EISSN: 2707-0425

*East African Journal of Science, Technology and Innovation, Vol. 4 (2): March 2023*



# The effect of IMPACT team approach implementation processes on health supply chain management data use in Singida region: A quantitative study

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**Abstract**

The Government of Tanzania (GoT), in collaboration with development partners, has made significant improvements in the health supply chain since 2013 through developing of an electronic Logistics Management Information System (e-LMIS) and strengthening of the Logistics Management Services (LMS) component. Nevertheless, the use of reported data in the e-LMIS remained very low. In efforts to respond to low data use at all supply chain levels, the GoT introduced the Information Mobilized for Performance Analysis and Continuous Transformation (IMPACT) approach to reinforce data use culture for decision-making to improve the supply chain. Therefore, this study aimed to determine the effect of IMPACT team approach implementation processes on health supply chain data use in Singida region. This was a pre- and post-cross-section study whereby the quantitative data were obtained from e-LMIS stock imbalance reports. This data was processed using Microsoft Excel power query and analysed using Microsoft Excel 2019 pivot tables to get indicator results on availability, not-in-demand and overstocked health commodities. The overall pre (2018) and post (2020) intervention results for both Iramba district council (DC) and Singida municipal council (MC) were 66% and 81% for the availability of essential health commodities, 17.2% and 21% for not-in-demand health commodities and 17% and 20.7% for overstocked health commodities respectively. Iramba DC demonstrated a significant statistical increase in both indicators compared to Singida MC, as the P-value was less than 0.05 at a 95% confidence level (df=35). Conclusively, the IMPACT team approach positively influenced data use and availability of health commodities. However, it was not the case for overstocked and not-in-demand indicator results. Apart from the possible low quality of logistics data, further studies should explore other contributing factors behind the increasing trends of overstocks and not-in-demand health commodities in the region.

**Keywords:** *data use; health commodities; health supply chain; IMPACT team approach; not-in-demand.*

**Cite as**: Silabi *et al.,* (2023). The effect of IMPACT team approach implementation processes on health supply chain management chain data use in Singida region: A quantitative study. *East African Journal of Science, Technology and Innovation 4(2).* http://doi.org/10.3329/bjar.v42i3.34505

Received: 15/11/2022
Accepted: 22/02/2023
Published: 29/03/2023

## Introduction

Achieving universal health coverage (UHC) is a priority global goal in almost every country worldwide, as it provides expanded access to quality health services for the general population through primary health care (Kapologwe *et al.,* 2020; Van Niekerk *et al.,* 2020). The provision of quality health services in all programs requires the existence of efficient health care supply chains to ensure the sustainable availability of essential health commodities at all points of care in each country (Clauson *et al.,* 2018; Dubois *et al.,* 2017). Essential medicines and commodities are based on the prevalence of major diseases in the population (Wirtz *et al.,* 2017) and their relevance to public health, considering the cost-effectiveness of health services or treatments. WHO regularly publishes a list of essential medicines that countries can adapt or adopt in developing standard treatment guidelines based on their clinical needs and disease burden (WHO, 2021).

Tanzania is among the member states that have adopted the WHO essential medicines list to establish their priority list, which includes 290 items that should be available at all times in all health facilities depending on the level of care (MoHCDGEC, 2013). Thus, the Tanzanian health supply chain is designed to ensure the sustained availability of priority health commodities for quality primary health care for all Tanzanians at all levels of care.

In various of its efforts to improve the availability of essential health commodities, the Government of Tanzania, in collaboration with development partners, developed the electronic Logistics Management Information System (e-LMIS) (Technical Assistance - Tanzania, 2018) to simplify reporting and requisition of shipments from the MSD, improving the visibility of logistics data while eliminating the paper-based submission of orders to the MSD (Gilbert *et al.,* 2020; Mwencha *et al.,* 2017). The Logistics Management Services component was formulated under the Pharmaceutical Services Unit (PSU) to enhance technical assistance and capacity building in various areas of health supply chain (Mwencha *et al.,* 2017).

Despite these investments, the availability of essential health commodities at points of care remained unstable (Vledder *et al.,* 2019). The information found in the country's existing information management systems, including e-LMIS was found to be inadequately used for identifying supply chain challenges, planning targeted interventions, and decision-making in general at all levels of the supply chain (Simeo *et al.,* 2022).

