# Detailed Annex for the Health Workforce Interventions of the Malawi Health Sector Strategic Plan (HSSP III) for 2023-2030

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# 1 Executive Summary

## 1.1 Introduction

Sufficient numbers of well-trained health workers are critical to achieving a country's service delivery goals – without enough of them, the health system will provide insufficient volumes of care that are of unsatisfactory quality. In Malawi, 48%[1] of posts for health workers are vacant across the public sector and CHAM facilities.[2] Malawi has only 1.48 doctors, nurses, and midwives per 1000 people, falling well below the WHO recommended minimum of 4.45 health workers per 1000 people to meet the Sustainable Development Goals (SDGs) and Universal Health Coverage (UHC).

To meet the service delivery targets laid out in Malawi's Health Sector Strategic Plan III 2023-2030 (HSSP III), a thorough, evidence-based approach was used to plan for future health workforce needs across the eight-year period (from fiscal year 2023/24 to fiscal year 2030/31). This detailed annex to the health workforce activities in the HSSP III provides greater detail to the methods, results, and activities required to produce the health workforce necessary to deliver the levels of service targeted by the HSSP III.

Whilst health workforce planning is typically done in an ad-hoc manner, the HSSP III instead uses a systematic, data-driven approach to health workforce planning, summarized below in *Section 1.2 Methods and Results* and detailed in *Section 3*. Activities and their costs are summarized in *Section 1.3 Health Workforce Interventions and Costs* and detailed in *Sections 4* and *5*. Amongst the many activities presented, activities that are prioritized for funding and implementation are summarized in *Section 1.4* and detailed in *Section 5.3*. The mechanisms for monitoring and evaluation, financing and resource mobilization, and implementation arrangements are provided in the HSSP III and will guide implementation of these health workforce activities and have therefore not been described in detail in this annex document.

## 1.2 Overview of Methods to Develop Pre-Service Activities

The HSSP III health workforce activities were developed with the goal of conducting the detailed level of planning required to identify specific, tangible goals and activities that present a clear path to meeting the HSSP III health workforce targets and service delivery goals, working towards the provision of universal health coverage and equitable access to care. This manifested in a strong orientation towards evidence and modeling to support the intervention design process. At a high-level, the process was as follows:

1. **Set health workforce targets:** HSSP III targets for service delivery in 2030 were translated into targets for the health workforce required to deliver those services in 2030, through a Workforce Optimization Model (WFOM) and other target-setting methods.

[1] From the 2017-2022 Government of Malawi Health Sector Strategic Plan II (HSSP II)

[2] The Christian Health Association of Malawi (CHAM) is not-for-profit conglomerate of hospitals belonging to several faith-based organizations (FBOs) and is responsible for 29% of all service delivery in the country. They are primarily funded by the government through service-level agreements (SLAs)

a. The WFOM uses existing government data sources for service delivery indicators, as well as integrated analytics around healthcare worker activities and productivity to define health workforce targets and propose how health workers can be distributed optimally for the provision of health care services across Malawi at the primary and secondary level of care. These results are available disaggregated by cadre, facility type, district, and facility.

b. The Delphi Method was used to complement the WFOM and set district targets for certain specialist cadres when there were insufficient data inputs available to use the WFOM. Relevant experts were put in structured group discussions to achieve consensus on targets for specialists required to provide high-quality pediatric services. Whilst pediatric services were the focus of this Delphi exercise, the approach can serve as a model for workforce planning across all specialist cadres needed in the health system, particularly once specialist services are defined as part of the platforms of care.

c. Lastly, tertiary hospital targets were extracted from the establishment of central hospitals, which was last updated in August 2020 after all central hospitals completed a functional review process and community-based cadre targets were identified from population-based ratios set in national strategic documents and consultations with the relevant departments in the Ministry of Health.

2. **Develop a pipeline that meets health workforce targets and set enrollment targets for each program:** The health workforce targets for the system in 2030 were translated into enrollment targets for training institutions. This analysis accounted for the number of years available for intervention as well as attrition rates, graduation rates, and licensure exam passing rates, and produced target enrollment numbers for each cadre by training institution and by year.

3. **For each program, identify the current capacity (scholarships, faculty, infrastructure, and equipment) to provide pre-service education, the ideal capacity to provide high-quality training at the enrollment target-level, and the capacity gap against which to design interventions:** An assessment of current capacity at training institutions was conducted to understand the available scholarships, faculty, infrastructure, and equipment available to support enrollment scale-up. Where capacity was insufficient to provide high-quality instruction at scaled-up enrollment levels (which was true in almost all programs), training institutions were presented with their enrollment targets and they in turn provided ratios and/or quantities of faculty, infrastructure, and equipment required to provide a high-quality education to the increased number of trainees. The gap was then calculated between the current capacity and ideal capacity for each type of scholarship, faculty, infrastructure, and equipment named by the training institution for each program.

4. **Develop and cost interventions to address capacity gaps:** Finally, scholarships, faculty, infrastructure, and equipment interventions were developed and costed to address the gap between the current capacity for enrollment for each program and the capacity needed to provide high-quality instruction at the target enrollment numbers. Rules of thumb that guided this intervention design are summarized in the following section and described in detail in Section 3.6 on Intervention Design and Costing Methods.

5. **Prioritize costs to fit within resource envelope:** the cost of training the health workforce to deliver the original service delivery targets (high-quality care with no access constraints) totaled $4.4 billion over the course of the HSSP III period. As it is unrealistic that such a large sum will be available for health workforce interventions based on realistic resource envelope projections for the Malawi health sector, two different prioritization processes were used to arrive at interventions that were feasible given limited resources: (1) several rounds of target-setting were conducted, each with lower service delivery targets until a scenario was reached that seemed realistic for the HSSP III overall, and (2) for the proposed package of prioritized interventions for the next fiscal year that could realistically be influenced after launch of the HSSP III (fiscal year 2024/25), further prioritization based on value for money was conducted to further reduce health workforce costs to fit within the final projected fungible resource envelope for that year

These methods are each elaborated upon in Chapter 3, and the intervention design and prioritization processes are each further detailed below.

## 1.3 Health Workforce Interventions

Pre-Service & Salary Interventions

As described above, interventions were designed to address gaps between a training institution's current capacity and the institutional capacity required to meet enrollment targets to fulfill HSSP III heath workforce and service delivery goals. Summarized details on the interventions are below.

*Cadres Selected for Intervention Design*

For delivery of the HSSP III's Health Benefits Package (the successor of the Essential Health Package), workforce planning included cadres defined in the EHP to plan for delivery of HBP services at the primary and secondary levels of care. To support delivery along the continuum of care, from communities to health centers to hospitals, the HSSP III also included workforce planning for select community-based cadres and specialist cadres; selection of these cadres was primarily based on availability of sufficient-quality data to develop reasonably accurate projections and modeling.

For the past five years, Malawi has strengthened health systems to support delivery of the EHP detailed in the 2017-2022 Health Sector Strategic Plan II. The EHP included 97 health services that were cost-effective and would thus maximize health for all Malawians given limited resources. Prioritized cadres to deliver the EHP, as defined in the HRH Strategic Plan 2018-2022, include medical officers, clinical officers, medical assistants, nursing officers, nurse midwife technicians, pharmacy officers, pharmacy technicians, pharmacy assistants, laboratory officers, laboratory technicians, and laboratory assistants. For the HSSP III's Health Benefits Package (the successor of the EHP), workforce planning continued to use the prioritized cadres defined in the HRH Strategic Plan 2018-2022. As described above, targets for these cadres were set by the WFOM for primary and secondary level care and set by the establishment for tertiary level care.

Community-based cadres increase access to primary care, increase linkages to communities, and thus create a more equitable and accessible health system. Cadres included in the health workforce interventions in the HSSP III are: Health Surveillance Assistants (HSAs), Senior Health Surveillance Assistants (SHSA), Community Health Nurses (CHNs) and Community Midwifery Assistants (CMAs).

Targets for these cadres were identified through consultation with both national strategic plans and MOH departments. Whilst other community-based cadres are also important, there was insufficient quality data to model their health workforce interventions. Future updates of the HSSP III should include time to collect sufficient-quality data and model the costs for these other important cadres.

The HSSP III also included a case study for health workforce planning for specialists. Support was available to conduct planning for pediatric specialists, and the approach used can be adapted to plan for the specialists needed in all fields in Malawi, such as cardiology, surgery, oncology, etc. The following specialists were planned for: pediatricians, pediatric and child health clinical officers, family medicine physicians, pediatric emergency medicine physicians, child health nursing specialists, critical care nursing specialists, child critical care nursing specialists, palliative care nursing specialists, and neonatal nursing specialists. Targets for these cadres were set by the Delphi method for secondary level care and set by the establishment for tertiary level care.

*Details of Pre-Service& Salary Interventions*

Interventions for scholarships, faculty, infrastructure, and equipment were designed to address the identified capacity gaps at training institutions to ensure scaled-up enrollment to meet the health workforce targets. Transportation was not included in intervention design, as transportation support for students is not provided in Malawi. Details on pre-service interventions are available below.

- **Scholarships** were costed for all trainees at target enrollment level and account for tuition for the duration of the program. When presented with the four intervention domains, most training institutions shared that scholarships were the biggest barrier to scale-up – that faculty, infrastructure, and equipment could be configured to provide training of sufficient quality, but financial support for students was the primary bottleneck to increasing enrollment.

- **Faculty development and salary interventions** were used to address faculty gaps between the current availability of faculty and the ideal number of faculty if enrollment targets are reached (the ideal number was determined by an ideal student: faculty ratio provided by training institutions for each faculty type, and the target enrollment). Three types of interventions addressed the faculty gap:
    - hiring faculty from the existing labor pool, which was chosen if a training program existed in-country and it could be assumed that the cadre was available in the labor pool.
    - sending trainee faculty for advanced qualification study in-country, which was chosen if a new advanced qualification program was available in-country where it could not be assumed that there were sufficient numbers of that cadre available in the labor pool as the program is new.
    - sending trainee faculty for study abroad, which was chosen if no program was available in-country.

  Trainee faculty sent for in-country advanced qualification study and study abroad were presumed to be hired by the system immediately upon graduation; faculty in the existing labor

pool were hired as soon as program scale-up required them. Salaries for faculty were also costed based on their year of hire.

- **Infrastructure interventions** were broken into five types of infrastructure: classrooms, skills development laboratories, lecture theaters, libraries, and residence halls. Similar to faculty, the ideal capacity of infrastructure was determined by ratios – each infrastructure type had a unique method for doing so and is detailed in *Section 3.6* on methods for intervention design. Whilst classrooms and skills development laboratories stay within the department and were designed and costed to cadre-specific interventions, lecture theaters, libraries, and residence halls serve all departments within a training institution and were designed and costed in a cross-cutting manner. The cost during the HSSP III period for infrastructure for institutions that provide in-classroom training only include basic equipment costs like projectors, chairs, and blackboards. Infrastructure costs for institutions that deliver services and provide clinical training are discussed in the next section.

- **Equipment interventions** focused on equipment required for the skills development labs. Training institutions provided detailed lists and ideal ratios of all equipment required for the skills labs in each department – for example, the pharmacy department equipment list is 63 items long and the clinical medicine department list is 109 items long. The lists included multiple types of weight scales, different sizes of beakers, PCR machines to run samples, and many other types of equipment. Similar to the above, the gap was calculated by comparing current availability to the ideal availability of equipment (deduced from the student: equipment ratio provided by training institutions and the target enrollment). Maintenance costs were also costed at an additional 15% of original purchase price.

The interventions also account for a few other factors:

- **Baseline production relative to the workforce target:** Interventions were differentiated for programs that were producing more health workers at expected baseline enrollment (the average enrollment in past years) than required by the workforce target. For programs producing beyond the 2030 target, all quantities and costs to produce up to the baseline were prioritized and the additional costs for training beyond the workforce target were still included in the HSSP III but deprioritized for government/donor funding due to the limited resource envelope, and the need to ensure public funds are directed towards the most impactful interventions relative to the health workforce target. These additional costs are assumed to be borne by the students themselves or by the private sector.
- **New programs:** The timing of new program enrollment (starting in FY 2025/26) considered availability of curriculum, the need for regulatory approval and administrative steps, etc. although there were no costs associated with those steps as they are routine activities already conducted in the health system.
- **Additional training requirements:** Medical officers require clinical rotations in their pre-service education. Should funding become available to scale-up training for medical officers, it should be confirmed that the proper trainee: bed ratio is still available for high-quality clinical training for trainees. If there are insufficient beds, stakeholders have suggested that all district hospitals

and all central hospitals be converted and capacitated to provide clinical practice to trainees. This will require further consultations to validate and operationalize.

- **Timing**: With the magnitude of scale-up required from most cadres, training institutions do not currently have sufficient infrastructure and equipment to provide high-quality education at the scaled-up target enrollment level. Thus, enrollment scale-up was delayed until FY 2025/26, when optimistically infrastructure and equipment could be in place to support high-quality education.

Finally, salaries were costed to meet the target set by the WFOM. Scale-up was linearly distributed across the years to reach the target from current levels of employment. This was then multiplied by the weighted average of the salary band for the cadre, accounting for inflation each year.

