriate level of commodity specification and/or formulation | 168 | 71%                    | 91%                    | ▲ 20   | < 0.001 ** |
|                         | National treatment guidelines: National treatment guidelines on interventions to deliver commodities exist, are updated regularly, & refer to latest WHO guidance | 182 | 76%                    | 87%                    | ▲ 11   | 0.001 ** |
|                         | Registered in-country: The commodity is fully registered in-country under approved & relevant formulations | 135 | 64%                    | 76%                    | ▲ 12   | 0.004 ** |
|                         | Prescription authority: The commodity is prescribed at lowest appropriate level of service delivery (per national policy and essential intervention package) | 179 | 77%                    | 89%                    | ▲ 12   | 0.001 ** |
| Quality Strengthening   | GMP-accredited manufacturers: Public sector procurement is done only from manufacturers with a valid GMP accreditation for domestic & international purchases | 14  | 86%                    | 86%                    | 0      | 1.000   |
|                         | National medicines control laboratory: At least one national medicines control laboratory exists in-country that is certified by any standards accreditation agency | 14  | 36%                    | 29%                    | ▼ -7   | 0.336   |
|                         | Monitoring quality of medicines: Functioning systems exist for monitoring quality of medicines (i.e. post-market surveillance). | 14  | 43%                    | 64%                    | ▲ 21   | 0.040 * |
|                         | Monitoring patient safety for medicines: Functioning systems exist for monitoring patient safety for medicines (i.e. pharmacovigilance). | 14  | 43%                    | 50%                    | ▲ 7    | 0.583   |
| Supply and Awareness    | Forecasting Tools: Existence of a forecasting tool or method used routinely for forecasting needs for RMNCH medicines and medical devices | 14  | 64%                    | 64%                    | 0      | 1.000   |
|                         | Supply chain training to districts: Training in supply chain management for RMNCH commodities has been deployed to all SDPs at the district level | 14  | 50%                    | 57%                    | ▲ 7    | 0.336   |
|                         | Comprehensive national eLMIS: There is a single electronic national LMIS or an interoperable platform that tracks commodity availability and distribution from first point of warehousing to point of service for each RMNCH service area AND automatically compiles/ aggregates data on a continuous basis | 14  | 7%                     | 29%                    | ▲ 21   | 0.189   |
|                         | Tracked in eLMIS: Commodity availability is tracked from first point of warehousing to service delivery point by an electronic LMIS | 171 | 50%                    | 57%                    | ▲ 7    | 0.134   |
|                         | National stock-outs: No commodity stock-outs at the national level in the past 12 months (for EML commodities) | 128 | 64%                    | 59%                    | ▼ -5   | 0.291   |
| Performance and accountability | Training curricula (national): In-service training curricula exist at the national level for interventions that deliver the commodity at the appropriate level of care | 182 | 73%                    | 85%                    | ▲ 12   | 0.001 ** |
|                         | Job aids or check lists (national): National level job aids have been developed or updated, include the specific commodity, are clearly written & refer to WHO version | 182 | 68%                    | 86%                    | ▲ 19   | < 0.001 ** |
| Reaching Women and Children | Policy against user fees: National policy states that patients should not be assessed any fee or out of pocket expense for the LSCs and related services at the point of service delivery [2] | 56  | 46%                    | 52%                    | ▲ 5    | 0.370   |
| Demand & Utilization    | Demand Generation: National RMNCH plan includes costed demand generation/behavior change communication activities with a budget allocated | 14  | 71%                    | 79%                    | ▲ 7    | 0.336   |
| Innovative financing    | Results-based financing mechanism: The country entered into an agreement with a results-based financing mechanism to increase access to LSCS and related services | 14  | 21%                    | 43%                    | ▲ 21   | 0.189   |
| RMNCH Coordination [1]   | Coordination mechanism exists: A functional national coordination mechanism on RMNCH exists (or RMNCH is included in broader coordination mechanism) | 14  | 64%                    | 100%                   | ▲ 36   | 0.019 * |
|                         | RMNCH plan costed and budgeted: A national RMNCH plan exists that is costed with a budget allocated for interventions for LSCs at national and sub-national levels | 14  | 57%                    | 50%                    | ▼ -7   | 0.720   |
## UNCoLSC Recommendation (2013-16)

| Indicator and Definition to meet minimum threshold | n  | Baseline (2013-16) Mean | Endline (2016-17) Mean | Change | P-value |
|----------------------------------------------------|----|-------------------------|------------------------|--------|---------|
| Commodity security strategy: National commodity security strategy for LSCs have been developed and approved by the Ministry of Health | 14 | 43%                     | 36%                    | ▼ -7   | 0.336   |
| Total (average):                                   | 1,551 | 65%                   | 76%                    | 11%    |         |