In 2018, the President's Office, Regional Administration and Local Government (PORALG), in collaboration with the Ministry of Health and development partners, introduced the Information Mobilized for Performance Analysis and Continuous Transformation (IMPACT) approach (Lamphere *et al.,* 2019) to reinforce a culture of data use for decision making to improve the supply chain and availability of essential health commodities (MOHCDGEC, 2021). It was further introduced in the country to transform the way supply chain managers, coordinators and different actors perform their work in the supply chain.

IMPACT is a people-centred and data driven initiative which employs quality improvement principles for health supply chain improvements. This approach is being implemented in teams which should be having several characteristics such as; a common goal, use of information management systems, leadership at national and sub-national levels, performance monitoring using data, recognition of best performance to stir up motivation, problem solving using structured approaches, action planning to track outcomes of meetings including actions to be taken by the responsible persons and team meetings which is a forum for data-driven decision making among team members (Lamphere *et al.,* 2019).

The IMPACT approach in the supply chain is based on the control tower concept used in the commercial sector and proven to improve supply chain performance. The control tower serves as a hub for data visibility across all supply chain functions and enables decision-making based on real-time data and analytics (Bhosle *et al.,* 2011). The idea is essentially for implementers at different levels of the supply chain who should select indicators for measurement, set targets to achieve, use data to track progress towards targets and address the arising challenges that impair the intended performances as per monitored indicators in the supply chain.

The concept of the control tower in the supply chain is featured with end-to-end data visibility and controls, real-time tracking of goods, access to information and data through multiple channels, data analytics, and immediate notifications and alerts on problems in the supply chain systems. The control tower concept is now gaining popularity in

public health supply chains in the form of the IMPACT team approach, which is about ensuring that the right people, technologies, and processes are aligned to deliver timely healthcare products to facilities when and where they are needed.

The IMPACT approach also serves as a foundation for data use and the culture of continuous improvement required for a responsive and customer-focused supply chain. The approach strengthens visibility and use of data, corrects consistent application of procedures in the supply chain, creates transparency and accountability, improves coordination and communication, and fosters trust and collaboration among health commodities supply chain staff, clinical and technical coordinators to identify and address supply chain challenges (MOHCDGEC, 2021). The composition of IMPACT teams at the council level is expected to comprise health professionals who are coordinating various health programs which are related to health commodities in one way another such as HIV/AIDS, TB and leprosy, Malaria, maternal and child health services, Laboratory supplies, Nutrition, essential health commodities, vaccines and health information systems coordinator (MOHCDGEC, 2021). In addition to that, the team is free to co-opt any other member from amongst council health management team members as per their needs in their daily operations.

This approach was rolled out to Singida region and its councils in January 2019, but ever since its implementation started, little is known about its influence, impact, and contribution to health supply chain data use and the availability of essential health commodities in the region. Therefore, this study was conducted in the two councils of Singida region to gain understanding and insights into the gap by analysing the indicators before and after the IMPACT team approach in the respective councils

**Materials and Methods**

***Study design***

This was a pre and post cross sectional quantitative study such that secondary data from e-LMIS reports were used to assess the councils' performance pre- and post-IMPACT team approach in the two councils of Singida region in Tanzania.

***Study area***

This study was conducted in Singida region and included two councils which were; Singida MC and Iramba DC. The Singida region and the two councils were selected for this study because it is one of the few regions where selected members of CHMTs have been trained in the IMPACT team approach to decision-making for improving health supply chain management. Following formal training, PORALG, the Ministry of Health, and implementing partners such as Global Health Supply Chain Technical Assistance Tanzania (GHSC-TA-TZ), JSI-InSupply Health, and Elizabeth Glaser Paediatric Aids Foundation (EGPAF) conducted two rounds of monitoring visits to each council over two years to assess the implementation progress. The monitoring visits to each council were accompanied by capacity building in the areas of data extraction from the e-LMIS database and other electronic systems and subsequent analysis of these data to identify problems in the supply chain and then plan for improvement strategies. These kinds of investments made Singida region suitable for this study.

***Study population***

The target population for this study were the health facilities reporting stock information data in the e-LMIS. The health facilities included in this study were of three categories; Hospitals, health centres and dispensaries in both councils.