Other Health Workforce Interventions

As described in the HSSP III primary document, platforms of care will be defined after publication of the HSSP III, and cadres will be aligned to the new vision for care. To accompany the platforms of care cadre review, development of a plan will be considered, for phasing out and transitioning cadres, including development of education upgrade and retirement pathways for the phased-out cadre(s) as well as implementation and use of an equipment monitoring system to ensure that new graduates are deployed to facilities that have the equipment necessary to provide high-quality care.

In addition, the HSSP III health workforce planning assumes a 100% absorption rate in the pipeline, as the primary barrier to absorption is the availability of salaries and all salaries are fully costed in the HSSP III. These have been costed and prioritized against the existing fungible resource envelope as part of the HSSP III process. However, it will require additional conversation within government to discuss if scale-up of the wage bill is politically feasible, and if both government and donors are willing to substantially increase funding towards the overwhelming health workforce intervention need required to deliver the Health Benefits Package.

Lastly, other health workforce aspects that greatly affect pre-service training are addressed in the HSSP III. Activities on retention (particularly in rural and hard-to-reach facilities), remuneration, alignment of functional reviews with the WFOM, and allocation of health workers to the facilities that most need them are further described in the HSSP III primary document.

## 1.4 Prioritized Interventions for Funding and Implementation

The HSSP III aims to provide a set of the most important activities, commodities, and other investments that are achievable with the resources available. For the aspirational vision of provision of the HBP at high-quality with no access constraints, at $6.3 billion just for pre-service and associated salary costs across all eight years and $4.0 billion for the aspirational list of sector-wide activities in FY24/25 alone, costs far surpassed the projected resource availability, and a rigorous prioritization process was conducted. Even after scaling down service delivery targets and their associated health workforce targets multiple times, the health workforce interventions were still a major cost driver of the aspirational list of activities that needed to fit within the fungible funds projected to be available in FY24/25 (in the end, health workforce interventions were costed at $538M, constituting 52% of the $1042M prioritized cost that needed to fit within the projected resource envelope of $537M). The prioritization process – to both scale down service

delivery targets, and then to further reduce those interventions in FY24/25 to fit within available resources – is described in this section.

Prioritization Approach #1: Reducing Costs by Running Multiple Scenarios with Increasingly Lowered Targets

For the HSSP III, as a part of the consultative process between Government and health sector donors to ensure that the HSSP III fits within the available resource envelope, a workforce target-setting model was run for several scenarios of varying levels of service coverage and quality, to determine the associated optimal health workforce targets. Three scenarios were run:

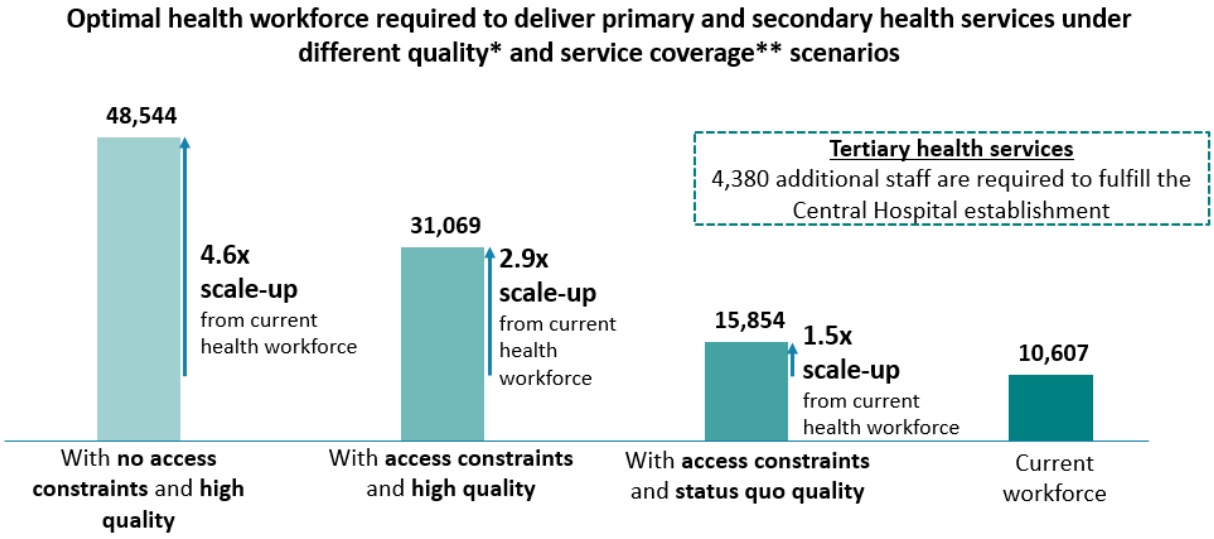



*Figure 1. Optimal health workforce required to deliver service delivery targets in the three HBP scenarios.*

**A "high quality" scenario is considered one in which health workers spend adequate time with each patient and follow all clinical guidelines without rushing through patients. "Status quo" quality reflects the realistic amounts of time that health workers currently spend with patients.*
*** "Access constraints" were applied to certain scenarios, based on the assumption that out of all patients who seek a service, not all of them receive that service (due to supply side constraints such as unavailability of drugs).*

Targets were then fed into a pre-service pipeline model and intervention planning and costing tool to determine the associated pre-service education costs, following the process summarized in Section 1.2. Across all eight years of the HSSP III, inclusive of pre-service and salary interventions, the scenarios cost $6.3 billion, $4.1 billion, and $1.6 billion, respectively. As it became clear that even the least ambitious scenario would require a substantial increase in availability of sector-wide funding for health workforce, as seen below in Figure 2, the least ambitious scenario was selected for the HSSP III.

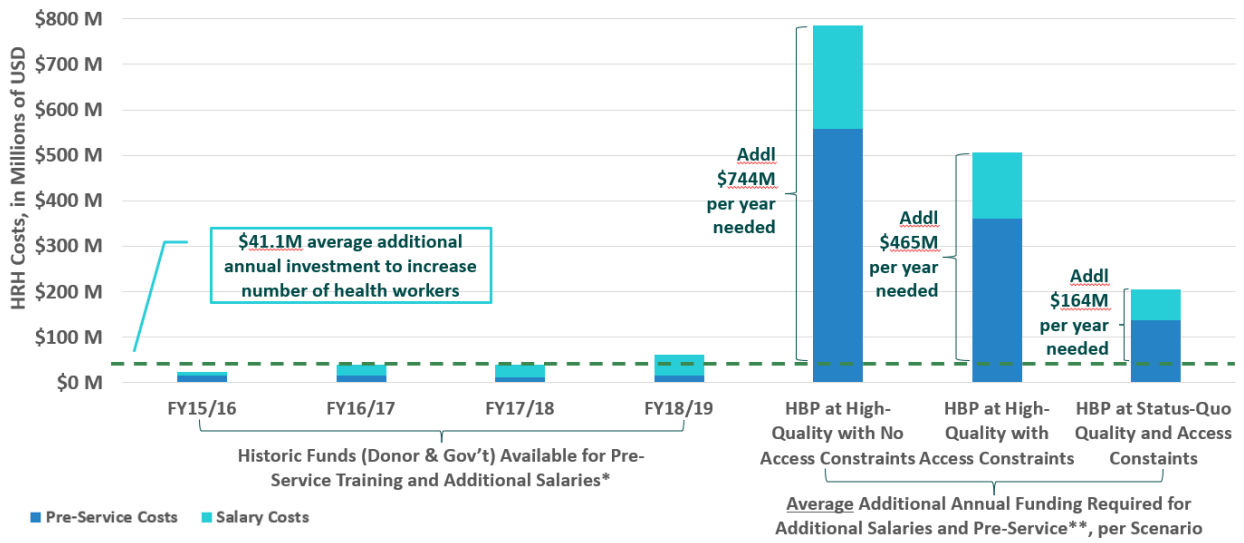



*Figure 2. Average additional annual funding required for salaries and pre-service for various HBP scenarios, compared to historic funding availability.*

**Data is from resource mapping. Historic funding is shown only for pre-COVID years, as allocations for salaries in 2020-2021 included outlier funds for COVID surge hiring. Government funding for workers already in the system are excluded, only increases in gov't funding for salaries and donor funding for salaries are included. Funding for pre-service education from all institutional sources (excluding individuals) are included.*
***for all scenarios, pre-service and salary costs fluctuate widely by year. In order to provide a better picture of the health workforce investment required, an average annual cost was calculated. Salaries for all scenarios include salaries and pre-service costs to satisfy the central hospital establishment – whilst they may not fit the definition of each scenario, they are necessary to consider in the full health system cost.*

Annual costs for pre-service interventions, disaggregated by domain, for the least ambitious scenario – provision of the HBP at status quo quality with access constraints – are available below in Table 1.

*Table 1. Annual costs for delivery of HBP at status quo quality with access constraints in USD*

| Intervention Domain | FY 23/24 | FY 24/25 | FY 25/26 | FY 26/27 | FY 27/28 | FY 28/29 | FY 29/30 | FY 30/31 | Grand Total |
|---|---|---|---|---|---|---|---|---|---|
| Scholarships | $6M | $7M | $13M | $21M | $29M | $37M | $48M | $60M | $221M |
| Faculty Salaries & Development | $0 | $6M | $33M | $45M | $57M | $77M | $98M | $123M | $438M |
| Infrastructure | $0 | $299M | $0 | $0 | $0 | $0 | $0 | $0 | $299M |
| Skills Lab Equipment | $0 | $201M | $0 | $0 | $0 | $60M | $0 | $0 | $261M |
| Total | $6M | $514M | $46M | $66M | $86M | $174M | $146M | $183M | $1,219M |

The costing summary above reflects the timing of intervention implementation: equipment procurement and infrastructure construction costs are concentrated in FY24/25, the next fiscal year, to enable scholarship scale-up and faculty hiring which are conducted in FY25/26. Costing reflects the costs to the whole system – whether government or donors are paying (and in the case of scholarships, some costs for individuals or the private sector for cadres that produce beyond the targets). Costing was conducted in Malawi Kwacha and converted into USD at the 1030:1 conversion rate used in the rest of

the HSSP III. Average inflation was also accounted for year-to-year: like the HSSP III, this costing uses a 14.29% annual inflation rate, the twenty-year average (2001-2020) available from the World Bank.[3]

*Table 2. Pre-service costs for delivery of HBP at status quo quality with access constraints in USD, by cadre by domain*

| ***Pre-Service Education Costs in USD To Meet Access Constrained HBP, Inflated, By Cadre by Domain*** | | | | | |
|---|---|---|---|---|---|
| **Cadre** | **Scholarships** | **Faculty Development** | **Infrastructure** | **Skills Lab Equipment** | **Grand Total (USD)** |
| **Biomedical Sciences Cadres** | **32.0 M** | **186.2 M** | **16.0 M** | **11.0 M** | **238.0 M** |
| Lab Officer | 25.1 M | 184.0 M | 11.9 M | 10.0 M | 224.3 M |
| Lab Technician | 6.6 M | 2.0 M | 4.0 M | 1.0 M | 13.1 M |
| Lab Assistant | 0.3 M | 0.2 M | 0.1 M | 0.0 M | 0.6 M |
| **Clinical Medicine** | **12.8 M** | **3.8 M** | **2.2 M** | **25.0 M** | **42.6 M** |
| Clinical Technician | 12.8 M | 3.8 M | 2.2 M | 25.0 M | 42.6 M |
| **Medicine** | **56.7 M** | **187.4 M** | **1.1 M** | **15.9 M** | **253.5 M** |
| Medical Officer | 56.7 M | 187.4 M | 1.1 M | 15.9 M | 253.5 M |
| **Nursing Cadres** | **121.4 M** | **54.3 M** | **124.4 M** | **207.6 M** | **493.0 M** |
| Nurse Midwife Technician | 73.3 M | 18.7 M | 53.2 M | 150.9 M | 287.4 M |
| Nursing Officer (BSc) | 7.5 M | 7.3 M | 5.1 M | 29.4 M | 47.8 M |
| Nursing Officer (Bsc) - Child Health Nursing | 0.2 M | 0.0 M | 0.3 M | 1.7 M | 2.2 M |
| Nursing Officer (MSc) - Child Health Nursing | 0.4 M | 0.0 M | 0.2 M | 1.7 M | 2.3 M |
| Nursing Officer (MSc) - Child Critical Care Nursing | 1.6 M | 0.6 M | 0.4 M | 1.8 M | 4.3 M |
| Nursing Officer (MSc) - Critical Care Nursing | 0.6 M | 0.8 M | 0.3 M | 1.7 M | 3.3 M |
| Nursing Officer (MSc) - Palliative Care Nursing | 1.6 M | 1.3 M | 0.4 M | 1.7 M | 4.9 M |
| Nursing Officer (MSc) - Neonatal Nursing | 2.4 M | 0.8 M | 0.2 M | 1.8 M | 5.1 M |
| Community Midwifery Assistant | 33.8 M | 24.8 M | 64.4 M | 16.9 M | 135.7 M |
| **Pharmacy Dept Cadres** | **7.1 M** | **0.4 M** | **4.0 M** | **0.6 M** | **11.7 M** |
| Pharmacist | 0.3 M | 0.0 M | 0.0 M | 0.0 M | 0.3 M |
| Pharmacy Assistant | 1.9 M | 0.1 M | 0.4 M | 0.2 M | 2.5 M |

| | | | | | |
|---|---|---|---|---|---|
| Pharmacy Technician | 4.9 M | 0.2 M | 3.7 M | 0.4 M | 8.9 M |
| **Specialist Clinical Training** | **9.3 M** | **23.3 M** | **1.8 M** | **8.7 M** | **41.9 M** |
| Family Medicine Doctor (Pediatrics) | 1.8 M | 2.1 M | 0.3 M | 1.7 M | 5.8 M |
| Pediatric Clinical Officer (Bsc) | 0.2 M | 1.1 M | 0.6 M | 1.7 M | 3.5 M |
| Pediatrician (MMed) | 4.5 M | 17.6 M | 0.7 M | 3.5 M | 25.5 M |
| Emergency Medicine Physician | 0.0 M | 0.0 M | 0.0 M | 0.0 M | 0.0 M |
| Pediatric Emergency Medicine Physician | 2.8 M | 2.5 M | 0.2 M | 1.7 M | 7.0 M |
| **Cross-Cutting Infrastructure** | **0.0 M** | **0.0 M** | **158.8 M** | **0.0 M** | **154.2 M** |
| Across All Programs | 0.0 M | 0.0 M | 158.8 M | 0.0 M | 154.2 M |
| **TOTAL** | **239.3 M** | **455.3 M** | **308.4 M** | **268.9 M** | **1271.9 M** |