P-value: ** P-value < 0.01 * P-value < 0.05

Notes: [1] RMNCH Coordination is a performance indicator but not a UNCoLSC recommendation
[2] Policy against user fees is reported by the four service delivery areas (reproductive, maternal, newborn or child).
DISCUSSION

This study assessed the ambitious UNCoLSC recommendations to improve availability and access to 13 life-saving commodities among countries in Africa and Asia with among the highest global burden of preventable maternal child deaths. Service readiness, including availability of commodities, improves the likelihood of receiving good quality services. Over the observation period, commodities were collectively more available; however, some commodities fared better than others (Figure 2). Commodities to reduce maternal deaths, treat newborn infection, and long acting methods for pregnancy prevention became more widely available. Scale-up of contraceptive implants have been a concerted focus of recent international and domestic efforts, while the low cost and long regulatory history of oxytocin and injectable antibiotics, such as gentamicin, facilitate efficient delivery through the supply chain. Conversely, access to misoprostol, chlorhexidine, antenatal corticosteroids and newborn resuscitation equipment still hovers around half of health facilities. Emerging science on the effective use of Chlorhexidine and antenatal corticosteroids produced operational re-examination, clouded guidance and limited scale-up. While the administration of misoprostol to prevent and treat post-partum hemorrhage is expanding to home-births, it can also be used to induce abortion, which can limit cultural adoption and the need for local stock availability.

Maintenance of national stock levels for essential commodities declined over the observation period and requires urgent attention. Increasing the use of centralized procurement through partners, such as family planning commodities, is cost-effective and efficient, but needs complementary in-country coordination. Often the discordance of national budget and cash flow cycles impedes the efficient bulk purchase of commodities by national governments. Innovative bridge funding mechanisms or working capital facilities (with prompt payback terms) to support local procurement through established systems could reduce stockouts and save money. Once procured, ensuring efficient, timely and equitable distribution of commodities within country relies on electronic logistics management information systems (eLMIS). In-country supply chains are often fragmented across multiple partners along with the corresponding eLMIS, which limits performance and timely corrective action. The Health Data Collaborative (HDC) has sought to support the harmonization and more efficient use of information systems. Expanding the domain of HDC or applying the same principles to complex issues such as supply chains and eLMIS is warranted to reduce fragmentation and improve efficient data use.

Inadequate workforce competencies is an underlying operational barrier to effective healthcare delivery. To further strengthen the patient-provider interface, countries in this study improved national health workforce resources (e.g. training curricula and job-aids / checklist) as well as facility-based training. Since countries trained staff at just under half of health facilities within 12 or 24 months, the ability to reach all facilities could take approximately three to five years (assuming equitable distribution). This collective training capacity should inform introduction rates for new commodity guidelines and technology in the future. Prioritized investments and improved metrics on health workforce training and guidance (e.g. job-aids) portend enhanced quality of service delivery. A new opportunity for acceleration is the Network for Improving Quality of Care (QOC) for Maternal, Newborn and Child Health, which aims to establish local quality improvement teams to identify quality shortfalls and undertake quick cycles of problem-solving for facility-driven improvement and preparedness. Unfortunately, the utilization and quality of facility-level care is clouded by the lack of coverage data for administration of life-saving interventions at health facilities. Moreover, while this study had access to the health management information systems, such as DHIS2, in most countries, the data available from these sources at time of assessment was deemed insufficient to generate a valid estimate of intervention coverage over time.