***Sample size estimation***

The estimated sample size for this study was 576 quarterly Integrated Logistics System (ILS) stock imbalance reports were obtained from the e-LMIS database for 48 health facilities in the two councils. Each health facility reported once per quarter, resulting in a total of four quarterly reports per facility for review and analysis in one year prior to IMPACT implementation and an additional eight quarterly reports for the same health facility for two years of IMPACT team approach implementation. Therefore, a total of 192 reports were reviewed before the introduction of an IMPACT team approach in 2018, whereas, a total of 384 reports were reviewed post IMPACT team approach in the councils for 2019 and 2020. The data extracted from the e-LMIS were reviewed and analysed to determine the performance trends of the councils before and after the introduction of the IMPACT team approach.

*Table 1. Characteristics of health facilities that provided secondary data for the study*

| Demographic Variables | | Iramba DC | Singida MC | Total number of health facilities | Percent |
|---|---|---|---|---|---|
| HEALTH FACILITY | Referral regional hospital | 0 | 1 | 1 | 2.1 |
| | District Hospital | 1 | 0 | 1 | 2.1 |
| | Health centre | 4 | 1 | 5 | 10.4 |
| | Dispensary | 31 | 10 | 41 | 85.4 |

***Sampling procedure***

The ILS stock imbalance reports for all health facilities in Iramba DC and Singida MC were selected from all programs reported in the e-LMIS because it is a report of a health facility's logistics program in which all health commodities are represented in the SDPs. Therefore, this report was appropriate to capture the performance of data use in various health programs such as HIV/AIDS, malaria, laboratories, reproductive and child health, nutrition, and other essential health commodities. The quarterly ILS stock imbalance reports for all health facilities in both councils were extracted from the e-LMIS database for 2018, 2019 and 2020, which are the periods before and after the introduction of the IMPACT team in the councils. The pre-intervention period was 2018 while 2019 and 2020 were the post-intervention period in both councils.

***Inclusion criteria***

The reports selected in this study were the stock imbalance reports from e-LMIS that fall under the ILS category only. These reports were selected because they represent multiple program commodities in one report, providing a broader picture of the supply chain performance in the facilities and councils.

***Exclusion criteria***

The stock imbalance reports that fell under the laboratory and tuberculosis categories were excluded from the study because they had very low representativeness across commodity groups. In addition, e-LMIS records for new facilities that were opened to begin operations after the end of the first quarter in April 2018 were not included in the study to maintain the denominator throughout the review period from January 2018 through December 2020.

***Recruitment and training of Research assistants***

After developing data collection tools, two research assistants were identified, trained, and oriented

on the respective tools for successful data collection processes in the field.

***Data collection tools and procedures***

The quantitative data was obtained in the ILS stock imbalance by facility reports from the e-LMIS database, which were from one year before (January to December 2018) the introduction of the IMPACT team approach in the councils and two years (2019 and 2020) after the IMPACT team approach implementation in the respective councils.

***Data management and analysis***

The quantitative data from the e-LMIS database were extracted quarterly for 2018, 2019 and 2020 and then combined, cleaned, and organised using Microsoft Excel's Power Query technique to create a single 2019 Microsoft Excel workbook. After combining and cleaning the data, analysis was conducted using Microsoft Excel 2019 pivot tables to determine the performance of each indicator for each quarter and overall annual average performances. A paired t-test was used to test for the findings' significance levels at a 95% confidence interval (P = 0.05) when comparing pre- and post-IMPACT team approach results.

**Results**

***Availability of health commodities Pre and post IMPACT in Iramba DC and Singida MC***

The result presented in Figure 1 shows the overall positive trend for this indicator from 2018 to 2020, but unlike Singida MC, the percentage availability of essential health commodities for Iramba DC was significantly increasing progressively from pre to post IMPACT intervention in the council and eventually contributing more to the overall or combined availability of health commodities in 2019 and 2020.

