PEOPLE THAT DELIVER WORKFORCE OPTIMISATION TOOL

Zambia pilot test

August 2021

USAID GLOBAL HEALTH SUPPLY CHAIN PROGRAM

IQVIA

PEOPLE THAT DELIVER

USAID FROM THE AMERICAN PEOPLE

ZAMMSA

CONTENTS

ACRONYMS

CMS ..... Central medical stores
DHO..... District health office
eLMIS ..... Electronic management information system
GFATM..... The Global Fund to Fight AIDS, Tuberculosis and Malaria
GHSC-PSM ..... Global Health Supply Chain – Procurement and Supply Management
HR4SCM TOC ..... Human Resources for Supply Chain Management Theory of Change
HSS ..... Health systems strengthening
PEPFAR ..... President's Emergency Plan for AIDS Relief
PHO..... Provincial health office
PtD ..... People that Deliver
SCOR..... The Association of Supply Chain Management's supply chain operations reference model
SDP..... Service delivery point
SOW ..... Scope of work
STTA..... Short-term technical assistance
USAID..... United States Agency for International Development
WH ..... Warehouse
WMS ..... Warehouse management system
WOT ..... Workforce optimisation tool
ZAMMSA..... Zambia Medicines and Medical Supplies Agency

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INTRODUCTION OF PARTNERS

The following partners are discussed at length within the report. Each partner has their own mission which supported their specific roles and responsibilities within the activity.

People that Deliver
People that Deliver (PtD) was established in 2011 when 79 institutions came together at the World Health Organization and pledged their support and action to strengthen the capacity of the health supply chain workforce, while promoting the professionalisation of the supply chain within the broader health system. PtD is the global leader in human resources (HR) for supply chain management (SCM). It does this by advocating a systematic approach to HR for SCM and for interventions that improve the demand and supply of qualified health supply chain professionals

PtD is the creator and owner of the workforce optimisation tool (WOT). Through its advocacy a core team comprising PtD, IQVIA, GHSC-PSM and ZAMMSA was brought together to support the tool's application in Zambia. PtD is committed to understanding the user experience during pilot tests to inform next generation versions of the tool.

Zambia Medicines and Medical Supply Agency
The Zambia Medicines and Medical Supplies Agency (ZAMMSA) supports 17.3 million Zambians in the public sector supply chain through a single large warehouse located in Lusaka.

After attending an information session on the workforce optimisation tool, Zambia volunteered for a pilot test by submitting a potential research question. PtD chose their activity given their documentation of the data availability as well as eagerness to workshop potential research questions. As the pilot test subject ZAMMSA was responsible for providing the key inputs for the model as well as participating in the formation of the research question.

Global Health Supply Chain – Procurement Supply Management
GHSC-PSM purchases and delivers health commodities, strengthens national supply chain systems and provides global supply chain leadership to ensure lifesaving health supplies reach those in need when they need them. By working closely with country partners and suppliers worldwide, the project aims to promote wellbeing and help countries develop sustainable supply chain systems. The project is supported with funding from USAID.

GHSC-PSM was the primary activity manager of the pilot test and was responsible for requesting support from each of the partners as needed to reach the activity's objectives.

GHSC-PSM recognises that without a strong, skilled workforce at the national and local levels, system-based and technological improvements won't have their intended effect. The project goes beyond basic capacity building to look at long-term solutions for organisational and people development, considering the development of human resources systems as an investment.

IQVIA

IQVIA is a world leader in using data, technology, advanced analytics and expertise to help customers drive healthcare forward. Together with the companies they serve, they are enabling a more modern and effective healthcare system and creating breakthrough solutions that transform business and patient outcomes.

IQVIA's role in this activity was to provide technical training and guidance to GHSC-PSM for the use of the tool. Their responsibility was to ensure that partners understood how the model was operating to provide value in answering the research question.

EXECUTIVE SUMMARY

Recognising that improving supply chains requires both the appropriate number of supply chain workers and that these workers are placed in the right position and level within the supply chain, USAID and the Global Fund for AIDS, Tuberculosis, and Malaria (GFATM) funded the People that Deliver (PtD) in the beginning of 2018 to develop a tool to calculate the optimal number and cadre of supply chain personnel needed to improve an organisation's supply chain performance and/or health outcomes.

PtD then engaged the firm IQVIA in 2018 to build the workforce optimisation tool (WOT), which supports supply chain managers with staffing decisions and scenario analysis to improve the delivery of products within the public-sector supply chain. In FY2020, USAID requested that GSHC-PSM conduct a pilot test of the WOT and Zambia volunteered to provide a use case. GHSC-PSM, the Zambia team and IQVIA worked together to determine a "research question" to be used in the pilot-test to be conducted at the Zambia Medicines and Medical Supplies Agency (ZAMMSA). The team agreed to test the tool with the following research questions:

1. Given the change in role of the four regional warehouses from cross-docking functions to stock-holding storage, what would be the optimal number of staff to support inventory management activities?

2. What would be the appropriate allocation of staff by activity category to support the warehouse's new role?

The team gathered the data and generated three scenarios under the tool: staffing without hiring constraints, staffing limited to the current number of staff and staffing limited to a user-input total. Data-gathering and analysis, especially during the COVID-19 pandemic, was difficult and led to some data estimation that should still have resulted in an appropriate analysis.

The findings suggest that the regional hubs would require a significant increase in staffing. However, given that the basis of the calculation for productivity in the hubs is based on the main ZAMMSA warehouse, the results may not be an accurate reflection of expected needs, although the proportions of staff by function may be applicable.

Given that this pilot-test did not require the stockout rate or treatment gap functions and given that the results may suggest staffing levels higher than would be logically appropriate, it is recommended that USAID and PtD consider an additional pilot test to demonstrate the utility of the tool and its usability in various use cases. In this report GHSC-PSM makes several recommendations for improving the utility and usability of the tool.

BACKGROUND

Improving supply chains requires both the appropriate number of supply chain workers and that these workers are placed in the right position and level within the supply chain. Recognising that this is might be a challenge in the host-country supply chains they support, USAID and the Global Fund for AIDS, Tuberculosis, and Malaria (GFATM) funded People that Deliver (PtD) in the beginning of 2018 to develop a tool to calculate the optimal number and cadre of supply chain personnel needed to improve an organisation's supply chain performance and/or health outcomes.