Delays in regulatory approval limit pharmaceutical companies interest in providing drugs to developing countries, which creates a market opportunity for an influx of counterfeit drugs. In this study, regulatory indicators exhibited significant improvement; however, they require regular review to ensure the latest treatment guidelines and formulations are adopted and product registration does not expire. With the rise of counterfeit drugs in circulation, countries need quality controls and monitoring of medicines to ensure the safety and effectiveness of drugs is intact when reaching women and children. Aside from post-market surveillance, there was little to no improvement in quality strengthening conditions, which have been persistent intractable bottlenecks. Several interconnected regional efforts, such as the African Medicines Regulatory Harmonization (AMRH) Initiative, continue to strengthen fragmented regulatory environments and improve the availability of safe and effective commodities.

The collective improvements against the UNCoLSC recommendations mirrored the predominance of supply side investments prioritized by country teams and financed via the RMNCH Fund (see Online Supplementary Document Figure B). More than 80% of these expenditures were allocated towards two UNCoLSC recommendations: supply and awareness (e.g. commodity procurement, integrated LMIS, and supply chain management); and health worker performance and accountability (e.g. staffing, training, supervision, job-aids / checklists). These RMNCH acceleration plans were developed by government-led RMNCH coordinating mechanisms using a resource mapping across partners, therefore, expenditures against the RMNCH Fund provide a window into national priorities and funding gaps facing governments, UN agencies and development partners (see Online Supplementary Document Table G). An example is provided below (Box 1), which outlines the experience of the United Republic of Tanzania with the RMNCH Fund. In terms of sustainability, the RMNCH Fund provided short-term catalytic funding towards the UNCoLSC agenda. This short-term funding is small relative to potential domestic allocations; however, domestic budget allocations were often unpredictable and vacillated year-to-year across countries (Table 2). This type of shorter-term gap filling to support existing country-derived strategic plans should complement new longer-term funding sources, such as the Global Financing Facility, as they are actuated and put towards the same strategic vision.

There were several limitations in this analysis that are important to draw attention to. First, gaps in data availability, such as maternal and newborn service delivery at health facilities, persist and constrained interpretation of community impacts. This study used the RMNCH Situation Analysis process, which is relatively easy and low-cost to conduct, but relies on existing data sources. The tool can be adapted for country context, such as sub-national use or expanded commodity and equipment list, but does not es-
tablish new primary quantitative datasets for analysis. Second, the identification of operational bottlenecks relies on performance thresholds defined by a panel of experts; however, during enumeration, participant input and categorization by individual enumerators may be subjective and introduce bias. Third, countries assessed that met the requirements for this study (e.g. multiple data collection rounds of the RMNCH Situation Analysis) may not represent conditions experienced in other countries or regions. Fourth, this study did not analyze global-level UNCoLSC recommendations (e.g. product innovation and market shaping), which were assessed in a previous study, but could affect progress against related in-country bottlenecks. Next, this study utilized point estimates from facility- and population-based surveys to statistically analyze trends. The raw datasets had limited availability and their analysis was beyond the scope of this study, but may generate more decisive results and worthy of future research. Finally, the timeliness and consistency of available data sources may obfuscate recent changes. For example, this study utilized health facility assessments supported by various international institutions, including UNFPA (service delivery point survey), WHO (service availability and readiness assessment), and USAID (service provision assessment). While UNFPA has by far the most frequent data collection, the WHO and USAID tools are more comprehensive. Unfortunately, the tools are not entirely compatible among agencies (such as content and methodologies) and collection schedules are uncoordinated. The inter-agency HDC has undertaken an effort to harmonize these tools and data collection schedule among partners.

CONCLUSION

Over a five-year period, significant improvements in commodity availability and health workforce training at the facility level were observed overall. Important commodity-related bottlenecks, such as coordination mechanisms, regulatory requirements, and national training curricula and job-aids, were near fully rectified. However, critical supply chain and medicine safety functions showed inconsistent improvement and remain an impediment to universal access. Leveraging the lessons learned from this unfinished UNCoLSC agenda can help in-country and global initiatives – such as the African Medicines Regulatory Harmonization, Global Financing Facility, Health Data Collaborative, and Quality of Care Network – address these remaining barriers to women and children receiving life-saving commodities and ultimately reaching universal health coverage.

Box 1. Implementation Experience: United Republic of Tanzania

The United Republic of Tanzania received two rounds of financing: US$4.0 million in early 2014; and US$11.9 million in 2015 from the RMNCH Fund. Planning of grant investments was led by the government and involved diverse stakeholders including multiple governmental agencies, UN organizations, and implementing partners.