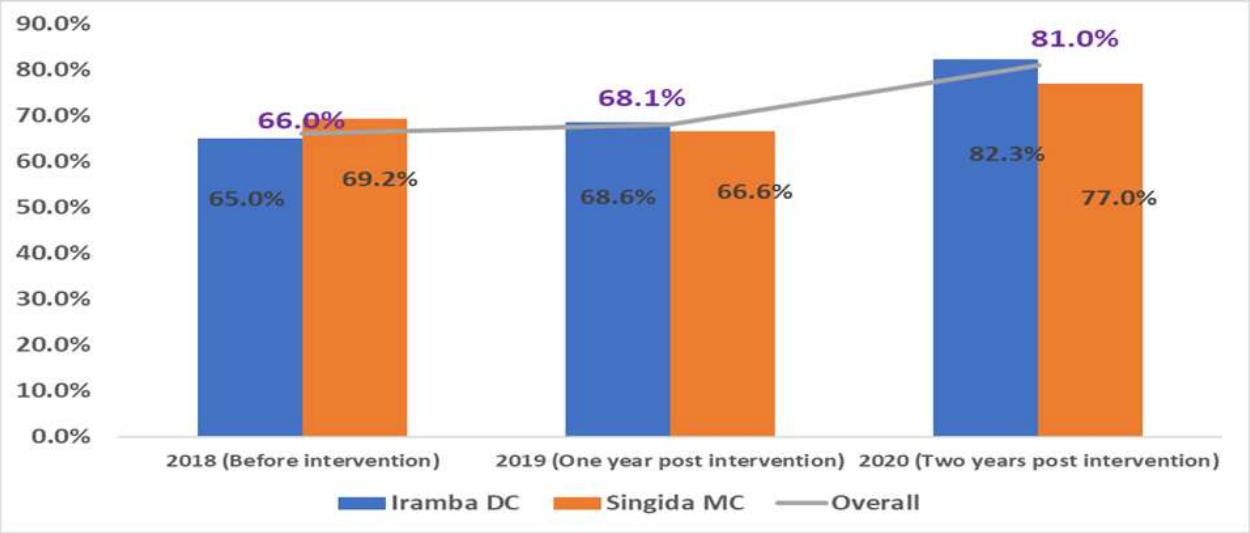


*Figure 1. The trend of reported availability of health commodities in the e-LMIS for Iramba DC and Singia MC pre- and post-intervention*

***Comparisons of percentage availabilities of health commodities for individual councils in the first and second year of the intervention***

The percentage availability of health commodities was stratified by each council and significant pre- and post-differences were determined as per results presented in Table 2 for the first and second-year years of IMPACT team approach implementation. Unlike Singida MC, Iramba DC had significant improvements in the availability of health commodities for both the first and second years of IMPACT implementation ($p<0.05$). The overall increase in the percentage availability of health commodities in the second year of implementation (2020) for both councils seem to be attributed more to Iramba DC than Singida MC.

*Table 2. Pre- and post-percentage availability of health commodities in Iramba DC and Singida MC for the first and second year of IMPACT team approach implementation*

| | **First-Year of implementation** | | | | **Second-year of implementation** | | | |
|---|---|---|---|---|---|---|---|---|
| | Pre (2018) | Post (2019) | % Change | P value | Pre (2018) | Post (2020) | % Change | P value |
| **Iramba DC** | 65 | 68.6 | +3.6% | 0.024 | 65 | 82.3 | +17.3% | 1.78e-10 |
| **Singida MC** | 69.2 | 66.6 | -2.6% | 0.026 | 69.2 | 77.0 | +7.8% | 0.112 |

***Pre and post IMPACT proportions of health commodities which are* not-in-demand *in the councils***

The trends in Figure 2 show that the overall proportions of not-in-demand health commodities had been increasing from pre to post IMPACT intervention. However, these figures have been relatively higher for Iramba DC than Singida MC except at the baseline in 2018. These results imply that as the overall availability of health commodities increased, as shown in Figure 1 they were also a piling up of the not-in-demand health commodities in the same facilities.