Despite limited resources limiting targets to this least ambitious scenario, achieving this scenario will still require a coordinated, sector-wide push to increase availability of funding for health workforce interventions. **Simply to maintain status quo quality – given population changes – even with the addition of access constraints, an average annual sector wide increase of $164M (about a five-fold increase) in health workforce funding will be required, as seen below in** Figure 1**Figure 3.**

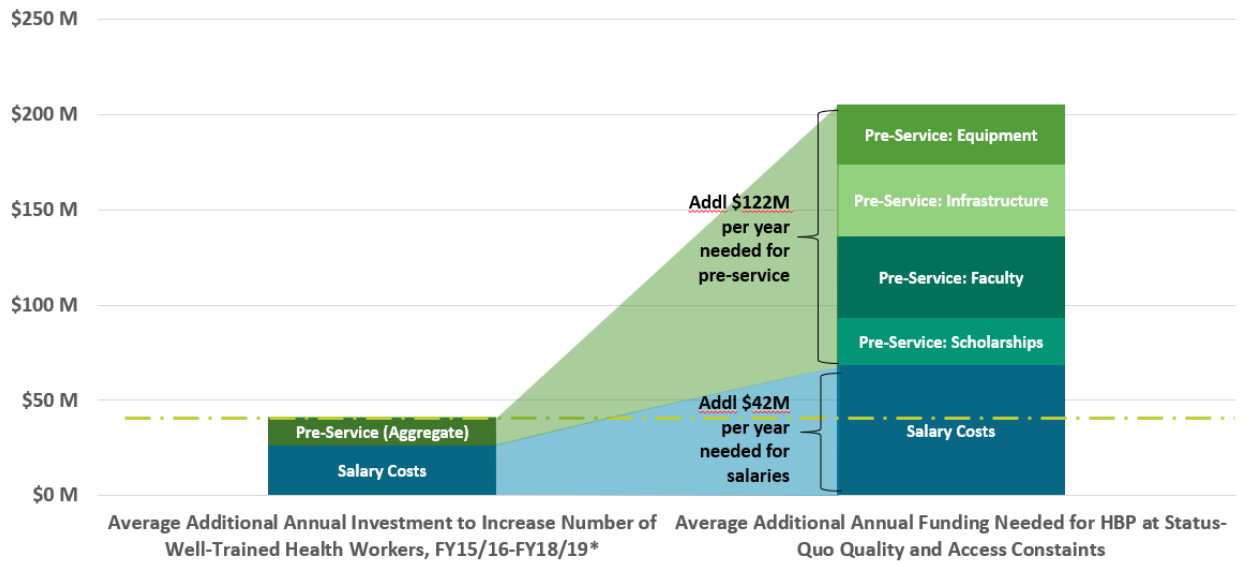



*Figure 3. Average additional annual funding required to deliver the HBP at status quo quality with access constraints, disaggregated by increase in funding required by intervention type.*

<u>Prioritization Approach #2: Selection of Which Interventions to Fully Fund, and Which to Allocate Funds Proportional to Need</u>

The most prioritized costs within the final service delivery and health workforce scenario still cost $1042M in FY24/25, out of $537M projected fungible available resources in the health sector that year (for more details on this process, see Section 6.1 and Annex 4 in the main HSSP III document). Health workforce interventions – inclusive of pre-service and salaries for facility-based and community-based cadres – were allocated $60M out of the $537M, and interventions were further prioritized with a focus on value-for-money and strengthening the community health workforce.

First, absorption of graduates from pre-service training programs in FY24/25 was fully funded at $5.4M, as it is poor value-for-money to not absorb trainees that have already had pre-service capacity and scholarship costs invested in them.

Next, maintaining baseline pre-service education enrolment in FY24/25 was prioritized and fully funded at $6.7M. Scholarships included FY24/25 enrolment and all students currently in the pipeline regardless of their starting year, as the next best value-for-money is to complete the pipeline for students who are partway through their education and have already had costs invested in their pre-service education.

Then, community workforces were prioritized, as a strong community health workforce will not only strengthen equitable access to care, but also increase service provision of primary care. Given the significant resource constraints for the HSSP III, investments in the community health workforce also tend to be cost-effective relative to cadres at higher levels of the health system. Thus, salaries, pre-service education, and supplies for HSA and SHSA scale-up to their respective targets (1 HSA to 1000 population, and 1 SHSA to 10 HSAs) was fully funded at $15.8M. A similar-level investment was allocated to CMAs – $15.6M – covering salaries for the FY24/25 CMA graduating class, scholarships for all CMA trainees enrolled at baseline in FY24/25, and selected investments to improve the quality of education for CMAs at baseline enrolment.

Finally, the remaining $16.1M was allocated towards improving the quality of pre-service training at baseline enrolment. The domain with the most direct link to quality of education is faculty, as training institutions have indicated that infrastructure and equipment can be reconfigured to accommodate more students. The full faculty training and salary costs to reach the ideal student: faculty ratios for baseline enrolment were therefore prioritized for the intervention package. Additionally, selected infrastructure and skills lab equipment needs were also included, though given resource constraints, these are only a subset of the full suite of infrastructure and equipment investments needed to ensure high-quality pre-service education. These costs were also allocated across the various training programs for each health workforce cadre proportional to their need.

<u>Implications of Limited Resource Availability to Fund Health Workforce Interventions</u>

Presuming that the prioritization process in future fiscal years maintains the same process and values, then there will only be enough resources for health workforce interventions to maintain baseline enrollment throughout the remainder of the HSSP III period. However, **unless there is a monumental increase in funding for health workforce interventions, the resultant shortage of health workers will have severe negative impacts on service delivery**.

**If current levels of enrollment are maintained – which will already require increases in health workforce funding – the projected number of health workers will not be able to deliver all estimated services in 2030.** For example:

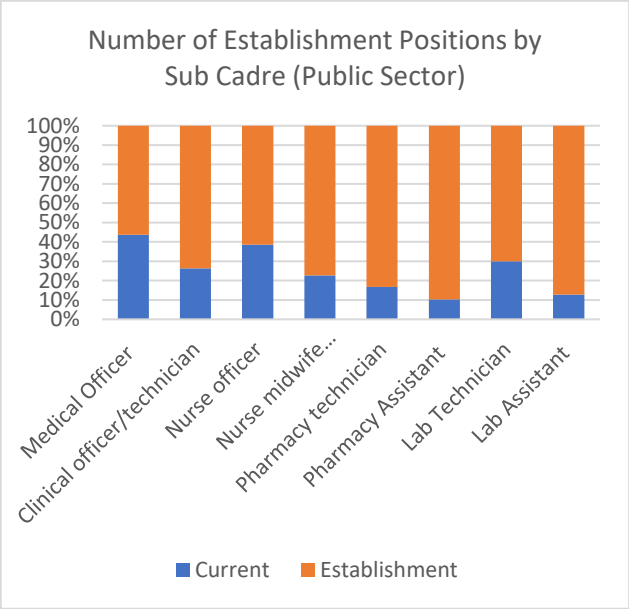
- Nurse Midwife Technicians will only be able to attend to **45%** of the estimated normal deliveries in 2030. This will have seismic impacts on maternal mortality.
- Clinical Officers/Technicians will only be able to attend to **14%** of the estimated major surgeries needed in 2030.

**The Malawi health sector needs to have a coordinated, sector-wide push to increase availability of funding for health workforce interventions in order to even maintain progress made in the past decades on maternal mortality, neonatal mortality, and HIV.** Without increased investment in health workforce, service delivery in all disease areas will decrease in quality and availability, and the people of Malawi will suffer the consequences.

# 2 Introduction

## 2.1 Malawi Country Context

The Health Sector Strategic Plan III (2017-2022) estimated that in the public sector there is a 29%, 63%, 66%, and 79% vacancy rate for medical officers, clinical officers, nursing officers and pharmacy technicians respectively.[4] Vacancy rates for major cadres are presented below in Figure 1.1



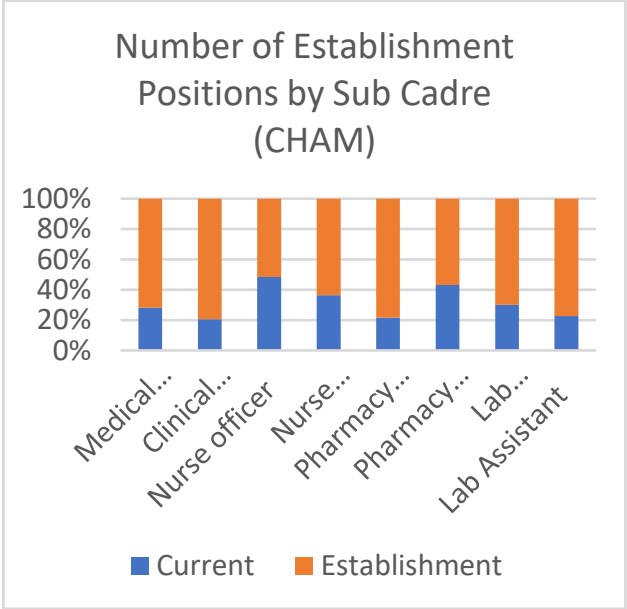




*Figure 4. Vacancy rates for major cadres, 2016*

*Source: Government of Malawi, Health Sector Strategic Plan II, 2017-2022*

As can be seen from Figure 1.1 above, in 2016 the public sector most cadres had a vacancy rate higher than 60% including Clinical Officers, Nursing Officers, Nurse Midwife technicians and Pharmacy Assistants. The same situation is evident in CHAM facilities as well. In a related vein, the HRH- SP (2018-2022) highlights that the establishment underestimates the requirement of specialized health workers to fill the current demand for services, and thus even if all posts were to be filled, there would still be inadequate specialized health workers to meet the current levels of service demand. Such gaps not only constrain citizen's access to high quality health care services but also contributes to country's high rates of maternal and child mortality.[5] In response, for instance the HRH SP (2018-2022) aims to train *inter alia* 15 general pediatricians, 3 pediatric cardiologists, 3 pediatric cardiothoracic surgeons and 20 critical care nurse practitioners (neonatal/pediatric) by the year 2022. This is indicative of the critical shortage of specialists that exists in the public sector.

[4] Health Sector Strategic Plan II
[5] Rapid Assessment of Elma Health Workforce Investments in Malawi report

The training pipeline in Malawi is equally inadequate to meet workforce targets. In-country training of specialized health workers is also limited as further reducing the pipeline for specialists. To ameliorate the gap that exists amongst specialized health workforce and to enhance maternal and child health outcomes, the ELMA foundation has been providing support since 2013 to the Kamuzu University of Health Sciences formerly College of Medicine and Kamuzu College of Nursing and the University of Cape Town to train Malawian pediatric doctors and nurses.

## 2.2 Purpose of the Document

To meet the service delivery targets laid out in Malawi's Health Sector Strategic Plan III 2023-2030 (HSSP III), a thorough, evidence-based approach was used to plan for future health workforce needs across the eight-year period (from fiscal year 2023/24 to fiscal year 2030/31). This detailed annex to the health workforce activities in the HSSP III provides greater detail to the methods, results, and activities required to produce the health workforce necessary to deliver the levels of service targeted by the HSSP III.

Against the background explained in the previous section particularly with regards to shortage of health workers both general and specialized, and the limited training pipeline; this has necessitated a systematic approach to resolving some of the issues. This document anticipates that there would be greater visibility into national needs and plans for training and hiring, while augmenting capacity of MOH in HR planning, and creating a coordinated group of key stakeholders and better align donors supporting training and deployment. This ought to ensure that future programs and financial support to training and deployment are better coordinated and aligned to national need, reducing inefficiencies, and increasing the probability that future trained graduates will be hired into the public sector in a timely manner.

Several steps have been taken to produce this document. First, a graduate mapping exercise was undertaken to map the current health workforce candidate pool, including (1) students currently in pre-service training (both generic and upgrading training programs), (2) new graduates who are not yet employed, and (3) health workers who are employed through non-permanent schemes or non-governmental funding and awaiting transition onto government payroll. Second, a training institution capacity assessment was undertaken to identify critical gaps amongst other things in infrastructure, ICT, transportation, faculty staff, skills development laboratory equipment and accommodation. Lastly, a pipeline analysis was done to project pre-service training pipeline to meet current and future health workforce targets.