All interventions selected for grant funding were consistent with the national 'Sharpened One Plan' as well as the Big Results Now agendas. The initial grant supported the registration of 12 Life Saving Commodities (with the exception of Chlorohexidine); roll out of information systems (eLMIS and ILS gateway) to assist supply chain management and procurement of essential commodities; and nationwide Comprehensive Emergency Obstetric and Newborn Care (CEmONC) assessment of facilities. The second round of engagement with RMNCH Fund, broadened the activities to include upgrade of eight facilities to CEmONC, 67 ambulances procured and delivered to districts, and the establishment of two blood banks to help deliver comprehensive maternal care.

To initiate the grant process, a diverse, multi-sector coordinating platform was established with regular meetings and discussions among stakeholders. This improved planning, resource allocation, and partnership between the Government and the UN agencies. The grant terms of the RMNCH Fund were flexible and allowed the Tanzanian coordinating platform autonomy to select and adjust investments in RMNCH activities as needed – starting with a life-saving commodities focus and then broadening. This enabled strategic and adaptive selection of interventions to meet national and local needs. Lastly, the timing and adaptive use of funds helped lay the foundation for future investment mechanisms, such as the Global Financing Facility (GFF).

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REFERENCES

1. UNICEF, World Health Organization, World Bank Group, UNPD. Levels & Trends in Child Mortality: Report 2017. New York, USA; 2017.

2. World Health Organization, UNICEF, UNFPA, World Bank Group. Trends in Maternal Mortality: 1990 to 2015. Geneva, Switzerland; 2015. https://www.unicef.org/eapro/MMR_executive_summary_final_mid-res.pdf.

3. Alkema L, Chou D, Hogan D, et al. Global, regional, and national levels and trends in maternal mortality between 1990 and 2015, with scenario-based projections to 2030: A systematic analysis by the. Lancet. 2016;387(10017):462-474. doi:10.1016/S0140-6736(15)00838-7.

4. Every Woman Every Child. The Global Strategy for Women’s, Children’s and Adolescents’ Health: Final Draft.; 2015.

5. World Health Organization, UNICEF. Tracking Progress towards Universal Coverage for Reproductive, Newborn and Child Health: The 2017 Report. Washington, DC; 2017. http://countdown2030.org/reports-and-publications/countdown-2017-report.

6. Liu L, Oza S, Hogan D, et al. Global, regional, and national causes of under-5 mortality in 2000-15: An updated systematic analysis with implications for the Sustainable Development Goals. The Lancet. 2016;388(10063):3027-3035. doi:10.1016/s0140-6736(16)31593-8.

7. Winter R, Yourkavitch J, Wang W, Mallick L. Assessment of health facility capacity to provide newborn care in Bangladesh, Haiti, Malawi, Senegal, and Tanzania. J Glob Health. 2017;8(1). doi:10.7189/jogh.07.020509

8. Carvajal–Aguirre L, Amouzou A, Mehra V, Ziqi M, Zaka N, Newby H. Gap between contact and content in maternal and newborn care: An analysis of data from 20 countries in sub-Saharan Africa. Journal of Global Health. 2017;7(2). doi:10.7189/jogh.07.020501

9. Boerma T, Requejo J, Victora CG, et al. Countdown to 2030: Tracking progress towards universal coverage for reproductive, maternal, newborn, and child health. The Lancet. 2018;391(10129):1538-1548. doi:10.1016/s0140-6736(18)30104-1

10. Akachi Y, Kruk ME. Quality of care: Measuring a neglected driver of improved health. Bull World Health Organ. 2017;95(6):465-472. doi:10.2471/blt.16.180190

11. 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.

12. Pronyk PM, Nemser B, Maliqi B, et al. The UN Commission on Life Saving Commodities 3 years on: Global progress update and results of a multicountry assessment. The Lancet Global Health. 2016;4(4):e276-e286. doi:10.1016/s2214-109x(16)00046-2

13. International Health Partnership. 13 International Health Partnership. A global "Compact" for achieving the Health Millennium Development Goals. 2007. http://webarchive.nationalarchives.gov.uk/+/http://www.dfid.gov.uk/news/files/ihp/compact.pdf.

14. Dickson KE, Simen-Kapeu A, Kinney MV, et al. Every Newborn: Health-systems bottlenecks and strategies to accelerate scale-up in countries. The Lancet. 2014;384(9941):438-454. doi:10.1016/s0140-6736(14)60582-1.