Based on its work with individual countries PtD was concerned that supply chain staffing shortages, and misallocated staff, could be contributing to gaps in treatment as well as stockouts at the service delivery point. PtD wanted to provide the community with a resource that went beyond existing human resources for health tools which mainly use activity-based assumptions for primary care settings. They hypothesised that if managers had a tool to consider these two factors as well as volume and capacity, managers could create staffing strategies that were optimised to improve health outcomes and supply chain performance. PtD engaged IQVIA, a global biopharmaceutical services company, to help solve this problem. PtD selected IQVIA because of its decades-long expertise in modelling the staffing needs of thousands of biopharmaceutical companies, from global multi-national corporations to emerging companies, around the world. These projects typically involve two elements: understanding where to put resources based on demand and determining key performance indicators to staff for optimal efficiency.

The resulting tool, the workforce optimisation tool (WOT), was constructed in the initial phases using EPI (Expanded Programme on Immunization) data from Pakistan and in later phases with HIV and TB data provided by the National Product Supply Chain Management Programme (NPSCMP) in Nigeria. Using data from different health programmes and countries helps to understand the complexities of a global health setting. Given the positive results of this proof-of-concept, the WOT was presented in various information sessions to country supply chain managers. Of the countries that attended these sessions several contacted PtD about conducting a pilot test. However, Zambia's activity proposal was selected due to the availability of data and focus on capacity building.

Donor organisations were also interested in the potential capabilities of the WOT. USAID requested that the GHSC-PSM project's Workforce Development team within the Health Systems Strengthening (HSS) team learn how to use the tool and pilot-test it in one of the project's country offices in FY20. The purpose of the pilot-test was, in part, for GHSC-PSM staff to be coached to use the tool and be able to facilitate the refinement of research questions, data analysis and use the model to run various scenarios.

The GHSC-PSM and Zambia partnership was well aligned given USAID's investment in capacity development and the applicability of a research question that the tool could

explore. GHSC-PSM/Zambia has made a considerable investment in capacity development activities for warehousing and distribution.

BACKGROUND TO THE WORKFORCE OPTIMISATION TOOL

The PtD workforce optimisation tool (WOT), also referred to as the "tool", was created in Microsoft Excel with the understanding that the tool will be moved out of Excel after piloting and testing to improve user experience. The WOT's objective is to optimise supply chain staffing to improve overall human resources utilisation as one of the key elements in the PtD Theory of Change for Building Human Resources for Supply Chain Management (see Annex A).

The primary output of the WOT is an analysis of supply chain staffing requirements based on a user-determined set of parameters. The user selects one of three objectives which optimises the total number of staff and the functions to which staff are assigned. The user can then select one of three scenarios listed below (see also the "Output Scenario Planning" and "Output Combined" worksheets):

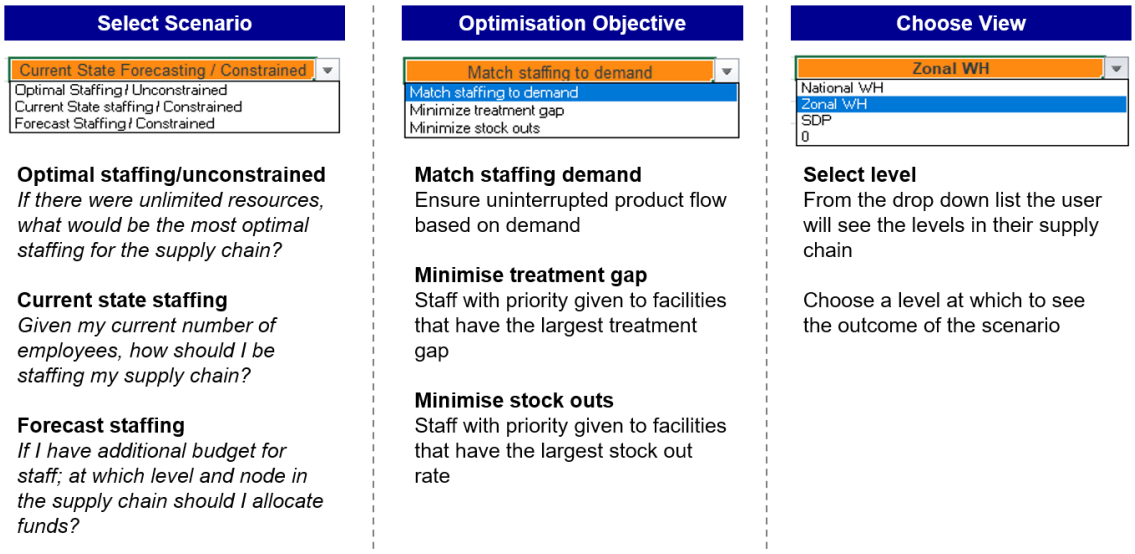
1. **Optimal staffing/unconstrained:** If there were unlimited resources, what would the optimal staffing for the supply chain by total count and function at each location be?

2. **Current state staffing/constrained:** If the total number of staff in the system was limited to the current total number of staff, how should the current staff be assigned by function and location?

3. **Forecast staffing/constrained:** If the total number of staff in the system was limited to a user-defined number, how should the staff be assigned by function and location?

Run an optimisation exercise by choosing options from the dropdown list: select the scenario, set your optimisation objective, view

The user can select various scenarios and objectives to optimise the workforce



4. The tool uses the following inputs to optimise staffing by number and area of responsibility. These are organised by worksheet within the Excel workbook:

Supply chain map and annual consumption: The level and number of warehouses/facilities is a required input. "Annual consumption" is used as the demand for each warehouse/facility and is a required input measured in "units." The tool does not determine how units are measured, nor does it differentiate among different products. Users should enter the number of units required to be handled, for, for example, throughput. (See the "Phase 1A Mapping of the Supply Chain" worksheet.)