Having gone through the above steps. These different workstreams have culminated in this costed national health workforce training and absorption. Structurally, this document is organized as follows. Section 1 provides the introduction where brief background of the Malawi health system is given. Section 2 provides the policy framework within which the Malawi Training and Absorption plan operates in. Section 3 is the rationale. Section 4 provides the situation analysis. Section 5 describes the methodology utilized to develop this document. Section 6 provides the findings from the graduate mapping exercise, training institution capacity assessment and the pipeline analysis. Section 7 explains the program theory of change and lastly, Section 8 proposes some interventions.

# 3 HSSP III Approach to Health Workforce Planning, Costing, and Prioritization

## 3.1 Overview of Pre-Service Planning, Costing, and Prioritization

The HSSP III health workforce activities were developed with the goal of conducting the detailed level of planning required to identify specific, tangible goals and activities that present a clear path to meeting the HSSP III health workforce targets and service delivery goals. This manifested in a strong orientation towards evidence and modeling to support the intervention design process. At a high-level, the process was as follows:

1. **Set Health Workforce Targets:** HSSP III targets for service delivery in 2030 were translated into targets for the health workforce required to deliver those services in 2030, through a Workforce Optimization Model (WFOM) and other target-setting methods.

    a. The WFOM uses existing government data sources for service delivery indicators, as well as integrated analytics around healthcare worker activities and productivity to define health workforce targets and propose how health workers can be distributed optimally for the provision of health care services across Malawi at the primary and secondary level of care. These results are available disaggregated by cadre, facility type, district, and facility.

    b. The Delphi Method was used to complement the WFOM and set district targets for certain specialist cadres when there were insufficient data inputs available to use the WFOM. The Delphi method relies on experts in a given space that have the experience, insight, and expertise into the question being addressed – they were put in structured group discussion to achieve consensus on targets for specialists required to provide high quality pediatric services. Whilst pediatric services were the focus of this Delphi exercise, the approach can serve as a model for workforce planning across all specialist cadres needed in the Malawi health system.

    c. Lastly, tertiary hospital targets were extracted from the establishment of central hospitals, which was last updated in August 2020 after all central hospital completed a functional review process and community-based cadre targets were identified from population-based ratios set in national strategic documents and consultations with the relevant departments in the Ministry of Health.

2. **Develop a pipeline that meets health workforce targets and set enrollment targets for each program:** The health workforce targets for the system in 2030 were translated into enrollment targets for training institutions. This analysis accounted for the number of years available for intervention as well as attrition rates, graduation rates, and licensure exam passing rates, and produced target enrollment numbers for each cadre by training institution and by year.

3. **For each program, identify the current capacity (scholarships, faculty, infrastructure, and equipment) to provide pre-service education, the ideal capacity to provide training at the enrollment target-level, and the capacity gap to design interventions for:** Meanwhile, an assessment of current capacity at training institutions was conducted to understand the available scholarships, faculty, infrastructure, and equipment available to support enrollment scale-up. Where capacity was insufficient for scale-up (which was true in almost all programs), training institutions were presented with their enrollment targets and they in turn provided ratios and/or quantities of faculty, infrastructure, and equipment required to provide a high-quality education to the increased number of trainees. The gap was then calculated between the current capacity and ideal capacity, for each type of scholarship, faculty, infrastructure, and equipment named by the training institution for each program.

4. **Develop and cost interventions to address capacity gaps:** Finally, interventions were developed to address the gap between the current capacity for enrollment for each program and the capacity needed to provide high-quality instruction at the target enrollment numbers. Interventions were then multiplied by unit costs to arrive at the full need. Rules of thumb guided this intervention design and are further detailed in Section 3.6 on Intervention Design and Costing Methods.

5. **Iterative target-setting to prioritize health workforce interventions to fit within the identified resource envelope:** as the intervention costs for the initial targets far exceeded the available resources, several rounds of iterative target-setting and costing ensued, until the final round of targets and prioritized interventions fit within the resource envelope. The targets and prioritization process strived to balance impact with fiscal feasibility and responsibility.

Interventions that did not change in scale along with the projected workforce targets were planned vis-à-vis the standard intervention planning process used for the rest of the HSSP III.

Detailed descriptions, methodology, and results of the various target-setting scenarios are available in Section 3.4 on Target-Setting; detailed methodology and results from the various pipelines built for each scenario are available in Section 3.5 on Pipeline; descriptions of the rules of thumb that guided intervention design and costs the various target scenarios can be found in Section 3.6 on Intervention Design and Costing. Lastly, details on the subsequent prioritization process are available in Section 3.7 on Prioritization to Fit Within the Resource Envelope.

## 3.2 Stakeholder Engagement

Stakeholders provided input on all major decisions points throughout the planning process. The Ministry of Health Department of Human Resource Management and Development and Department of Policy and Planning Development were the focal points for development of this document; the Department of Curative and Medical Rehabilitation Services and the Department of Nursing and Midwifery Services were closely involved as well. To develop a well informed and contextually relevant document, the following institutions regularly participated in workshops described in **Table 3** below: the Christian Health Association of Malawi (CHAM) Secretariat and all CHAM colleges, Kamuzu University of Health Sciences, Mzuzu University, select district hospitals, select health centers and all central hospitals.

*Table 3 Stakeholder Engagement throughout planning process*

| Date | Activity | Agenda | Representatives |
|---|---|---|---|
| July 2019 | Project setup and kick off meeting | Introduce the project, its objectives and deliverables to the Director of HR | Director, Ministry of Health Department of Human Resource Management and Development |
| Dec 2019 | Develop Service-Based Staffing Targets for Pediatrics Medical and Nursing Specialists and Other mid-level practitioners | Develop targets for pediatric health workforce using Delphi Method | Kamuzu University of Health Sciences, Mzuzu University, select district and central hospitals |
| Mar 2021 | Validation of Pediatric targets for central and district hospitals | Gain consensus of the targets set through Delphi method by Ministry of Health | Ministry of Health Department of HR, Department of Nursing and Midwifery Services, Department of Curative and Medical Rehabilitation Services and Kamuzu Central Hospital |
| Mar 2022 | Presentation of pipeline model and WFOM assumptions and results | Present initial results of WFOM and pipeline model and validate assumptions being made in pipeline model | Department of Human Resource Management and Development, Ministry of Health HR |
| June 2022 | Intervention design for scale up of pre-service education | Development of assumptions for intervention design: student faculty ratio, faculty types, equipment, etc. | Kamuzu University of Health Sciences, Mzuzu University, Medical Council, Nurses and Midwives Council, Ministry of Health HR, CHAM colleges and Secretariate |
| Aug 2022 | Presentation of pipeline model and WFOM results and intervention design for underproducing cadres | Presentation of final WFOM and pipeline results and decision making on key decisions for scale up of enrollment | Ministry of Health Department of HR, Department of Policy and Planning Development, Department of Nursing and Midwifery Services, the Chief of Health Services, Department of Curative and Medical Rehabilitation Services and Kamuzu Central Hospital, Mzuzu University, CHAM secretariate, Medical Council |

## 3.3 Graduate Mapping

### 3.3.1 Objective

As a part of a broader approach to understanding the critical issues facing the health workforce in Malawi, a study was conducted to ascertain the employment outcomes of people who graduated from a pre-service health workforce program in Malawi between 2016-2018. The goal was to determine the extent of the availability of health workers in the existing labor pool who could be considered for hiring against priority vacancies in the public sector. The number of graduates available, or the stock count, included health workers currently in training, health workers already graduated and unemployed, and health workers employed in temporary schemes (for instance locum or other temporary hiring arrangements). By mapping current graduates and their employment status, the MoH and its partners can gather insights into the magnitude of absorption challenges, as well as a clearer picture of the number of enrollees required for pre-service programs to meet health workforce targets after accounting for absorption of graduates already available in the existing labor pool.

As the graduate mapping exercise was conducted between February and March 2020, results are historical and do not reflect the current employment and unemployment levels of health workers. In the wake of the COVID-19 pandemic and associated increased levels of funding available for recruitment and absorption, government conducted substantial recruitment drives (see **Table 4** below); levels of unemployment were greatly reduced as a result and the outcomes of the graduate mapping would thus be difficult to extrapolate to present day.

Nonetheless, this exercise clearly illustrates the importance and need for improved absorption planning as part of general human resources for health planning and training. As such surges of funding are unlikely to be regularly available, improved processes, understanding, and funding must be prioritized to ensure that amidst high vacancy rates, unemployed health workforce graduates are kept to a minimum and are quickly absorbed to ensure safer staffing levels and higher retention of knowledge, for the betterment of the people of Malawi.

*Table 4 Total number of staff hired and promoted in 2020/21 in Malawi health sector (including the emergency hiring).*

| Type of Health Workforce Change | Number of Staff |
|---|---|
| Number of health workers hired, 2020-2021 | 4421 |
| Number of health workers promoted, 2020-2021 | 359 |
| **Grand Total (Hiring + Promotions)** | **4780** |

### 3.3.2 Approach

A cross-sectional retrospective study design approach was undertaken. Individuals who matriculated between 2016 and 2019 from 18 Malawian pre-service training institutions were sampled (See Table 5 below), given time and resource constraints to interview all graduates. Phone interviews with a sample of graduates from select training programs and institutions across the country were conducted. Graduation outcomes were sampled using two approaches depending on the cadre and from which

program they graduated. Cochran's formula for small populations was used for sample size calculations in all approaches, with an expected employment rate of 50% to maximize sample size, as there was no known previously published research on health sector-specific employment rates post-graduation. Margins of error (MOE), confidence intervals (CI), design effect (DE), and non-response rates could vary from approach to approach. For the overall unemployment rate, a 5% MOE, 95% CI, 2.75 DE, and 2% non-response rate were used, resulting in a minimum sample size of 1,028 over all programs.

*Table 5 List of 17 Training Institutions in Malawi covered in this mapping exercise.*

| Training Institutions |
|---|
| **Daeyang University** |
| **Ekwendeni College of Health Sciences** |
| **Holy Family** |
| **Malamulo College of Health Sciences** |
| **MCHS - Blantyre** |
| **MCHS - Lilongwe** |
| **MCHS - Zomba** |
| **Mulanje Mission** |
| **Mzuzu University** |
| **Nkhoma College of Nursing and Midwifery** |
| **St John of God College of Health Sciences** |
| **St John's Institute for Health** |
| **St Joseph College of Nursing** |
| **St Luke's College of Nursing** |
| **Trinity College Of Nursing and Midwifery** |
| **Kamuzu University of Health Sciences (Main Campus)** |
| **Kamuzu University of Health Sciences (Lilongwe Campus)** |

#### *3.3.2.1 Sampling Approach 1 – For non-nursing and midwifery training programs*

For these programs, the sample size was calculated using a 10% MOE and a 90% CI, with a DE of 1.0 and a non-response rate of 2%.

Table 6 details which cadres received this sampling methodology. The sub-cadre of Nursing Officer, Mental Health was grouped with these programs due to it being more focused on psychosocial training rather than nursing skills and having very few graduates (32 total).

*Table 6 List of sub-cadres under sampling approach 1*

| Sub-Cadres | Sample size needed |
|---|---|
| Medical Officer / Specialist | 57 |
| Medical officer / Specialist / Optometrist* | 20 |
| Medical officer / Specialist / Physiotherapist* | 42 |
| Clinical Officer / Technician | 60 |
| Clinical Officer / Technician / Optometry* | 26 |
| Clinical officer, mental health* | 32 |
| Clinical Officer / Technician / ENT* | 19 |
| Medical Assistant | 62 |
| Nursing officer, mental health* | 22 |
| Lab Officer | 56 |
| Lab Technician | 52 |
| Pharmacist | 43 |
| Pharmacy Technician | 36 |
| Pharmacy Assistant | 39 |
| Dental therapist | 34 |
| Radiography technician | 30 |
| Counsellors* | 25 |

*Table 7 List of institutions where sampling approach 1 was applied.*

| |
|---|
| 1. Ekwendeni College of Health Sciences |
| 2. MCHS – Blantyre |
| 3. MCHS – Lilongwe |

| |
|---|
| 4. Malamulo College of Health Sciences |
| 5. Mzuzu University |
| 6. University of Malawi – College of Medicine |
| 7. St. John of God College of Health Sciences |

This sampling approach allows for analysis of graduation outcomes at the sub-cadre level for graduates between 2016 and 2018. The total population eligible to be sampled was 2,811 students of which 925 (by sub-cadre, ranging between 22 and 88) were ultimately sampled. Sampling Approach 2 – For nursing and midwifery training programs

All the institutions training nursing cadres were sampled differently using a two-stage cluster sampling procedure. A total of 16 training institutions train Community Midwives (certificate), Nurse Midwife Technicians (NMT; Diploma), and Nursing and Midwifery (Degree). Out of the 16 training institutions, half (eight) were randomly selected at the first stage by assigning a random number using the Excel function. The eight training institutions returning the highest value were selected. From the sampled eight institutions, five offered Community Midwife training, seven offered NMT or Diploma Registered Nursing and Midwifery, and only one offered Nursing and Midwifery at degree level.