15. Bhutta ZA. Using life saving commodities to save lives globally. The Lancet Global Health. 2016;4(4):e221-e222. doi:10.1016/s2214-109x(16)00062-0.

16. Carvajal–Aguirre L, Mehra V, Amouzou A, et al. Does health facility service environment matter for the receipt of essential newborn care? Linking health facility and household survey data in Malawi. Journal of Global Health. 2017;7(2). doi:10.7189/jogh.07.020508

17. Kanyangarara M, Chou VB, Creanga AA, Walker N. Linking household and health facility surveys to assess obstetric service availability, readiness and coverage: Evidence from 17 low- and middle-income countries. Journal of Global Health. 2018;8(1). doi:10.7189/jogh.08.010603

18. Corsi DJ, Subramanian SV. Association between coverage of maternal and child health interventions, and under-5 mortality: A repeated cross-sectional analysis of 35 sub-Saharan African countries. Global Health Action. 2014;7(1):24765. doi:10.3402/gha.v7i1.24765

19. Duvall S, Thurston S, Weinberger M, Nuccio O, Fuchs-Montgomery N. Scaling up delivery of contraceptive implants in sub-Saharan Africa: Operational experiences of Marie Stopes International. Glob Health Sci Pract. 2014;2(1):72-92. doi:10.9745/ghsps-15-00116
20. Jacobstein R. Liftoff: The blossoming of contraceptive implant use in Africa. *Glob Health Sci Pract.* 2018;6(1):17-39. doi:10.9745/ghsp-d-17-00596

21. Management Sciences for Health, World Health Organization (WHO). *International Drug Price Indicator Guide 2014.* Medford, MA, USA; 2014.

22. PATH, USAID. *Gentamicin for Treatment of Neonatal Sepsis: A Landscape of Formulation, Packaging, and Delivery Alternatives.* Seattle; 2015. h ttps://path.azuredge.net/media/documents/DT_gentamicin_rpt.pdf.

23. 23 World Health Organization. WHO Recommendations for the Prevention and Treatment of Postpartum Haemorrhage. Geneva, Switzerland; 2012. http://www.who.int/reproductivehealth/publications/maternal_perinatal_health/9789241548502/en/.

24. Osirin D, Colbourn T. No reason to change WHO guidelines on cleansing the umbilical cord. *The Lancet Global Health.* 2016;4(11):e766-e768. doi:10.1016/s2214-109x(16)30258-3

25. 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. *The Lancet.* 2015;385(9968):629-639. doi:10.1016/s0140-6736(14)61651-2

26. Ononge S, Campbell OMR, Kaharuza F, Lewis JJ, Fielding K, Mirembe F. Effectiveness and safety of misoprostol distributed to antenatal women to prevent postpartum haemorrhage after child-births: A stepped-wedge cluster-randomized trial. *BMC Pregnancy Childbirth.* 2015;15(1). doi:10.1186/s12884-015-0750-6

27. UNFPA. UNFPA Quality Assurance Framework for the Procurement of Reproductive Health Commodities. Copenhagen, Denmark https://www.unfpa.org/sites/default/files/document/2019-09+-UNFPA-RFO+QA+Framework_low_V11.pdf/2f06239e-de34-4afa-91e0-cd86f9aca00.

28. Pan American Health Organization. *Operating Procedures of the PAHO Revolving Fund.* Washington, D.C.; 2016. http://www.paho.org/hq/index.php?option=com_content&view=article&id=736&Itemid=2234&lang=en.

29. Financing for Development Corporation (F4D). Executive Summary: Evaluation of Country-Level Constraints in Accessing Financing for the Procurement of Nationally Funded MNCH Commodities. Washington, D.C.; 2015. http://ghpro.d exonline.com/sites/default/files/AccelerationFunds_ExecSumCH_508Doc.pdf.

30. Bergum B-I, Nielson P, Sæbø JI. Patchworks of Logistics Management Information Systems: Challenges or Solutions for Developing Countries? *IFIP Adv Inf Commun Technol.* 2017;504(May):V-VI.

31. PATH. *The Case for Developing and Deploying an Open Source Electronic Logistics Management Information System.* Seattle, WA, USA; 2012. h ttps://path.azuredge.net/media/documents/TS_dhs_open_source_e_lmis.pdf.