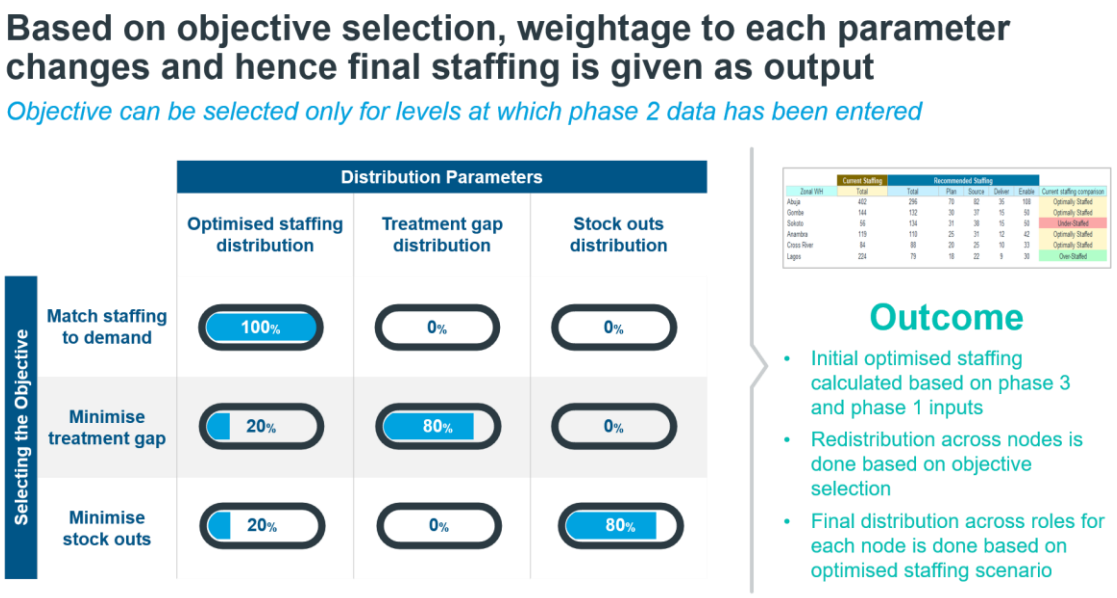
Current staffing: The tool is country and product agnostic. The WOT comes with default categories that align with the Association of Supply Chain Management's supply chain operations reference model (SCOR) model, which allows staff to be assigned to the plan, source, deliver or enable functions. A count of the current number of staff by function is required.

Stockout indicator: A key feature of the tool, users can input a stockout rate for one level of the system, preferably the lowest. Using this feature allows the model to run optimisations for staff across the supply chain in order to minimise stockouts. This feature can be customised for any supply chain key performance indicator.

Treatment gap indicator: A key feature of the tool, users can input the population served by the lowest level facility input into the tool, the percentage of the population affected, and the number of people receiving treatment. The tool will calculate the number of

patients, the gap in the treatment and the percentage of patients receiving treatment. Using this feature allows the model to run optimisations for staff workers across the supply chain in order to minimise treatment gaps.

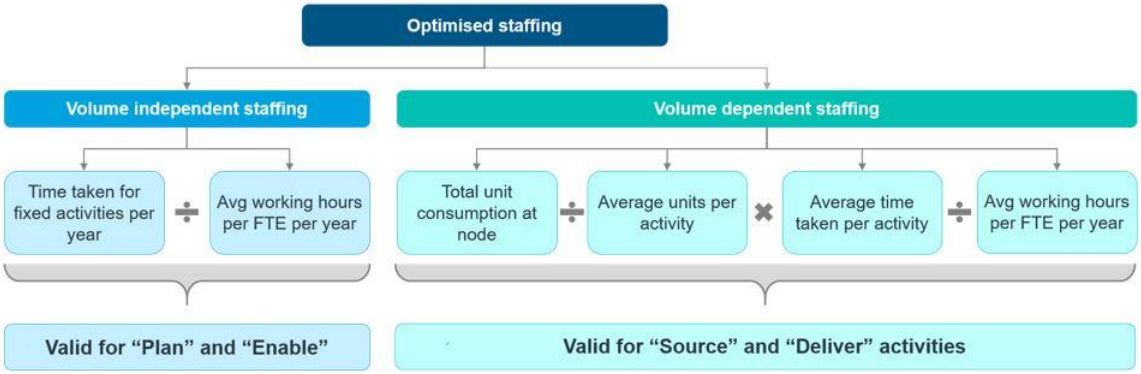
Activities and capacity by area of responsibility: A required input – data – is entered by each type of facility by category (i.e., high, medium, or low, if used), using a list of responsibilities created by the user. Each activity is assigned an activity category (i.e., SCOR function) and an activity role (e.g., picker or packer within the "picking" activity category). The number of staff in each role is required. For each activity, the activity is further defined by the time it takes, its frequency and whether or not the activity is dependent on the volume of demand or not. For example, time spent picking commodities each day depends on the volume of commodities that pickers can pick per day, but time spent in daily meetings or on breaks is not dependent on the volume of commodities to be handled. (See the "Phase 3 Activity and Timing" worksheet.)



Workforce optimisation tool: The maths

Here's the flow for reaching base optimised staffing

Initial distribution based on phase 3 activities across each SCOR category



BACKGROUND TO ZAMMSA

The Zambia Medicines and Medical Supplies Agency (ZAMMSA) supports 17.3 million Zambians in the public sector supply chain through a single large warehouse located in Lusaka. ZAMMSA also operates seven regional hub warehouses that currently have minimal stock management responsibilities and serve as cross docking facilities that link ZAMMSA to health facilities. ZAMMSA currently delivers health commodities to all regional hubs and transit points along 150 transportation routes that include some provincial health offices (PHO) and some of the 117 district health offices (DHO) in support of 2,500 service delivery points (SDPs).

ZAMMSA's strategic plan includes shifting four of the seven regional hubs – Mpika, Mansa, Luanshya and Mongu – from cross-docking to stock-holding facilities. The transition will begin with the implementation of a warehouse management system (WMS) at these facilities. Initially, they will manage 14 products (a total of 17 SKUs) that represent the products most ordered by volume. (See Annex D for a list of the products by SKU).

As mentioned earlier, the WOT comes with default settings that can be customised for the specific country context. For this pilot-test, the activity categories were modified to receive replenishment, and delivering and picking (instead of the SCOR functions plan, deliver, enable and source). The activities listed within in each category, as well as the time to

complete each activity, were estimates using the ZAMMSA warehouse as a benchmark for inventory management activities that will be completed at the regional hubs.