Samples were calculated at the individual sub-cadre level with the same MOE and CI as those listed above for non-nursing and midwifery programs (90% and 10%, respectively). A 0% non-response rate and a 1.5 DE were used.

*Table 8 List of sub-cadres under sampling approach 2*

| Sub-cadre | Sample size needed | Total schools | Proposed schools |
|---|---|---|---|
| Nursing Officer | 95 | 3 | 1 |
| Nurse Midwife Technician | 100 | 14 | 6 |
| Community Midwifery Assistant | 93 | 9 | 3 |

### 3.3.3 Results

- Unemployed recent graduates and interest in returning to the profession.

A broad definition of unemployment (reported not currently working) was used to calculate this result rather than the strict definition of unemployment (reported not currently working AND actively looking for a job). Overall, **23.9%** (95% CI 21.4-26.5%) of recent graduates are unemployed (and 76.1% are

employed). Rates by sub-cadres with sufficient sample size range between point estimates of no unemployment (Radiography technicians) to Optometry technicians (75% unemployment):

*Table 9 Sub cadres of graduates by the unemployment point estimate*

| Sub-cadre | Unemployment point estimates | 90.0% Confidence Interval | |
|---|---|---|---|
| | | **Lower** | **Upper** |
| Medical Officer / Specialist | 6.7% | 2.3% | 14.6% |
| Clinical Officer / Technician | 37.6% | 30.4% | 45.3% |
| Clinical Officer / Technician / Optometry* | 75.0% | 60.4% | 86.3% |
| Medical Assistant | 29.8% | 23.7% | 36.5% |
| Nurse/Midwifery Officer | 21.6% | 15.0% | 29.7% |
| Nurse Midwife Technician | 30.5% | 23.1% | 38.7% |
| Lab Officer | 17.9% | 10.0% | 28.4% |
| Pharmacist | 14.7% | 8.2% | 23.7% |
| Pharmacy Technician | 0.0% | 0.0% | 5.8% |
| Pharmacy Assistant | 2.9% | 0.5% | 8.7% |
| Radiography technician | 0.0% | 0.0% | 7.4% |

Not everyone unemployed is necessarily interested in returning to the profession in which they trained. Those who were unemployed were additionally asked if they were willing to return to the profession and overall, about 94% indicated they would be willing. This was multiplied by unemployment point estimates to give an estimated proportion of recent graduates that could be approached to be re-absorbed into the health workforce. Overall, this proportion is 22.4%. While the majority (>90%) of respondents in the above sub-cadres were interested in returning to their professions, an exception was with Medical Officer / Specialists (25%). Those listed in the table below should be considered a potential pool for re-absorption into the health sector.

*Table 10 Sub cadres of graduates adjusted unemployment proportions.*

| Sub-cadre | Of unemployed respondents, the proportion willing to return to the profession | Adjusted unemployment (not currently working AND willing to return to the profession) |
|---|---|---|
| Medical Officer / Specialist | 25.0% | 1.7% |

| | | |
|---|---|---|
| Clinical Officer / Technician | 96.3% | 36.2% |
| Clinical Officer / Technician / Optometry* | 100.0% | 75.0% |
| Medical Assistant | 100.0% | 29.8% |
| Nurse/Midwifery Officer | 100.0% | 21.6% |
| Nurse Midwife Technician | 92.6% | 28.2% |
| Lab Officer | 100.0% | 17.9% |
| Pharmacist | 100.0% | 14.7% |
| Pharmacy Technician | N/A; all employed | 0.0% |
| Pharmacy Assistant | 100.0% | 2.9% |
| Radiography technician | N/A; all employed | 0.0% |

- Employment by sector

Using the lower bound of the overall proportion of unemployed recent graduates (74% employed), an additional sub-analysis was done on overall recent graduates and sub-cadres with enough power for 50% working in the public sector (vs. any other sector), 90% CI, 10% MOE. Overall, 73% (90% CI 70.4-75.5%) were employed in the public sector (any kind of contract). All respondents were additionally employed in clinical settings in the public sector. Proportions by sub-cadre ranged from 84% (Medical assistants) to 12.1% (Pharmacists).

*Table 11 Sub cadres of graduates employed in the public sector.*

| Sub-cadre | Of employed, proportion in public sector point estimates | 90.0% Confidence Interval | |
|---|---|---|---|
| | | **Lower** | **Upper** |
| Medical Officer / Specialist | 67.9% | 56.1% | 78.1% |
| Clinical Officer / Technician | 69.2% | 59.5% | 77.8% |
| Medical Assistant | 84.0% | 76.9% | 89.5% |
| Pharmacist | 12.1% | 5.8% | 21.5% |
| Pharmacy Technician | 82.0% | 70.7% | 90.3% |
| Pharmacy Assistant | 88.2% | 79.8% | 94.0% |
| Radiography technician | 79.5% | 66.0% | 89.4% |

## 3.4 Target Setting

### 3.4.1 Workforce Optimization Model

#### *3.4.1.1 Objective*

As a part of the process of costing the Human Resources for Health requirement in the HSSP III, workforce targets for primary and secondary care were set using target levels of HBP service delivery volumes in Malawi, to understand the districts and the cadres that are most understaffed. The workforce target setting was conducted using a Workforce Optimization Model (WFOM), which was originally developed as a collaboration between the Clinton Health Access Initiative (CHAI) and the Zambian Ministry of Health in 2009[6],and since then, the model has been utilized in Malawi, Lesotho, Liberia, and Swaziland. In Malawi, the WFOM was first implemented in 2010, and then updated in 2014.[7] [8]

#### *3.4.1.2 Approach*

The WFOM uses service delivery data (this can either be demographic and service delivery data collected through the District Health Information System 2 (DHIS 2), or, estimates of target levels of service delivery), as well as integrated analytics around healthcare worker activities and productivity to estimate the number of healthcare workers, by cadre, required to optimize primary and secondary healthcare coverage for all of the public and CHAM health facilities in Malawi. The workforce optimization model was based on a rigorous analysis that was structured to maximize the country's existing data sources. The model logic is outlined in the following equation:

$$\frac{(Number\ of\ services\ provided * Time\ required\ from\ each\ cadre\ per\ service)}{Time\ available for\ patient\ facing\ activities\ per\ health\ worker\ per\ year} = Health\ worker\ requirement$$

The result from this model ("Health worker requirement") can then be compared to established and current positions.

The WFOM can be used to estimate health worker requirement based on current service coverage or based on aspirational service coverage targets. For the HSSP III, the latter was used to calculate three scenarios of varying quality and service coverage:

- The optimal health workforce required to deliver the Health Benefits Package with **no access constraints**, and at **high quality.**
- The optimal health workforce required to deliver the Health Benefits Package **with access constraints**, and at **high quality.**
- The optimal health workforce required to deliver the Health Benefits Package **with access constraints**, and at **status quo quality**.

[6] Walsh FJ, Musonda M, Mwila J, Prust ML, Vosburg KB, Fink G, Berman P, Rockers PC. Improving Allocation and Management of the Health Workforce in Zambia. *Health Aff (Millwood)*. 2017 May 1;36(5):931-937.

[7] Clinton Health Access Initiative. (October 2014). Malawi's Health Workforce Optimization Analysis & Report: A Working Paper. Optimal Allocation of Health Workers Across Malawi's Public Health Facilities.

[8] Nkhoma L, McKay C, Chimota H, Mabvumbe E, Gunda A. (2017, November). Determining health worker staffing requirements through demand-based modeling in Malawi. Poster presentation at the 4th WHO Forum on Human Resources for Health. Dublin, Ireland.

These scenarios and their results are described in greater detail in this chapter.

#### *3.4.1.3 Data Sources*

Data for the WFOM was synthesized from a comprehensive range of sources and organized as described below:

- **Facility list:** A master facility list for the whole country was required, in order to designate which sites will be included in the WFOM calculations**.** A unique set of facilities was consolidated, mainly drawing from the Master Health Facility Registry, the list of facilities in DHIS2 data, HIV data and TB data, etc. Facilities were eligible to be included in the model if the facility (a) had any HMIS data available for 2019, (b) is a district hospital, community hospital, or health center, (c) is owned by MOH or CHAM, (d) is marked as functional in Malawi Master Health Facility Registry or is otherwise known to be functional. This resulted in a total of 672 included sites.

*Table 12 Number of facilities included in the WFOM, by type.*

| Facility Type | Number of facilities included in WFOM |
|---|---|
| District Hospital | 25 |
| Community Hospital | 66 |
| Urban Health Centre | 546 |
| Rural Health Centre | 35 |
| **Grand Total** | **672** |

- **Health service delivery volumes**: In Malawi, the package of services to be included in the model had previously been defined by the Malawi Health Sector Strategic Plan II (2017-22). Services were included in the WFOM if they were services that consumed the majority of the patient-facing time spent by the priority cadres in the model; and, had reliable and regularly collected service volume data, available at the facility-level. For the HSSP II, the WFOM used service delivery data from sources such as the DHIS2. For the HSSP III, however, the WFOM scenarios did not use existing service delivery data; instead, projected levels of service delivery under the newly defined Health Benefits Package were estimated. For each intervention under the HBP, the target population in 2030 was defined (through modelling, various reports, etc.), and a demand constraint was applied to it, to arrive at the expected number of visits in 2030. The expected number of visits in 2030 was then mapped to relevant WFOM indicators and assigned a percentage to dictate what proportion of the 2030 visits should be mapped to the WFOM indicator. For example, the intervention "Treatment of injuries (Fracture fixation)" from the HBP was estimated to have 20,801 visits in 2030. The intervention was mapped to the WFOM indicators 'AccidentsandEmerg, 'IPAdmission', 'InpatientDays', 'LabHaem' and 'LabTrans'. For each indicator that it was mapped to, a percentage was defined. All (100%) of the 20,801 visits were mapped to the WFOM indicator 'AccidentsandEmerg'. However, only 5% of those visits are assumed to require blood transfusion, so 5% of 20,801 visits (i.e., 1,041 visits) were mapped to 'LabTrans'.

  Once all interventions had been mapped to WFOM indicators, the 2030 service volume for each WFOM indicator was calculated by totalling the services assigned to it as described in the previous step. The 2030 service volumes were then divided among facilities using a 2-step process:

1. The 2030 service volumes for each WFOM indicator were split across the four facility types (district hospitals, community hospitals, rural health centers, urban health centers) using the same proportions that the 2019 service volume was distributed across them. For example, if rural health centers had 70% of Under5OPD visits in 2019, then 70% of the projected 2030 service volume load for Under5OPD visits was assumed to be delivered at rural health centers.
2. To calculate the service load at individual facilities, the 2030 service volume for a particular WFOM indicator of a particular facility type was split across facilities using the same proportion of services that the facility provided in 2019, compared to other facilities of the same type. For example, if Ndirande Urban Health Center provided 2% of all the ANC visits provided by urban health centers in 2019, then it was assigned 2% of the 2030 ANC visits service volume that was provided by urban health centers.

All services under the HBP were mapped in a similar fashion to the same set of service delivery indicators used in the HSSP II, with the addition of a few more indicators. The complete list of WFOM indicators used for the HSSP III are as follows:

- **Inpatient / outpatient care**
    - Over-five outpatient department visits
    - Under-five outpatient department visits
    - Inpatient days
    - Inpatient admission
- **HIV**
    - PMTCT visits
    - Adult HIV treatment visit - established patient, stable
    - Adult HIV treatment visit - new patient
    - Adult HIV treatment visit - established patient, non- stable
    - Pediatric HIV treatment visit
    - HCT Negative
    - HCT Positive
    - Voluntary Medical Male Circumcision
- **TB**
    - TB visit - new patient
    - TB visit – Follow-up visit
- **Misc**
    - Accidents and Emergencies
    - Major Surgery
    - Minor Surgery
- **RMNCH**
    - STI treatment
    - ANC - first visit
    - ANC - follow-up visit
    - Caesarian Section
    - Complicated Delivery
    - Normal Delivery

    - EPI visit
    - Under-five malnutrition
    - Family planning visit
- **Lab**
    - Biochemistry
    - Cytology
    - Haematology
    - Microbiology
    - Molecular
    - Point Of Care tests
    - Parasitology
    - Serology
    - TB Microbiology
    - Blood Transfusions
- **New indicators**
    - HPV Vaccination
    - Covid19 Vaccination
    - Cholera Vaccination
    - Mental Health – New cases
    - Mental Health – Complex cases
    - Mental Health – Non-complex cases
    - NCDs – New cases
    - NCDs – Complex cases
    - NCDs – Non-complex cases
    - Cervical Cancer Diagnosis
    - Cervical Cancer Treatment
    - Family Planning – Follow-up visit

- **Health worker activity times**: In 'high quality' scenarios of the WFOM, the activity times were defined as the number of minutes required to provide a service without rushing through patients and following all clinical guidelines. These activity times was established using a consultation workshop with medical, nursing, pharmacy and laboratory officers from various districts to revise assumptions used in previous modelling exercises, which were originally based on time-motion observations and expert opinion. For the new indicators added for the HSSP III (i.e., those under the sub-heading 'New indicators' in the previous sub-section), activity times of similar existing WFOM indicators were used, or were collected through expert consultation. For 'status quo quality' scenarios, an approximation of the 'status quo' time to deliver a service was arrived at by dividing the current health workforce for each cadre by the optimal health workforce required to deliver current levels of services at high quality and multiplying this ratio with the 'high quality' activity time for that service.