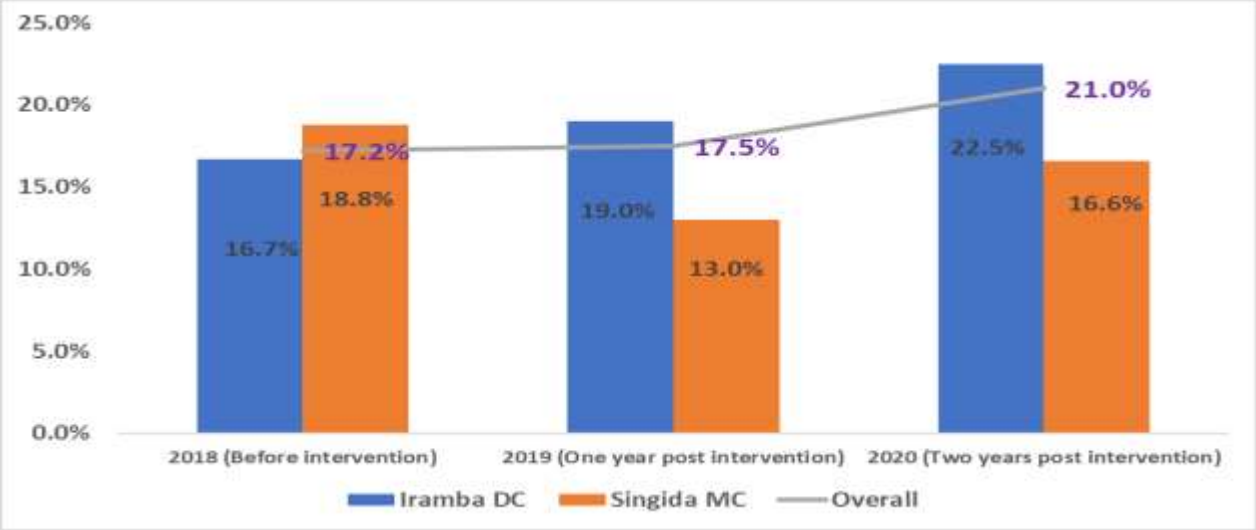


*Figure 2. Trend of "*not-in-demand *commodities" proportions of health commodities as reported in the e-LMIS by Iramba DC and Singida MC pre- and post-intervention*

***Statistical comparisons of* not-in-demand *health commodities proportions for the first and second year of IMPACT team approach implementation***

The proportions of not-in-demand health commodities were stratified by each council and significant pre- and post-differences were determined as per results presented in Table 3 for the first and second years of the IMPACT team approach implementation. The proportion of not-in-demand health commodities in Iramba DC increased significantly in 2020 compared to Singida MC, so again, these results show that the higher proportion of not-in-demand health commodities is attributed more to Iramba DC's performance than Singida MC.

*Table 3. Pre- and post-proportions of* not-in-demand *health commodities in Iramba DC and Singida MC for the first and second year of IMPACT team approach implementation.*

| | First-Year of post-intervention | | | | Second-year of post-intervention | | | |
|---|---|---|---|---|---|---|---|---|
| | Pre (2018) | Post (2019) | % Change | P-value | Pre (2018) | Post (2020) | % Change | P-value |
| **Iramba DC** | 16.7 | 19.0 | +2.3% | 0.051 | 16.7 | 22.5 | +5.8% | 0.001 |
| **Singida MC** | 18.8 | 13 | -5.8% | 0.001 | 18.8 | 16.6 | -2.2% | 0.675 |

***Pre- and post-proportions of overstocked health commodities in Iramba DC and Singida MC***

The results in figure 3 show the overall increasing trend of overstocked health commodities for both councils combined. Nevertheless, each council demonstrates the increasing proportions of overstocked health commodities from pre to post IMPACT intervention periods. However, Singida MC portrays higher proportions in this indicator than Iramba DC, except in the year 2020.