Figure 1: Map of Zambia[1]

METHODOLOGY

RECEIVING THE TOOL AND TRAINING

IQVIA gave an initial demonstration of the WOT to GHSC-PSM in April 2020. In June 2020, IQVIA provided remote training of the tool and sent a completed version of the tool and training materials to the GHSC-PSM project workforce development team. The training materials include:

a. Blank Excel copy of the final WOT
b. User guide focusing on instructions for entering the data
c. Frequently asked questions (FAQ) list

[1] Taken from https://ontheworldmap.com on August 6, 2021

d. PowerPoint overview of the tool's functionality
e. Advocacy brief for using the tool
f. Sample use cases for using the tool
g. PowerPoint advocating the benefits of the tool
h. Link to a YouTube video (PtD workforce optimisation tool recorded training - YouTube) with worksheet-by-worksheet instructions for entering the data

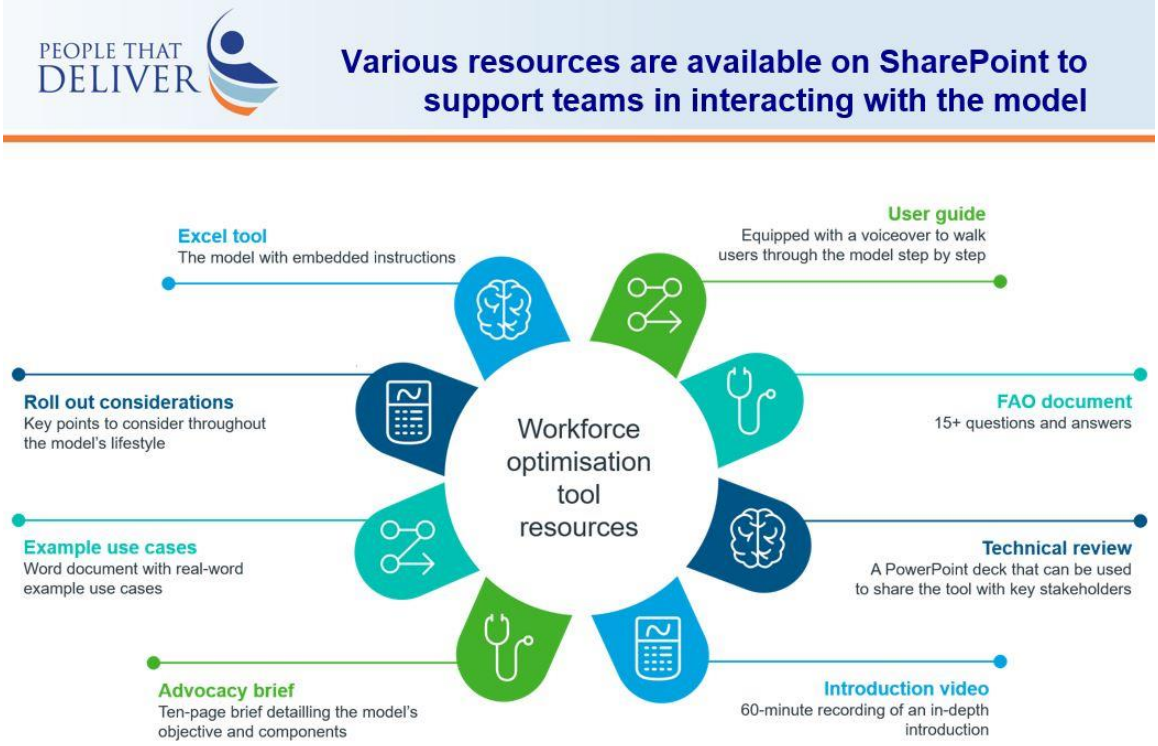


Figure 2: Various resources available on SharePoint to support teams in interacting with the model

Following the remote training, GHSC-PSM and IQVIA cascaded the training to the GHSC-PSM/Zambia field office staff and ZAMMSA.

REFINING THE RESEARCH QUESTION

GHSC-PSM, PtD, USAID/Washington and IQVIA worked to understand the supply chain staffing context to develop a research question that would leverage the value of the WOT and provide Zambia with actionable information about its staffing. The research question formulation was undertaken via several conference calls. While the team settled on the below research question, other potential research questions were discussed and captured. The decision to move forward with the selected research question was based on current strategic priority.

Recognising the planned change of role for the four regional hubs from cross-docking to stock holding the research questions for the pilot-test were:

1. Given the change in role of four of the seven regional hub warehouses from cross-docking functions to stock-holding storage, what would the optimal number of staff to support inventory management activities at each hub be?

2. What would the appropriate allocation of staff by activity category to support the hubs' new roles be?

The research question was reviewed by GHSC-PSM/Zambia's director of distribution centre logistics and agreed to the research questions.

As with all USAID/Washington core-funded activities, USAID mission director concurrence was required before proceeding to implement the tool; agreement was granted in November 2020. While this is a required administrative step, the length of time it took should not reflect on the total time needed to implement the tool as the time was related to formal submission of a request and response within USAID.

With USAID approval it was then possible to provide ZAMMSA management with an overview of the purpose of the activity and this was done in January 2021. In February IQVIA provided a demonstration of the tool to ZAMMSA management. In March 2021 an informal agreement was made that allowed the GHSC-PSM team to use the e-LMIS for the purpose of the pilot-test, which began the data collection process.

COLLECTING THE DATA

The scope of work for the pilot-test activity was budgeted to include a short-term technical assistance (STTA) visit by one of the trained GHSC-PSM staff to travel to Zambia for data collection and to present the data. Given the international travel restrictions owing to the COVID-19 pandemic, the team considered the possibility of hiring local consultants who could visit ZAMMSA to gather the data needed for the required inputs. Unfortunately, COVID-19 restrictions made it impossible for non-ZAMMSA staff to enter the ZAMMSA facility to either observe staff directly or to interview them, including the GHSC-PSM/Zambia director of distribution centre logistics.

However, the GHSC-PSM/Zambia director of distribution centre logistics worked with the workforce development team to produce a set of "mock data," using his pre-pandemic experience at ZAMMSA.

Mapping the supply chain and collecting data by number of staff and warehouse function

Supply chain mapping was limited to the central and regional hub levels given the research questions. The number of staff and staff by warehouse function were obtained from the GHSC-PSM/Zambia director of distribution centre logistics.