- **Health worker patient-facing time**: The number of minutes available per year for a health worker to provide direct patient services was determined based on the number of days worked in a year (accounting for national holidays and other policies governing the number of days worked), and assumptions about how much time is spend on management or administrative tasks versus patient

care during days worked. These assumptions were validated in a consultation workshop with medical, nursing, pharmacy and laboratory officers from various districts.

- **Current health workers**: The number of current health workers was based on staff return data for MoH facilities collected in 2021 and for CHAM facilities, collected in January 2022.

The activity time data was input into the WFOM to calculate the health worker time required per category of health service, and the service volume data was input to determine the utilization frequencies at the health facilities. The human resources requirements were then calculated according to the above-mentioned formula to determine the number of staff demanded at each type of health facility across the country. Because staffing decisions are made at the facility level, all health worker needs per facility are rounded up to the nearest whole number to ensure that the full demand is met at each individual facility.

The results of the model were then compared to the current health workforce to calculate gaps between the optimized demand-based health workforce targets, and the current staff by district, cadre, and facility type. The cost of salaries for the additional health workers to be hired was also calculated.

As mentioned earlier, the WFOM was run for different scenarios for the HSSP III, with varying levels of service coverage and quality to determine the optimal health workforce targets. Through continuous iterations between government and donors, the health workforce targets were gradually scaled down until the associated salary and pre-service costs required to meet the targets fit into the realistic resource envelope projections for the Malawi health sector. The various scenarios also account for changes to the distribution of where services are provided in line with HSSP III policy directives (e.g., moving primary and secondary care out of central hospitals to ensure that the central hospitals can focus on delivering tertiary care). Section 3.7 describes each scenario and the associated results in detail.

### 3.4.2 Tertiary Care Vacancy Analysis

The Workforce Optimization Model is used for primary- and secondary-level health services, but is considered unsuitable for tertiary-level services, due to the complex and varied nature of the work done by tertiary-care specialists. Therefore, to calculate the vacancy among tertiary-care staff at Central Hospitals, the current staff was compared the established staff. This is appropriate given that the Central Hospital establishments have been recently updated, which is not the case for all districts across the country necessitating further analysis for other districts.

Current staff returns for the five Central Hospitals in Malawi – Kamuzu Central Hospital (KCH), Queen Elizabeth Central Hospital (QECH), Mzuzu Central Hospital (MCH), Zomba Central Hospital (ZCH) and Zomba Mental Hospital (ZMH) – were obtained from the Malawi Human Resources Information System in 2021, along with the latest establishment from 2014/15. The staff returns and establishment for each hospital were cleaned, and each post was tagged to a WFOM cadre for comparability between the datasets.

Using the department, cadre name and grade, the staff returns for KCH, QECH, ZCH and ZMH were compared to the establishment on a post-to-post basis to calculate the number of vacant positions for each post listed in the establishment. The vacancy gap for each post was then multiplied by the salary of the relevant grade, to arrive at a costed vacancy gap.

The staff returns for MCH did not contain department-level information, and therefore a post-to-post comparison was not possible. As a proxy, the vacancy for each post in KCH was used instead, adjusting for the total staff in MCH. In other words, the ratio of established posts in MCH to KCH (0.64) was multiplied with

the number of vacancies for each post in KCH, to arrive at the vacancy for the same post in MCH. For example, if there were 3 vacancies for a Grade 'G' Clinical Officer in the Clinical Dietetics department, then the vacancy for the same post in MCH was calculated to be 2 (i.e., 3*0.64=1.92, which was rounded up to 2).

To meet the central hospital establishment, 4,382 additional staff need to be hired. The average annual cost of salaries of these additional health workers is estimated to cost US$33 million per year.

### 3.4.3 Delphi Method

#### 3.4.2.1 Objective

There are several target setting approaches. Where there is robust data available and easily accessible, the WFOM has been used to set targets for health workforce. However, where data is scanty or not readily available, the Delphi method is instructive. The objective of the Delphi method is to gain group consensus and action plan on a given topic. Therefore, the nominal group technique brings together experts in a field to gather qualitative and quantitative information. Thus, the Delphi method has been used as an example of target setting for specialist cadres.

#### 3.4.2.2 Approach

The Delphi method relies on experts in a given space that have the experience, insight, and expertise into the problem being addressed. In this instance, experts from the health sector and academic institutions were invited to a one-day workshop held in Lilongwe on 6 December 2019. These experts comprised of pediatricians, family medicine doctors, medical officers, nurses, clinicians and directors of health and social services from district hospitals. The participants were divided into three groups with 5 participants in each to set pediatric health workforce targets for district hospitals. All groups were provided with a list of pediatric services offered at district level and the current cadres that provide those services. Groups were then asked to come up with a list of cadres they thought from their expert opinion, should be providing high quality pediatric services beyond the status quo. Once all groups had finalized their lists, a validation exercise was undertaken to generate consensus on the number of each cadre required at district level.

#### 3.4.2.3 Results

*Table 13 District Level Targets for Pediatric services*

| Department | Cadre | Degree | Target / District | Estimated National Need at District Level | Total Available | Gap |
|---|---|---|---|---|---|---|
| **Clinical** | Family Medicine Doctor | MMED in Family Medicine | 1 | 28 | 0 | 28 |
| | Medical Officer | MBBS | 1 | 28 | 28 | 0 |
| | Pediatric Clinical Officer (BSc) | Bsc Pediatric and Child Health | 3 | 84 | 0 | 84 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Clinical Officer / Technician | Diploma in Clinical Medicine | 4 | 112 | 84 | 28 |
| | Pediatric Anaesthesia Clinician | N/A | 2 | 56 | 0 | 56 |
| | Medical Assistant | Certificate in Clinical Medicine | 2 | 56 | 28 | 28 |
| **Nursing** | Child Health Nurse (MSc) | Bsc Child Health Nursing | 2 | 56 | 0 | 51 |
| | Nurse Midwife Technician | Diploma in NMT | 15 | 420 | 140 | 280 |
| | Child Health Nurse (BSc) | Bsc Child Health Nursing | 3 | 84 | 28 | 56 |
| | Palliative Care Nurse | N/A | 2 | 56 | 0 | 56 |
| | Neonatal Nurse | N/A | 3 | 84 | 0 | 84 |
| | Child Critical Care Nurse | N/A | 2 | 56 | 0 | 56 |
| | **Total** | | **40** | **1,120** | **308** | **812** |

### 3.4.4 Tertiary Hospital Vacancy Analysis

#### *3.4.4.1 Objective*

As illustrated above, the Delphi method can be replicated to set targets for specialists at any level of care and discipline. However, tertiary hospital targets were extracted from the latest establishments of central hospitals. In August 2020, all central hospitals produced an updated established after undergoing a functional review process. Therefore, instead of duplicating efforts, targets for specialists required at central hospital level were taken from the new establishments.

#### *3.4.4.2 Approach*

The August 2020 approved new establishments for central hospitals were collected and analyzed. Specifically, the pediatric department was isolated as an area of interest given the high demand for pediatric services at central level but also due to the fact that a large proportion of the Malawi population is under 15 years of age[9].

[9] Statista.com

#### *3.4.4.3 Results*

*Table 14 Central Level Targets for pediatric services*

| Department | Cadre | Established Posts |
|---|---|---|
| **Clinical** | | |
| | Clinical Officer | 61 |
| | Clinical Technician | 77 |
| | Medical Officer | 101 |
| | Pediatric Emergency Med. Physician | 15 |
| | Pediatric Surgeon | 13 |
| | Pediatrician | 38 |
| **Nursing** | | |
| | Child Health Nursing Officer | 68 |
| | Critical Care Nursing Officer | 13 |
| | Emergency & Critical Care Nursing Officer | 6 |
| | Nurse Midwife Technician | 405 |
| | Nursing Officer | 243 |
| | Orthopaedic Nursing Officer | 3 |
| **Total** | | **1043** |

## 3.5 HRH Pipeline Analysis

### 3.5.1 Objective

The objective of a health worker training pipeline model is to estimate the number of health workers expected to be available in the future workforce based on current training, recruitment, and retention trends, and under various intervention scenarios. Practically, the model provides the pace of scale up required – at each program/training institution level – to meet national workforce targets, to support evidence-based planning and operationalization of HRH interventions.

### 3.5.2 Approach

The pipeline model takes as its foundation the current workforce and adds to this the expected future inflow of health workers (e.g., those graduating from training institutions), and deducts the projected future outflow due to retirement, attrition, or health workers who have gone back to school for training. The model uses the following equation to calculate future available workforce on an annual basis:


Were,

- (1) = Current staff as reflected in MoH and CHAM staff returns.
- (2) = (Absorption rate) * [(Enrolled students) − (non-licensed or non-graduating students)] + (Upgrades)
- (3) = (Retired staff) + (Involuntary attrition, e.g., death) + (Voluntary attrition, e.g., transition to private sector employment) + (Education leave).

The model was run using baseline data and workforce assumptions presented in Table 15 below to calculate the projected future available workforce in the non-intervention scenario, as well as in scenarios to reflect health worker scale up required to meet the needs of varying service delivery packages (see Section 3.6 on the scenarios).

*Table 15 Pipeline model assumptions and sources*

| Assumption | Figure | Source |
|---|---|---|
| **Current public sector workforce** | Program-specific; see cadre summaries for details | MOH and CHAM staff returns |
| **Number of currently enrolled students/trainees in each program** | Program-specific; see cadre summaries for details | Training institution program records |
| **Graduation rate** | 80% for generalist cadres;<br>90% for specialist cadres | Training institution program records |
| **Licensing exam passing rate** | 90% for generalist cadres;<br>100% for specialist cadres as they are already licensed and do not undergo further licensing exams to become specialists | Training institution licensure exam records |
| **Yearly average workforce attrition to retirement, involuntary leave, voluntary leave, and education leave** | For generalist cadres:<br>1% loss to retirement<br>2% loss to involuntary attrition<br>3% loss to voluntary attrition<br>1% loss to education leave<br><br>For specialist cadres:<br>1% loss to retirement | Stakeholder consultation |

| | | |
|---|---|---|
| | 1% loss to involuntary attrition<br>2% loss to voluntary attrition<br>1% loss to education leave | |
| **Absorption rate** | 100% | Whilst there are cadre-specific absorption rates available from the 2019/2020 graduate mapping exercise, the primary barrier to absorption is availability of salaries. As salaries for all graduates are fully costed and prioritized for funding in the HSSP III, it is assumed that 100% absorption is possible. |

### 3.5.3 Results

Results for the pipeline for each scenario are available in Section 3.6 on prioritization. Note that due to the launch timeline of the HSSP III, enrollment projections for the HSSP III assume that 2022 enrollment maintains current levels of employment, with planning for the HSSP III beginning in 2023.

## 3.6 Intervention Design and Costing

### 3.6.1 Objective

The outputs of the pipeline provide a target enrollment specific to the program and year, which is an instrumental, oft-neglected step towards creating an evidence-based plan to meet health workforce targets. To have a comprehensive plan, interventions to meet health workforce targets must consider not only enrollment and accompanying scholarships, but also the enabling environment that supports training – namely the availability of faculty, equipment, and infrastructure. The following section describes how interventions were designed and costed for faculty, equipment, and infrastructure to support pre-service enrollment changes required to achieve HSSP III workforce targets.

### 3.6.2 Approach

#### *3.6.2.1 Overview of Approach*

At a high-level, interventions were designed to address the difference between the current situation and the envisioned goal. The general process for all domains (i.e., scholarships, faculty, equipment, and infrastructure) was as follows:

1. **Identify the ideal capacity / total need:** for scholarships, the total need is the target number of students enrolled across all years of enrollment. For infrastructure, equipment, and faculty, the total need is determined by the ideal student:domain ratios provided by the training institutions, and the target number of students.

2. **Identify the current capacity:** the current capacity was collected from training institutions as to the current availability of faculty, infrastructure, and equipment. This is detailed in the 'training institution assessments' section.
3. **Calculate the gap and design interventions:** a numeric calculation was taken to identify the difference between the current capacity and ideal capacity. Interventions were then designed to address the gap, the various approaches for intervention design are detailed below.

Sequencing and timing were also considered in the intervention design process. Upon seeing the magnitude of scale-up required from all cadres, it became obvious that most programs currently have insufficient infrastructure and equipment to provide high-quality education at the scaled-up target enrollment level. Thus, enrollment scale-up was delayed until FY 2025/26, when optimistically infrastructure and equipment could be in place to support high-quality education. (This timeframe, like the timeline in the rest of the document, assumes immediate and full availability of funds to support the intervention. It also assumes a speedy permitting, design, and construction process.) Accordingly, interventions are specifically sequenced as such:

- all infrastructure construction costs are in FY 2024/25 when construction would occur.
- all equipment procurement costs are in FY 2024/25 when procurement would occur.
- all scholarships for scaled-up enrollment start in FY 2025/26 accordingly.
- if there was a gap at baseline, costs for hiring faculty from the existing labor pool (when training for faculty exists in-country) are in FY 2024/25, otherwise, costs are incurred in 2025/2026 to avoid paying unnecessary salaries before enrollment is scaled-up.
- all costs for study abroad and in-country specialist training start in FY 2024/25 (when further study is required to develop faculty), as faculty trainees will take time to graduate from their training programs so they can begin before scale-up begins, but they cannot begin in FY 2023/24 as application and enrollment in programs takes time. These faculty trainees then become part of the existing labor pool and are hired immediately.