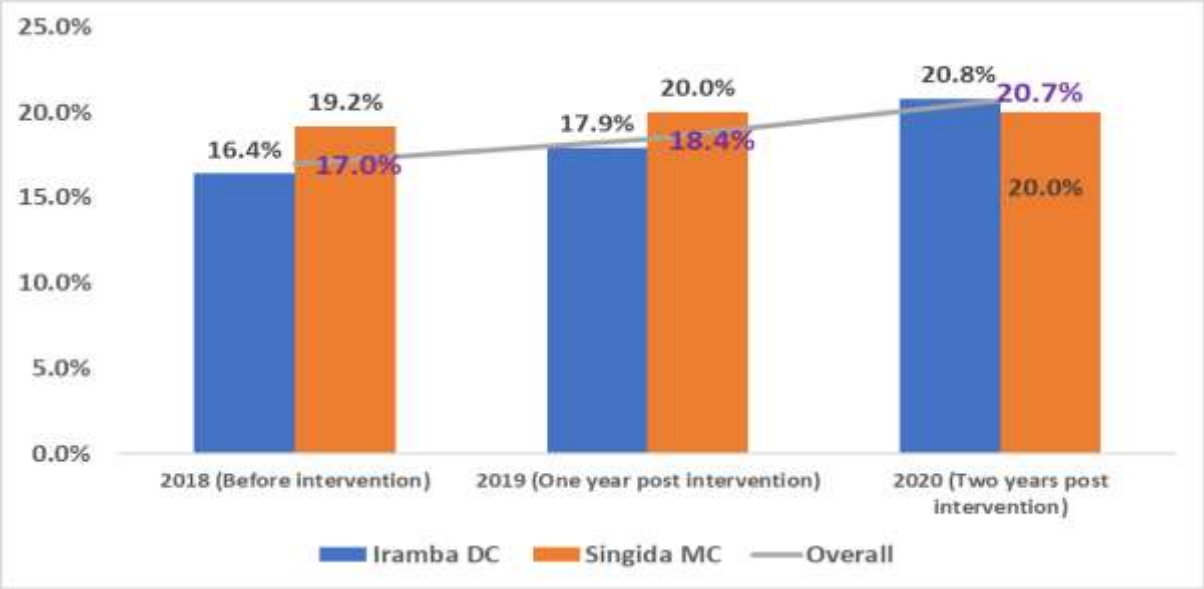


*Figure 3. The proportion trends of overstocked health commodities as reported in the e-LMIS by Iramba DC and Singida MC pre- and post-intervention*

***Comparisons of proportions of overstocked health commodities for the first and second years of IMPACT team approach implementation in Iramba DC and Singida MC***

The proportion of overstocked health commodities was stratified by each council, and significant pre and post differences were determined as per results presented in Table 4 for the first and second years of the IMPACT team approach implementation. The proportion of overstocked health commodities in Iramba DC increased significantly in 2020 compared to Singida MC, so again these results show that the higher proportion of overstocked health commodities is attributed more to Iramba DC's performances than Singida MC.

*Table 4. Pre- and post-proportions of overstocked health commodities in Iramba DC and Singida MC for the first and second year of IMPACT team approach implementation*

| | First Year of Implementation | | | | Second year of Implementation | | | |
|---|---|---|---|---|---|---|---|---|
| | Pre (2018) | Post (2019) | % Change | p value | Pre (2018) | Post (2020) | % Change | p value |
| **Iramba DC** | 16.4 | 17.9 | +1.5% | 0.0757 | 16.4 | 20.8 | +4.4% | 0.008 |
| **Singida MC** | 19.2 | 20.0 | +0.8% | 0.48 | 19.2 | 20.0 | +0.8% | 0.456 |

## Discussion

***Percentage availability of essential health commodities in the selected councils***

The results on the overall percentage availability of health commodities have been shown to significantly increase from 66% in 2018 before the introduction of the IMPACT team approach to 81% in 2020 (Figure 1), which was two years after the implementation of the approach had commenced in the councils. It implies that the increase in the availability might have been contributed by several factors including deliberations from IMPACT team meetings to solicit funds from various sources to procure health commodities from the Medical Stores Department (MSD) and the prime vendors. This effect was also observed in another similar study which was conducted in Malawi, whereby after implementing mobile (mHealth) technology interventions, the average availability of 6 tracer medicines increased compared to the period when such interventions was not in place (Shieshia *et al.*, 2014). Furthermore, Githendu *et al.*, got similar results that the reforms which were made to the Medical Stores Department (MSD) in Tanzania led

to the improvement in the availability of essential health commodities during the post-intervention period (Githendu *et al.,* 2020).

According to Lamphere *et al.,* the availability of family planning products under the quality improvement team approach (like the IMPACT team approach in Tanzania) improved from 46% to 73% in southern Myanmar, and these results are consistent with those obtained after the introduction of the IMPACT team approach in the Singida region (Lamphere *et al.,* 2019).