Collecting data for activity time and productivity by warehouse function

To obtain information about the list of activities and the approximate time and productivity rates of staff by function, the GHSC-PSM/Zambia director of distribution centre logistics worked with the workforce development team to produce a set of "mock data" using his pre-pandemic experience at ZAMMSA since even he was not permitted to enter ZAMMSA to directly observe performance or to conduct interview. As these are his estimates, they represent the best data available based on expert opinion given the constraints.

Collecting data for demand/consumption data by regional hub

Given that the research question was to be focused on the regional hubs and not on staffing in the entire system, and given the difficulty of collecting data in the field owing to COVID-19 travel restrictions, the team decided not to collect additional data on activity time below the regional hub level.

However, demand/consumption data for 2019 and 2020 was available for each SDP from the Electronic Logistics Management Information System (e-LMIS) database. This database collects reports from each SDP on a regular basis including stock on hand, losses and adjustments, consumption, quantities requested, and stockouts for all products in the database. It was possible to assign SDPs to the regional hubs that will ultimately pick products for them and allocate their demand/consumption in the model to each hub. For this pilot test, the "quantity requested" was used as a proxy for the quantity shipped from each hub, since the quantities issued through the WMS would not have captured the quantities shipped from ZAMZA to each SDP and it would have been challenging to assign each SDP's received quantity to each hub. Consequently, the quantity requested was determined to be an appropriate substitute for the pilot test.

As noted above, consumption data collection was limited to the 17 SKUs stored at the regional hubs (see Annex B). However, usable consumption data was only available for 15 of the SKUs, with complete demand data not available for large and medium powder-free gloves owing to high stockout rates in both 2019 and 2020. The analysis was completed using the 15 remaining SKUs.

Collecting data for stockouts

The WTO allows for optimisations to be run on supply chain performance indicators. The general model comes prepared to generate output based on minimising stockouts – though it can be updated to reflect any supply chain performance indicator. For this specific research question, it was not necessary to use this feature. However, the team did discuss how the e-LMIS-provided stockout information for each SDP could be used for future analysis.

Collecting data for the treatment gap

As with stockouts, the use of the treatment gap optimisation function did not support the research question. Additionally, gathering data on the treatment gap would have been difficult given a lack of data sources from which to estimate the gap. Because the pilot-test was intended to focus on the 14 products to be stocked in hubs, it would have been difficult or impossible to assign a gap to the products representing high-volume products rather than the complete assortment of products to treat a specific need. For example, male condoms are included because of their volume while the full range of family planning products (including oral contraceptives, injectables, implants and intra-uterine devices, among others) were not. Consequently, it was decided not to use the treatment gap in the pilot test as this feature did not support the research question.

In April and May 2021, the GHSC-PSM gathered the inputs and entered them into the WOT, producing the findings. (See Annex C for a timeline of activities.)

FINDINGS

Using the data inputs, the following are the results generated from the scenarios in the WOT.

CURRENT STAFFING

The first output of the WOT is the table below showing current staffing level totals and the number by function. As noted above, the SCOR functions of "plan, source, deliver and enable" were replaced by IQVIA with "receiving, replenishment, delivery and picking."

Since the regional hubs are not currently responsible for picking, no staff are currently assigned to the picking function. There is a total of 27 staff members currently assigned to the hubs.

	Current staffing				
Provincial Hub	Total	Receiving	Replenishment	Delivery	Picking
Mpika	8	2		6	
Mansa	7	1	1	5	
Luanshya	8	1		7	
Mongu	4			4	

Table 1: Current staffing

SCENARIO 1: OPTIMAL STAFFING/UNCONSTRAINED

In the first scenario, "optimal staffing/unconstrained", the WOT calculates the total number of staff and the number of staff in each category assuming that there are no limits to the number of staff that can be hired, nor any limits on the positions to which they can be assigned. In this scenario, the WOT recommended the following staffing levels, with the final column noting that all the hubs are currently under-staffed.

	Recommended staffing					
Provincial Hub	Total	Receiving	Replenishment	Delivery	Picking	Current staffing comparison
Mpika	32	8	4	9	11	Under-staffed
Mansa	23	6	3	6	8	Under-staffed
Quanshay	20	5	3	6	7	Under-staffed
Mongo	12	3	2	3	4	Under-staffed

Table 2: Scenario 1 recommended staffing

In this scenario the WOT recommended an increase from 27 to 87 staff across the four hubs. The WOT recommends staffing within all job categories. Although the four hubs are currently cross-dock facilities, it makes sense that the tool recommends assigning 30

staff to the picking function since this will be a new function when they move to stock holding.

The number of staff to be assigned to each hub is based on the number of staff currently at ZAMMSA and their rates of productivity. In other words, if pickers in the hubs pick work at the same rate as those at ZAMMSA and have the same time constraints for activities that are not volume-dependent, then 30 pickers will need to be hired for the hubs.

The GHSC-PSM/Zambia director of distribution centre logistics noted that the total number of staff recommended to be hired at the hubs appeared to be high given the physical size of the facilities.

SCENARIO 2: CURRENT STATE STAFFING/CONSTRAINED

In the second scenario, "current staff staffing/constrained", the WOT calculates the total number of staff and the number of staff in each category assuming that the total number of staff is limited to the current count, although the functions to which they can be assigned can be modified. In this scenario the WOT recommends the following staffing levels with the final column noting that all hubs are currently optimally staffed, which is logical given that the recommended levels must be equal to the current levels.

	Recommended staffing					
Provincial Hub	Total	Receiving	Replenishment	Delivery	Picking	Current staffing comparison
Mpika	10	2	1	3	3	Optimally staffed
Mansa	7	2	1	2	2	Optimally staffed
Luanshya	6	2	1	2	2	Optimally staffed
Mongu	4	1	1	1	1	Optimally staffed

Table 3: Scenario 2 recommended staffing

This scenario, consequently, serves primarily to allocate staff across all functions, which will include picking but does not have the capacity to determine if this staffing pattern will permit the hub to fulfil the responsibilities assigned to it. It should also be noted that the tool assigns at least one full-time member of staff to each function as it would be impossible for the tool to understand that, for example, the "replenishment" function, if not a full-time position, might be shared among more than one person.