Furthermore, note that due to the launch timeline of the HSSP III, enrollment projections for the HSSP III assume that 2022 enrollment maintains current levels of employment, with planning for the HSSP III beginning in 2023.

Additional guidelines and analyses were also developed for cadres that are projected to produce more trainees than the target in 2030, even without scale-up interventions. Separate quantifications were conducted for the number of trainees to reach the 2030 target, and the additional students required to reach the baseline. This enabled differentiated quantification and costing of capacity investments required to provide high-quality instruction at both levels. Given the limited resource envelope, the investments required to get to the target were prioritized at a higher level in the HSSP III, as compared to the additional investments required to reach enrollment levels beyond the target. This approach was validated at a stakeholder workshop in mid-August and is used in planning and projections starting FY24/25.

#### *3.6.2.2 Data Collection (Training Institution Assessments and Stakeholder Workshops)*

##### 3.6.2.2.1 Training Institution Assessments

Objective

The HSSP III has set targets for health workforce required in the public sector by 2030. These are targets required to provide a comprehensive list of health services at high quality. To meet these health workforce targets, an adequate supply must be guaranteed from training institutions. Given that these targets are significantly high, it was imperative that a training institution capacity assessment is undertaken to answer the following questions:

1. Which training institutions could be expanded to increase the production of these health workers?
2. What are their gaps in terms of infrastructure, equipment, faculty?

Approach

A structured questionnaire was developed which sought to identify gaps in faculty, infrastructure, equipment and learning materials. For training institution capacity, a structured institutional assessment completed by key informant interviews was undertaken. Of the 21 training institutions in the country, a subset was prioritized based on the size of the gap between current availability and the HRH SP target. Those with a >50% gap was prioritized. Given the facts on the ground and the information from the HSSPII and the Human Resources for Health Strategic Plan, the assessments prioritized the following cadres:

- Medical Officer
- Clinical Officer/Technician
- Nurse Officer/Nurse-Midwife Technician
- Pharmacy Technician
- Pharmacy Assistant
- Laboratory Technician
- Laboratory Assistant

For pediatric cadres these were prioritized for assessments:

- Pediatricians
- Pediatric clinical officers
- Family medicine medical officers
- Pediatric emergency medicine physicians
- Child health nursing officers
- Critical care nursing officers
- Child critical care nursing officers
- Palliative care nursing officers
- Orthopedic nursing officers
- Neonatal nursing officers

#### 3.6.2.2.2 Stakeholder Workshops

Using the outputs from the pipeline model, a stakeholder workshop was held with training institutions who oversaw programs with cadres that were under-producing against the public sector workforce target. This meeting aimed to 1) review the outputs from the WFOM and pipeline analysis to ensure training institutions understood the methodology, and 2) review the previous information shared and develop further interventions that would be needed to scale their programs according to the outputs of the pipeline.

Ahead of the consultative workshop, tools were developed to collect inputs from each training institution on the current capacity of their programs, and what additional inputs would be needed to reach the enrollment rates from the pipeline analysis. These inputs include additional faculty requirements, scholarships for training abroad, infrastructure and equipment, skills labs, and other interventions as needed. Where some of the required information was already collected from previous engagement through the graduate mapping and training institution assessment, it was included in the tool for that program and each training institution validated the information and outlined additional needs not previously captured. The workshop was held over the course of two days and was centered around working sessions for each of the training institutions to complete their tools.

Details of the information collected from training institutions, and how that information was used to design and cost interventions, are described in the following section that are specific to intervention design by domain.

#### *3.6.2.3 Detailed Approach for Scholarship Intervention Design and Costing*

The process for scholarship intervention design and costing was relatively straightforward. First, the total student population was assessed for each program – by counting the total student population, the costing can capture for the years in which students were still enrolled and required scholarship support after their initial year of matriculation. An example comparing the approaches for total need are below, with detailed logic of the 'total student population' accounting.

*Table 16 Comparison and Example of Different Methods of Calculating the Total Need for Intervention Design*[10]

| **Total Need Calculation Types for Malamulo College of Health Sciences Lab Technician Program (three years long)** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Total Need Calculation Type** | **FY 2023/24** | **FY 2024/25** | **FY 2025/26** | **FY 2026/27** | **FY 2027/28** | **FY 2028/29** | **FY 2029/30** | **FY 2030/31** |
| Enrollment Only | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| Total Student Population | 60 | 120* | 180^ | 180% | 180& | 180+ | 180+ | 180+ |

* 60 enrollees from FY 2023/24, 60 from 2024/25

^ 60 enrollees from FY 2023/24, 60 from 2024/25, 60 from 2025/26

% 60 enrollees from 2024/25, 60 from 2025/26, 60 from 2026/27, none from FY 2023/24as that class has graduated

& 60 enrollees from FY 2025/26, from 2026/27, 60 from 2027/28, none from 2023/24 or 24/25 as those classes have graduated

+ same logic as in previous years

[10] These numbers are based on a different set of projections and are included here for illustrative purposes only. These numbers do not reflect the enrollment estimates that were used in the most recent model that is used throughout the rest of this document.

Once the total student population was accounted for, this was multiplied by the cost of tuition at each training institution. Standard assumptions were used for tuition costs, based on standard costs at public and CHAM colleges.

#### *3.6.2.4 Detailed Approach for Faculty Intervention Design and Costing*

As described above, training institutions provided the types of faculty (e.g., microbiology lecturers, skills lab technicians) that teach in their program, along with current staffing levels and the ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the target enrollment identified by the pipeline and the ideal student:faculty ratio. The total need was then compared to the current staffing of the program, to identify the faculty capacity gap to provision of quality instruction at the scaled-up enrollment level.[11] An example of this process is available below for the faculty types for the Pharmacy Assistant training program at St. John's Institute for Health:

*Table 17 Sample calculation of total need and gap for faculty intervention design[12]*

| **St. John's Institute for Health Pharmacy Assistant Program Faculty Gap Analysis** | | | | |
|---|---|---|---|---|
| Target Enrollment | 138 | | | |
| **Faculty Types** | **Ideal Ratios** | **Total Need** | **Current Staffing** | **Gap to Intervene On** |
| Pharmacy Specialist | 50:1 | 3 | 0 | 3 |
| Pharmacist | 15:1 | 9 | 2 | 7 |
| Pharmacy Technician | 15:1 | 9 | 1 | 8 |
| Skills Lab Technician | 20:1 | 7 | 0 | 7 |

The gap calculations made evident the sheer volume of health workforce that are needed to become faculty in order to provide high-quality instruction. Given the magnitude of the need, the faculty requirements were added to the 2030 health workforce targets (that are calculated in the WFOM for service delivery only) to ensure that health workforce production accounted for the service delivery needs and faculty needs. This was done through a simple process: all faculty types were tagged with the base cadre that they would be upgraded from, the total need for each base cadre was summed, and then added to the workforce targets. A simple example is pharmacist faculty – all pharmacist needs were tagged as 'pharmacist' and all programs that required a pharmacist had their total need for that faculty type summed, and this sum was added to the WFOM pharmacist targets. A slightly more

[11] Note that there are limitations of this approach for the ratios and total need – without detailed information from training institutions on the number of courses per day a faculty type teaches and the number of semesters each trainee will train under each faculty type, these numbers are likely an overestimate of the true faculty need. However, using the enrollment and not the maximum student population to determine the faculty need balances out the overestimate somewhat, and without detailed data collection on the above information, it is the best estimate possible

[12] This is a sample calculation from a different set of projections and is only meant for illustrative purposes. The numbers in this table are not representative of the actual numbers used for faculty gap analysis in the most up to date scenario used throughout the rest of this document.

complicated example is pharmacy specialist, who is upgraded from a pharmacist. All pharmacy specialist needs were tagged as 'pharmacist', all programs that required a pharmacy specialist had their total need for that faculty type summed, and this sum was added to the WFOM pharmacist targets to account for the need to fill that faculty trainee's vacant role when they become faculty. After the faculty needs were added to the 2030 targets, the pipeline was rerun, and faculty gaps (and equipment and infrastructure gaps) were reassessed to meet these new targets.

After the faculty gaps were finalized, interventions were designed to fill the gap. The following rules of thumb were used to guide whether the faculty gap would be closed through hiring from the existing labor pool, sending trainee faculty to study abroad to then be hired immediately, enrolled in in-country programs for advanced qualifications to be then hired immediately.

#### 3.6.2.4.1 Faculty hired from the existing labor pool.

If a program for the needed faculty type was available in-country, given lack of availability of data stating otherwise, it was assumed that there were enough of that cadre to hire everyone needed in the existing labor pool in the first year of scale-up. As indicated in the overview of the approach, faculty hiring and the associated salary costs do not begin until FY 2025/26 when scaled-up enrollment begins, to enable sufficient time to build infrastructure and procure equipment to enable high-quality education. To ensure that faculty are ready to begin in FY 2025/26, in conjunction with interventions to address bottlenecks in hiring, recruitment processes will begin in 2024 so faculty are in place ready to teach in 2025.

With respect to salaries and qualifications, according to the National Council of Higher Education (NCHE), Minimum Standards for Higher Education Institutions (2015) for programs leading to the award of a bachelor's degree, the minimum qualification of teaching staff is a Master's degree. For programs leading to the award of a Diploma, the minimum qualification of teaching staff is a bachelor's degree. Therefore, to inform the faculty assessments, the assumed minimum qualification required for lecturers were master's degrees or bachelor's degrees respectively. Salary information for Christian Health Association of Malawi (CHAM) colleges were collected from the CHAM secretariate and those for Kamuzu University of Health Sciences (KUHES) and Mzuzu University were collected from the respective universities:

- For KUHES and Mzuzu University, the annual gross salary of a lecturer is at approximately MWK33,639,744 for a lecturer.
- For all other training institutions, faculty types with a diploma/bachelors receive a 'Lecturer Grade I' annual salary (MWK 3,864,00) and lecturers with a master's receive a 'Senior Lecturer Grade H' annual salary (MWK6,240,000).

#### 3.6.2.4.2 Faculty trainees sent for study abroad.

If a program for the needed faculty type was unavailable in-country, given lack of availability of data stating otherwise, it was assumed that there were no persons in that cadre that would be available to become that faculty type. The intervention chosen was to send workers in Malawi to upgrade to the necessary faculty type through a study abroad program. It is imperative that a reasonable number of health care workers remain in the system in-country to provide care at any given time, and thus the number of health care workers taken out of the system to be sent for training at any given time should be limited. Thus, the length of the program and the quantity required to send for study abroad were

considered in the timing and quantities of the study abroad intervention design. The rules of thumb developed were as follows:

- If the study abroad program was two years long or shorter, then up to 10 trainees per year would be sent for study abroad, as they would be taken out of the system for a relatively short amount of time. If the faculty gap was larger than 10, then trainees were enrolled in subsequent years, all in classes no larger than 10.
- If the study abroad program was longer than two years, then up to five trainees per year would be sent for study abroad, as they would be taken out of the system for a longer amount of time (the types of degrees that are longer than two years are listed below). If the faculty gap was larger than 5, then trainees were enrolled in subsequent years, all in classes no larger than 5.
- As mentioned in the overall approach, all study abroad interventions start in FY 2024/25, to allow for time for applications and enrollment and all trainees are assumed to enter the labor pool in Malawi after graduation and hired immediately.
- Standard assumptions were used to determine the length of the study abroad program:
    - Doctor of Philosophy (PhD) were four years long
    - Master of Medicine (MMed) were four years long
    - Other Masters (e.g., nursing) were two years long
    - Bachelor's programs were four years long.
    - Diplomas were three years long.

  The length of the program affected the number of years of tuition that was costed, and the year that the trainee faculty was hired (affecting the number of years of salary costed)
- Tuition costs were all assumed to be at the University of Cape Town, an institution that is regularly frequented by specialists-in-training in Malawi and provides most of the needed programs.

#### 3.6.2.4.3 Faculty trainees enrolled in in-country programs for advanced qualifications.

If a program for the needed faculty type was newly available in-country, it was assumed that there were no persons in that cadre that would be available to become that faculty type, but that training was available in-country to create that labor pool. There were few faculty types for which this was possible, but it was important to consider. Similar to study abroad, as it is important to keep sufficient health care workers in the health care system to continue delivering services, considerations of the length of the program and the quantity required to send for in-country advanced qualification were considered in the timing and quantities of this intervention design. The rules of thumb developed were as follows:

- The same rules of thumb used for study abroad were used here, regarding the length of the program (equal to vs more than two years), the size of the faculty gap (more/less than five or ten), the intervention start year (in FY 2024/25), and the length of the program.
- Tuition costs were assumed to be between 4-4.5M MWK per year, per KUHES tuition costs for specialized programs.