32. Celades E, Cocoman O, Kitamura M, Wall L. *Health Data Collaborative: Progress Report 2016-18.* Geneva, Switzerland; 2018. https://www.healthdatacollaborative.org/fileadmin/uploads/hdc/Documents/HDC_Progress_Report_UPDATE_AW_071218_Web.pdf.

33. 33 Management Sciences for Health. *Toward Building Resilient Pharmaceutical Systems: SIAPS Final Report.* Arlington, VA; 2017. https://www.siapsprogram.org.

34. World Health Organization. Quality, Equity, Dignity (QED): A Network for Improving Quality of Care for Maternal, Newborn and Child Health: Monitoring Framework. Geneva, Switzerland; 2017. ht tp://www.who.int/maternal_child_adolescent/topics/q uality-of-care/quality-of-care-brief-m-e.pdf?ua=1.

35. World Health Organization. *Quality Equity Dignity: A Network to Improve Quality of Care for Mothers, Newborns and Children.* Geneva, Switzerland

36. Carvajal–Aguirre L, Vaz LM, Singh K, et al. Measuring coverage of essential maternal and newborn care interventions: An unfinished agenda. *Journal of Global Health.* 2017;7(2). doi:10.7189/jog h.07.020101

37. Madaj B, Smith H, Mathai M, Roos N, Van Den Broek N. Developing global indicators for quality of maternal and newborn care: A feasibility assessment. *Bull World Health Organ.* 2017;95(6):445-452I. doi:1 0.2471/blt.16.179531

38. Dettrick Z, Firth S, Jimenez Soto E. Do strategies to improve quality of maternal and child health care in lower and middle income countries lead to improved outcomes? A review of the evidence. *Myer L, ed. PLoS ONE.* 2015;8(12):e83070. doi:10.1371/jour nal.pone.0083070

39. Ndondondo-Sigonda M, Miot J, Naidoo S, Dodoo A, Kaale E. Medicines Regulation in Africa: Current State and Opportunities. *Pharm Med.* 2017;51(6):383-397. doi:10.1007/s40290-017-0210-x
40. Dansie LS, Odoch WD, Årdal C. Industrial perceptions of medicines regulatory harmonization in the East African Community. Riccaboni M, ed. *PLoS ONE*. 2019;14(6):e0218617. doi:10.1371/journal.pone.0218617

41. Clark F. Rise in online pharmacies sees counterfeit drugs go global. *The Lancet*. 2015;386(10001):1327-1328. doi:10.1016/s0140-6736(15)00394-3

42. Ndomondo-Sigonda M, Miot J, Naidoo S, Ambali A, Dodoo A, Mkandawire H. The African Medicines Regulatory Harmonization Initiative: Progress to Date. *MRAJ*. 2018;6(2). doi:10.18103/mra.v6i2.1668

43. Bijleveld P, Maliqi B, Pronyk P, et al. Country perspectives on integrated approaches to maternal and child health: The need for alignment and coordination. *Bull World Health Organ*. 2016;94(3):401-404. doi:10.2471/blt.15.168823

44. Nemser B. Data-informed decision-making for life-saving commodities investments in Malawi: A qualitative case study. *Mal Med J*. 2018;30(2):111. doi:10.4314/mmj.v30i2.11

45. Euro Health Group. *Evaluation of RMNCH Trust Fund Activities - Volume I: Final Evaluation Report*. Vol I. Soborg, Denmark; 2017. https://www.unicef.org/evaldatabase/files/RMNCH_Trust_Fund_evaluation_Final_Reprt_Volume_II.pdf.

46. Fernandes G, Sridhar D. World Bank and the Global Financing Facility. *BMJ*. August 2017;j3395. doi:10.1136/bmj.j3395

47. United Republic of Tanzania - Ministry of Health. *Sharpened One Plan: The National Road Map Strategic Plan to Accelerate Reduction of Maternal, Newborn and Child Deaths in Tanzania 2008-2015*. United Republic of Tanzania; 2014.

48. United Republic of Tanzania - President’s Delivery Bureau. *Big Results Now! 2013/2014 Annual Report: Tanzania Development Vison 2025*. Dar es Salaam; 2014.
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