SCENARIO 3: FORECAST STAFFING/CONSTRAINED

In the third scenario, "forecast staffing/constrained", the user is asked to enter the total number of staff that can be added (or potentially reduced to) and the WOT will calculate the number of staff in each category and for each hub. In this scenario the team entered a total of 40 staff believed to be a reasonable total number. The WOT recommended the following staffing levels, with the final column noting that, on this basis, some of the hubs would be considered understaffed and some optimally staffed currently.

	Recommended staffing					
Provincial Hub	Total	Receiving	Replenishment	Delivery	Picking	Current staffing comparison
Mpika	15	4	2	4	5	Understaffed
Mansa	11	3	1	3	4	Understaffed
Luanshya	9	2	1	3	3	Optimally staffed
Mongu	5	1	1	1	2	Optimally staffed

Table 4: Scenario 3 recommended staffing

As with the second scenario, the tool does not have the capacity to determine if this staffing pattern will permit the hub to fulfil the responsibilities assigned to it. The total number of 40, thought by the team to be a "reasonable" number, does not have any particular value; had the team chosen 30, 50 or 60 the tool would assign staff at the percentage used in the ZAMMSA store by function.

OTHER SCENARIOS

All three tested scenarios are based on matching staffing at the hubs to the demand/consumption from each hub. The tool is also capable of executing all three of the above scenarios while also minimising stockouts or minimising the treatment gap and can weigh the value of demand versus the value of the stockout or treatment gap. Since neither of these functions was used when calculating the results, there is no result for these scenarios.

In June 2021, the data was presented to ZAMMSA management by GHSC-PSM, IQVIA, PtD and USAID.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS FOR THE PILOT TEST

Conclusion 1: there are many use cases of the tool and this activity looked at one specific use case. As noted above, this exercise did not use either the stockout rate or the treatment gap in the analysis, which resulted in no optimisation scenarios modelled. The team has shared with ZAMMSA 'trigger points' for where the tool could continue to provide support as the implementation of the regional hubs progresses (see figure 2).

Conclusion 2: constraints on data granularity limited the use of the tool. The GHSC-PSM team recognised during the drafting of this report that the productivity estimates as ZAMMSA will need to be validated for the regional hubs. Given that the regional hubs are physically smaller, have a different layout and manage fewer SKUs than the ZAMMSA central medical store, the hubs are expected to have greatly different through-put rates for the limited assortment of products. Owing to COVID-19 it was not possible to do shop floor walks and interview ZAMMSA central medical store staff on how they perceive the workload to change in a regional hub. However, the inputs were estimated via subject matter expertise as noted above and when the team has been formed these estimations can serve as a baseline for further analysis.

Conclusion 3: the WOT requires data availability, confidence in the data and ability to extract the data. The WOT requires investment from the team in order to collect and analyse available data to serve as input data in the tool. An existing WMS will make data extraction simpler and potentially provide greater confidence to the data being used. The increased confidence in data inputted will result in the outputs of the WOT being of greater use to the team for decision making. It may be desirable to integrate the tool with a WMS. Conversely, where data on through-put or productivity is already being collected through the GHSC-PSM activity-based costing (ABC) exercise, the same data would be useful in implementing the WOT, but then the ABC exercise has a significant overlap with the WOT in helping determine the staff count and function.

Conclusion 4: a successful pilot requires a dedicated team to collect and analyse the data. The WOT is a tool to help managers make strategic decisions about their supply chain staffing. In many cases additional data will need to be collected in order to effectively use the tool to answer the research question. This collection and analysis, depending on the current data availability, can include generating data by in-person interviews or shop floor walks. Depending on the research question and data maturity of the organisation, data collection can be a project within itself. When possible, the use of the WOT could be aligned with ongoing data-related activities to reduce the overall level of effort needed and increase efficiency within the overall programme.

RECOMMENDATIONS FOR ZAMBIA IMPLEMENTATION OF THE WOT

Recommendation 1: consider adjusting the productivity rates. As noted above, it was not possible to either directly observe or interview ZAMMSA staff. It would improve the quality of the analysis to conduct a more in-depth analysis of the productivity rates at ZAMMSA, especially providing more detail about activities that are not volume-specific.

Recommendation 2: use newly generated data from the WMS to refine data inputs. The implementation of the WMS will provide data points that can be extrapolated to understand staff activities and time spent on each activity. By collecting activity and time spent data through a WMS, rather than interviews, we have a unique opportunity to reduce the potential disruption of day to day activities.