***Proportions of overstocked and* not-in-demand *health commodities***

The overall trend of not-in-demand proportion of health commodities rose from 17.2% in 2018 to 23% in 2020 (Figure 2). In contrast, the overall results for overstocked health commodities rose from 17% in 2018 to 20.7% in 2020 (Figure 3). The progressive and significant increase in both of the two parameters before and after the introduction of the IMPACT team approach is a clear sign of the main challenge of using inaccurate data for forecasting, quantifying and ordering new shipments from MSD in Tanzania (JSI, 2017). This has also been discussed in a study conducted by JSI that the low-quality logistics data is highly associated with increased proportions of overstocked and not-in-demand maternal and child health commodities at service delivery points (JSI, 2017).

Therefore, there is a high possibility that during meetings, IMPACT team members focus more on ensuring commodities are available, but little emphasis is put on ensuring the available stocks fall within the minimum and maximum stock levels, which are better determined by high-quality information reported by health facilities. This is contrary to the situation observed in Indonesia, whereby the assessment of post-IMPACT approach implementation in the country resulted in increased data quality and reduced overstocking of health commodities (Lamphere *et al.,* 2019).

These results imply a possibility that Singida MC and Iramba DC supply chain staff at the health facility level have lower knowledge and skills in health commodities management and related record keeping, resulting in inaccurate and incomplete data being entered into the electronic system, leading to serious imbalances in the stock managed at the health facilities (Kagashe and Massawe, 2012).

In addition, these results imply that healthcare supply chain staff need to be informed about the six WHO-recommended indicators for early warning of stock-outs and overstocking of health commodities in order to predict and develop timely actions to curb stock imbalances at facility levels as it was the case for MDR-TB commodity management in Nigeria (Jatau *et al.,* 2015).

**Conclusion**

In this study, the introduction and implementation of the IMPACT team approach in the councils had a contribution to the improved availability of essential health commodities as an outcome of increased data use in the respective councils. We found that the overall availability of essential health commodities in both councils improved after the IMPACT team approach compared to 2018 before it was introduced. Furthermore, given the pre- and post-comparison of not-in-demand proportions of health commodities in the councils, the IMPACT team approach seems to have a minor effect on the performance of this indicator in the sense of reducing the number of commodities with no use in health facilities. Therefore, this study found no association between implementing the IMPACT team approach and the performance of the not-in-demand indicator.

Lastly, as the overall proportion of overstocked health commodities continued to increase in both councils despite the increased data use associated with the implementation of the IMPACT team approach, there was no correlation between implementing the approach and the reduction in the number of commodities stocked beyond the consumption capacity in the health facilities.

The following are some recommendations to improve the performance of the IMPACT teams and the approach. Since the IMPACT approach has been found to influence health supply chain data use and availability of health commodities therefore, The Ministry of Health and PORALG should ensure continuous learning among members of IMPACT teams at all levels by scheduling periodic refresher courses and capacity-building sessions to enhance electronic systems conversance and use of data for decision making to continue improving the supply chain (Ines *et al.,* 2021)

Further studies should be done to ascertain and explore the contributing factors and possible solutions for the rising trends of not-in-demand and overstocked health commodities as they are

highly linked to expiries and financial blockade implications (Kingston Omo-Emmanuel *et al.,* 2017; Mohammed and Workneh, 2020).

Despite the link which has been found in this study between implementing the IMPACT team approach and the increasing trend of essential health commodities availability, other factors can have an influence on the performance of this indicator. Therefore, further studies should explore other contributing factors to the availability of health commodities in the councils.

Proper commodity management and demand forecast skills should be included in the IMPACT team's implementation monitoring and capacity building packages to improve health commodity management knowledge and skills in health facilities and reduce prevailing stock imbalances such as overstocks and items not-in-demand. This is crucial as these parameters in the supply chain pose a high risk of expiries and waste of financial resources used to procure the health commodities in question.

**Acknowledgements**

We acknowledge the USAID Global Health Supply Chain Technical Assistance Tanzania (GHSC-TA-TZ) program for the cooperation they have given us throughout the execution of this study.
We appreciate Prof. Simba and Prof. Mujinja for their constructive criticism and feedback during the proposal development stages of this work. They provided a very positive contribution to making this study very focused.
We would also like to thank the District Medical Officers of Iramba District Council and Singida Municipal Council, Dr. Hussein Sepoko and Dr. Anwar Milulu, respectively, and the entire Council Health Management Teams for their support and permission to conduct our research in their councils.

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