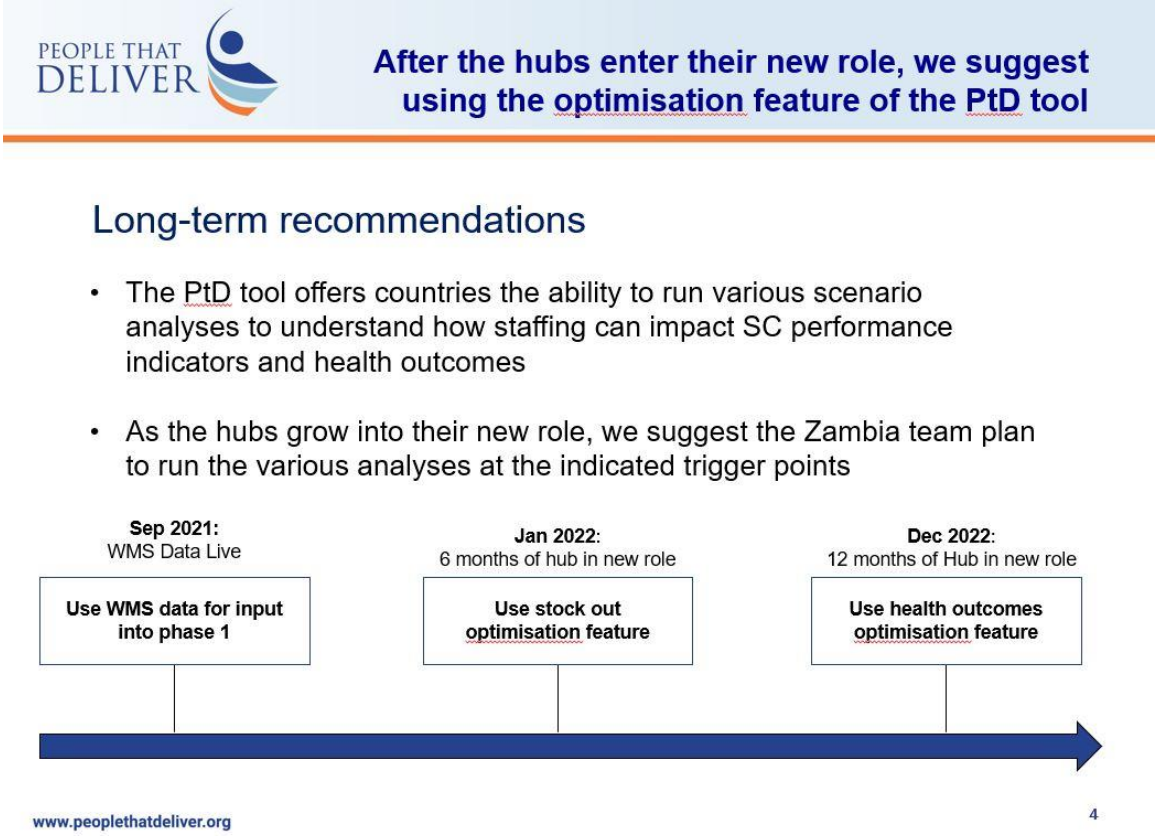


Figure 3: Long term recommendations for the Zambia team

Recommendation 3: the team can continue to use the WOT for distribution centres as well as service delivery points (SDPs). Although this feature was not necessary for this activity, the feature can be used for future activities to add an extra level of granularity for throughput and productivity inputs at the SDP level. For instance, SDPs are likely to be staffed by only a small number of staff who spend only a portion of their time managing supplies. The results of the tool at the SDP level will need to be interpreted differently, since aligning staff to supply chain functions and assigning them within the tool may not be logical, given the multiple, over-lapping roles SDP staff may play.

RECOMMENDATIONS FOR PTD REGARDING THE WOT

Recommendation 1: increase the number of in-depth hands-on training sessions, dependent on the team's comfort level with modelling. The GHSC-PSM team deemed that the introduction of the tool should be expanded to include the data relationships between the tables and an explicit description of how the tool calculates the outputs. At present, there is a hidden worksheet for "working output". While recognising that it is common to have hidden worksheets in Excel workbooks, the formulas used in this worksheet should be presented and explained to users to provide additional understanding of the tool's results and more confidence in the output, especially as related to stockouts and the treatment gap. The training materials should also be edited to include broader definitions of what the data to be entered means, with the current training materials being focused on data entry (e.g., where to click). Many of the terms are defined only within the FAQ document, however, the creation of a list of terminology would help users to better understand the model components and relationships. A list of suggested terminology is attached. (See Annex D.)

Recommendation 2: implement benchmarking for activities. It would be desirable to benchmark at least some activities, such as picking speed, to give users a sense of how their system is performing. As performance tools evolve and mature, metrics and benchmarks are an essential reporting element to assist management with current and future staffing operational strategies. With the expansion of further pilot tests PtD could make public the activities and productivity rates for future activities to use as data estimates.

Recommendation 3: add wage information. An additional feature that could enhance the tool would be to include wage information as part of the calculations to inform the financial consequences of hiring additional staff at different wage rates. While staff counts are informative, the additional cost information of implementing each scenario would be useful, with a potential target being, for example, to make changes while maintaining the same budget. At the moment wage calculations can be performed by copying the output scenario and multiplying by current wage information for the organisation.

Recommendation 4: move the tool from Excel. While recognising that the tool is based in Excel, it would be beneficial, if possible, to create an easier-to-use interface. Users may too easily overlook a button, causing errors in the embedded macros, which could impact the analysis. Until then it is recommended having a technical expert on the core team for future activities to provide any customisation needs or support with understanding macros.

Recommendation 5: provide flexibility for the treatment gap calculation. Although the treatment gap indicator functionality was not used, the optimisation tool may consider calculating treatment gaps from the forecasted or planned treatment and the number of

people currently receiving treatment. This is because the use of prevalent or incident rate may be too broad and the number of people currently receiving treatment in the private sector may also be excluded in the calculation of treatment gaps.

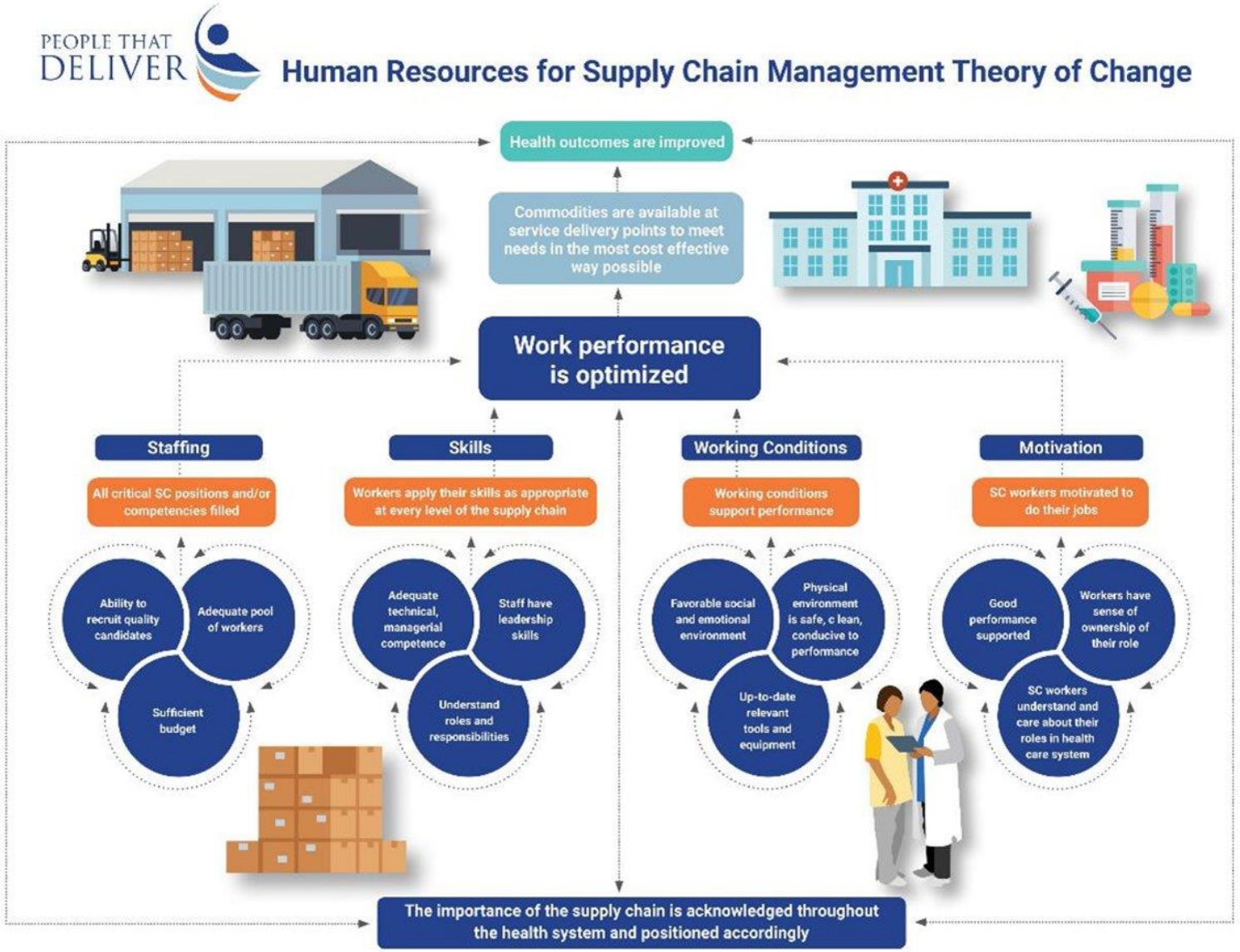
OVERALL CONCLUSION

The WOT provides users with information to understand supply chain staffing needs by function and location, based on commodity demand. Additionally, the tool helps with determining the gaps in community treatment, and finally, the tool allocates the right mix of resources by category and inventory strategy. All of this can support supply chain managers with strategic decision making. The objective of the pilot test in Zambia was to align resources by regional hub within the categories of receiving, replenishment, delivery and picking. The pilot-test was successful in aligning resources within the various categories, however, owing to the estimation of the productivity rates of the ZAMMSA store the results may not be applicable to the hubs and could mislead those not familiar with the tool design or those who were not involved in this pilot.

The GHSC-PSM team recognises that with increased data granularity the tool could support ZAMMSA leadership towards optimising the performance of their supply chain. The tool allows innovation to be modelled with no risk to existing supply chain ecosystems and can be used to explore other research questions.

To learn more about obtaining and using the workforce optimisation tool in your organisation please contact People that Deliver at info@peoplethatdeliver.org.

ANNEX A. PTD BUILDING HUMAN RESOURCES FOR SUPPLY CHAIN MANAGEMENT THEORY OF CHANGE - "STAFFING" PATHWAY



ANNEX B. Tracer commodities

Product code	Product description
ARV0063	TENOFOVIR/LAMIVUDINE/EFAVIRENZ,TAB 300/300/600MG
ARV0038	TENOFOVIR 300MG/LAMIVUDINE 300MG
ARV0068	TENOFOVIR 200MG
ARV0070	TENOFOVIR 150MG
ARV0050	ABACAVIR (SULPHATE) 60MG + LAMIVUDINE 30MG
ARV0002	ABACAVIR (AS SULPHATE), TAB 300MG
MAL0061	RAPID DIAGNOSTIC TESTS FOR MALARIA (P FALCIPARUM)
MAL0045	RAPID DIAGNOSTIC TEST FOR MALARIA (SD BIOLINE)
MAL0015	RAPID DIAGNOSTIC TEST FOR MALARIA
EM0033	AMOXYCILLIN SUSPENSION
EM0524	CO-TRIMOXAZOLE SUSPENSION 240MG
RH0002	CONDOMS LATEX MALE 144 PIECES
MS0058	SURGICAL GLOVES 7.5
MAL004	ARTEMETHER + LUMEFANTRINE 24
MAL001	ARTEMETHER + LUMEFANTRINE 6
EPS0045	GLOVES POWDER FREE – MEDIUM
EPS0080	GLOVES POWDER FREE – LARGE

ANNEX C. Pilot-test timeline

1. WOT introduced to PSM, April 2020.
2. PtD training in WOT provided to PSM, July 2020.
3. GHSC-PSM/Zambia agrees to pilot-test the WOT, November 2020.
4. Meeting with Zambia ZAMMSA leadership, process overview, January 2021.
5. WOT demonstration, to ZAMMSA and GHSC-PSM/Washington, February 2021.
6. Leadership changes at MSL, causing delays with decisions related to data, February 2021.
7. Zambian MOH informal approval of data collection, March 2021.
8. GHSC-PSM/Washington download of e-LMIS requisition for SDPs, April 2021.
9. Upload of e-LMIS data into the WOT for analysis, May 2021.
10. IQVIA analyses the ELMIS data, June 2021.
11. WOT presented to ZAMMSA, GHSC-PSM/Washington, GHSC-PSM/Zambia, PtD, and USAID/Washington, June 2021.

ANNEX D. Terminology

Cross docking: Where commodities are unloaded from an in-bound truck and loaded onto an out-bound truck for a customer delivery.

Current staffing comparison: Compares the current staffing levels (if entered by the user) with the outputs from the model.

Current state staffing/constrained: Given my current number of employees, how should I be staffing my supply chain?

Delivery: The delivery process involves the loading of the trailer, planning a route, securing a driver and delivering the customer-requested commodities to a predetermined location.

Forecast staffing/constrained: If I have additional budget for staff, at which level and node in the supply chain should I allocate funds?

Optimally staffed: The operation is staffed at the optimal level.

Optimal staffing/unconstrained: If there were unlimited resources, what would be the most optimal staffing for the supply chain?

Picking: Involves the selection of commodities that customers have requested through a requisition/customer order.

Receiving: The receiving process involves accepting, inspecting and counting in-bound packages from contractor suppliers or vendors.

Replenishment: The process of placing commodities within a dedicated storage location within the regional hubs.

Stockouts: Used to define the supply chain performance in the region and output scenarios to optimise supply chain performance rather than health outcomes. Specific definition (i.e., products) depend on the research question.

Treatment gap: Used to define the health outcomes in the region and run output scenarios to optimise health outcomes rather than supply chain key performance indicators. Specific therapeutic areas depend on the research question.

Understaffed: Staffing is below the WOT-recommended levels for a given scenario.

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