#### 3.6.2.4.4 Faculty to support clinical rotations for medical officers

Medical officers require additional intervention design, as their training includes clinical rotations in teaching hospitals. In mid-August 2022, stakeholders, led by the Chief of Health Services, discussed options for scale-up of clinical rotations for medical officers, and agreed on the following:

1. All medical officer trainees would undergo rotations at district hospitals at the same time, to ensure a case mix that is reflective of the disease burden that affects the majority of the country
2. All medical officer trainees would also undergo rotations at a referral hospital that central hospitals will refer specialized cases too – this will serve as the fourth-level of care and will provide the unique case mix that medical officers should have the opportunity to learn about

To enable this to happen, trainings will be conducted to equip all district hospital medical officers with the teaching and mentorship skills required for them to support the clinical training of medical officer trainees.

#### *3.6.2.5 Detailed Approach for Infrastructure and Basic Equipment Design and Costing*

As described in the overall approach, training institutions provided current infrastructure availability. An ideal student:infrastructure ratios for each infrastructure type was identified based off of the best available information that could serve as the most reasonable proxy for costs. Then, the intervention design process was then conducted based on whether the infrastructure type was department-specific (classrooms and skills development labs), or cross-cutting across all cadres in the training institution (lecture theatres, libraries, and residence halls).

##### 3.6.2.5.1 Infrastructure design for department-specific infrastructure (classrooms and skills labs)

In general in Malawi, classrooms and skills development labs are not shared amongst between departments. After gathering baseline capacity information, individual methods were devised to identify the ideal student:infrastructure ratio for each infrastructure type – this proved necessary because unlike faculty types, training institutions did not provide ideal ratios, but total need for a projected scale-up enrollment target. However, the enrollment numbers changed due to various intervention design decisions, so methods to extrapolate reasonable context-specific ratios became necessary.

Infrastructure design for skills development labs

For skills development labs (SDLs), the ideal student:SDL ratio was determined based on the department type. For the pharmacy and biomedical sciences departments, the lab equipment is comparatively small, so for a unit cost of $151,431.80 (also provided by CHAI's former HRH Infrastructure Manager and includes ventilation, natural and artificial light, a TV, a projector, whiteboards, and chairs) it was assumed that 40 students could fit in such an expensive lab at one time. It was then also assumed that there were four skills labs rotations a day and all students went to lab every day, so a 1:160 student:SDL ratio was identified for those departments. The same process was skills labs in the nursing and clinical/medical programs, but their equipment is larger so it was assumed that one lab of that unit cost could hold 20 students at a time, and at four classes per day with everyday lab, a 1:80 student:SDL ratio was identified for those departments. Then, similar to the process for faculty intervention design, the ratio was used to identify total need (for infrastructure, the need comes from the maximum student population at any given time which accounts for enrollees in previous years that are still in school due to the length of the training program and will need space to be accounted for) and then the current capacity and total need were compared to identify the gap. The gap was rounded up to the nearest integer, and the standard SDL cost was used to cost this intervention.

Infrastructure design for classrooms

For classrooms, training institutions had identified the number of classrooms needed for scale-up to a certain target enrollment number. To identify the ideal student:classroom ratio, first, the seating capacity per classroom was identified based on the original target enrollment and the number of classrooms that training institution identified were needed for that target enrollment. This seating capacity per classroom was then averaged across all programs that train for the same cadre. This became the ideal student:classroom ratio for this cadre, and that ratio combined with the maximum student population at any given time was used to determine the final total need of classrooms for each training institution's program in that cadre. Then, as with faculty and SDLs, the total need was compared to current capacity, a gap was identified and rounded up to the nearest integer, and the standard classroom cost ($100,900, provided by CHAI's former HRH Infrastructure Manager and inclusive of ventilation, natural and artificial light, a projector/plasma TV, and chairs) was used to cost this intervention.

#### 3.6.2.5.2 Infrastructure design for cross-cutting infrastructure (lecture theatres, libraries, and residence halls)

Infrastructure that is shared amongst departments (lecture theatres, libraries, and residence halls) have interventions that are designed for differently in the HSSP III pre-service component. This is because if infrastructure interventions were designed by cadre, the current capacity would be accounted for multiple times in the gap calculation step and the total need would be an undercount. By calculating the gap just once for all programs and departments in a training institution, the current capacity is only accounted for once, resulting in a more accurate estimate of the needed infrastructure.

Calculating Total Need for Cross-Cutting Infrastructure

For cross-cutting infrastructure that addresses the needs for all programs in a training institution, the total need calculation requires different considerations for both the student population that requires the infrastructure as well as the student:infrastructure ratios that ensure sufficient infrastructure is available for high-quality instruction.

For the total student population that requires cross-cutting infrastructure, the maximum student population was identified for each program as the space available in an institution needs to account for all students in the training institution at a time during the length of the program, not just new enrollees. Then, the maximum student population was summed for all programs within a training institution to understand the highest number of students enrolled in that TI during the intervention period if enrollment targets are reached. This became the total student need for each TI.

Identifying per-capita unit costs for cross-cutting infrastructure and conducting costing

For the ideal student:infrastructure ratios, a different approach was taken for each faculty type based on the best available information that was suitable to serve as a proxy. For all cross-cutting infrastructure, it was decided that it was best to calculate an approximate per-capita / per-seat cost, so that training institutions could use to design whatever combination of sizes and quantities that were best suited for their campus and their needs (i.e. if a TI had 200 total students on campus at a time, they could decide to build five 50-person classrooms, or ten 20-person classrooms, or some other combination of sizes and numbers of rooms based on whatever their needs are). A per capita unit cost was deemed reasonable as basic equipment costs like a projector and blackboard were negligible in comparison to capacity-related building costs like floor space and building materials, which were the largest influence on cost). By using

a per-capita cost, ideal student:infrastructure ratios became unnecessary. The approach for identifying per-capita costs for each infrastructure type was as follows:

- For lecture-theatres, it was decided to use a new lecture theater at MCHS-Zomba for a proxy, as their campus recently constructed their first lecture hall that is considered adequate to meet the needs of their total student population. At $253,000 for a state-of-the-art lecture hall for a total student population of 518 students, the per-capita lecture theater cost is $490.32.
- For libraries, it was decided to use a new library at Mzuzu University as a proxy, as their campus recently constructed a new state-of-the-art library that is expected to serve the needs of the total student population of 4000 students at a per-capita library cost of $1250.
- For residence halls, without information on recent construction of a residence hall, assumptions based on lived experience in the Malawi college campus system were made for the costs provided by CHAI's former HRH Infrastructure Manager. At a $1,300,000 building costs, it was assumed that the building held 80 rooms that housed two students per room. At $75/bed, this summed up to a per-room cost of $16,400/room for two persons.

Once per-capita costs or per-room costs were identified, the same process used in other intervention design processes was used. A gap was ascertained between the total need (the maximum student population across all programs in the training institution as described above) and the current capacity (which for most TIs was zero for lecture theaters, a few libraries, and a few hundred beds in residence halls). Then the gap was multiplied by the per-capita or per-room cost for the infrastructure type and the intervention design was complete.

#### *3.6.2.6 Detailed Approach for Skills Lab Equipment Intervention Design and Costing*

Overall, the approach used for equipment intervention design was very similar to the other domains described above. Training institutions provided the equipment types required at all workstations needed in the skills lab for that department (e.g. for clinical cadres, there are separate workstations for reproductive health, pediatrics, medical/surgical, and maternity). They also provided ideal student:equipment ratios for each equipment type. This ratio was combined with the total skills development lab seats required (a combination of seating capacity per lab and number of labs) to produce the total need for each equipment type, which was compared to the current equipment available (a number provided by the training institution; often, this level of detail was not provided by the TI and in such cases, the current availability was assumed to be zero) to identify the equipment. The equipment gap was then multiplied by the equipment unit costs, which were researched extensively from a number of sources including costs from Malawi, the SADC region, and internet catalogues. All equipment procurement costs were placed in 2024, to allow time for procurement processes and to enable enrollment scale-up in 2025. Equipment were presumed to have a standard need for servicing every four years (putting maintenance costs in 2027) at a standard cost of 15% of the purchase price.

The detailed list of equipment types per departmental lab and associated unit costs can be requested from the Ministry of Health.

### 3.6.3 Results

Costs by domain and by year for each of the scenarios are available in Section 1.5. Detailed costs for the final scenario – the HBP with access constraints and status quo quality – with various breakdowns by cadre, by training institution, by year, and by domain are available in Chapter 5.

## 3.7 Prioritization to Fit Within the Resource Envelope

### 3.7.1 Objective

The HSSP III aims to provide a set of the most important activities, commodities, and other investments that are achievable with the resources available. At $4.0 billion USD, the cost of the aspirational list of sector-wide activities in FY24/25 still far surpassed the projected resource envelope for that year, and a rigorous prioritization process was conducted. Even after scaling down service delivery targets and their associated health workforce targets multiple times, the health workforce interventions were still a major cost driver of the aspirational list of activities that needed to fit within the fungible funds projected to be available in FY24/25 (in the end, over $500M, constituting 49% of the $1137M prioritized cost, that needed to fit within the projected resource envelope of $537M). The prioritization process – to both scale down service delivery targets, and then to further reduce those interventions in FY24/25 to fit within available resources – is described in this section.

### 3.7.2 Approach

*Prioritization Approach #1: Reducing Costs by Running Multiple Scenarios with Increasingly Lowered Targets*

For the HSSP III, as a part of the consultative process between Government and health sector donors to ensure that the HSSP III fits within the available resource envelope, a workforce target-setting model was run for several scenarios of varying levels of service coverage and quality, to determine the associated optimal health workforce targets. Three scenarios were run:

- Health Benefits Package (HBP) with no access constraints and high quality,
- HBP with access constraints and high quality, and
- HBP with access constraints and status quo quality

Where:

- a “high quality” scenario is considered one in which health workers spend adequate time with each patient and follow all clinical guidelines without rushing through patients,
- “status quo” quality reflects the realistic amounts of time that health workers currently spend with patients, and
- “access constraints” were applied to certain scenarios, based on the assumption that out of all patients who seek a service, not all of them receive that service (due to supply side constraints such as unavailability of drugs).

Targets were then fed into a pre-service pipeline model and intervention planning tool to determine the associated pre-service education costs. Across all eight years of the HSSP III, inclusive of pre-service and salary costs, the scenarios cost $6.3 billion, $4.1 billion, and $1.6 billion, respectively. Through continuous iterations between government and donors, the health workforce targets were gradually scaled down until the associated salary and pre-service costs required to meet the targets fit into the realistic resource envelope projections for the Malawi health sector.

*Prioritization Approach #2: Selection of Which Interventions to Fully Fund, and Which to Allocate Funds Proportional to Need*

The most prioritized costs within the final service delivery and health workforce scenario still cost $1137M in FY24/25, out of $537M projected fungible available resources in the health sector that year (for more details on this process, see Section 6.1 and Annex 4 in the main HSSP III document). Health workforce interventions – inclusive of salaries and interventions for community-based cadres – were allocated $60M out of the $537M, and interventions were further prioritized with a focus on value-for-money and strengthening the community health workforce.

Details of both prioritization processes and results are available in the subsequent section.

## 3.7.3 Results

### *3.7.3.1 Optimal health workforce required to deliver HBP with no access constraints and at high quality*

First, the most ideal, ambitious health workforce requirement was calculated – i.e., **the optimal health workforce required to deliver the Health Benefits Package with no access constraints and at high quality**. 'High quality' is accounted for in the 'time requirement from each cadre for each service' component of the WFOM formula defined earlier, by estimating the time a health worker requires to deliver a service without rushing through patients, and by following clinical guidelines. These activity times were established through multiple consultation workshops with medical, nursing, pharmacy, and laboratory officers from various districts to revise assumptions used in previous modelling exercises, which were originally based on time-motion observations and expert opinion. 'No access constraints' refers to the service volume targets under the Health Benefits Package in 2030, with the assumption that all those who need a health service and demand the service will ultimately receive it (i.e., there are no supply-side limitations on service delivery).

The service volume data and activity times were run through the WFOM logic described above, to output the optimal health workforce required in 2030 to deliver the Health Benefits Package with no access constraints and at high quality. The optimal health workforce for 2030 was divided equally across the 8-year period of the HSSP III (2022-30). If the 2030 optimal target workforce was not a multiple of 8, the annual health workforce target was rounded up to the nearest whole number (e.g. if the 2030 optimal target workforce for Pharmacy Technicians in Mchinji was 10, which equals 1.25 health workers per year over an 8 year period, then 1.25 was rounded up to 2 health workers per year).

To cost the salaries for additional cadres, the number of additional health workers of each cadre to be hired each year was multiplied with the respective salary of that cadre (using MoH salary data as of April 2022). As each cadre can have health workers of different salary grades, a weighted average was taken across the salary grades using the Staff Returns from October 2021, to arrive at one salary per cadre. An annual inflation factor in line with that used for the rest of the HSSP III costing was incorporated for the salary costs as well.

#### 3.7.3.1.1 Optimal health workforce target-setting to deliver HBP with no access constraints and at high quality

The optimal health workforce required for this scenario was 48,544 health workers – requiring a scale-up of 4.6 times of the current health workforce of 10,607. Figure 5 below shows the optimal health workforce requirement per cadre. Of all the cadres, the highest number of optimal health workers required are Nurse Midwife Technicians, while Lab Officers require the highest scale-up relative to the current number of health workers (20 times scale-up).

Figure 5: Optimal health workforce required to deliver the HBP with no access constraints and at high quality

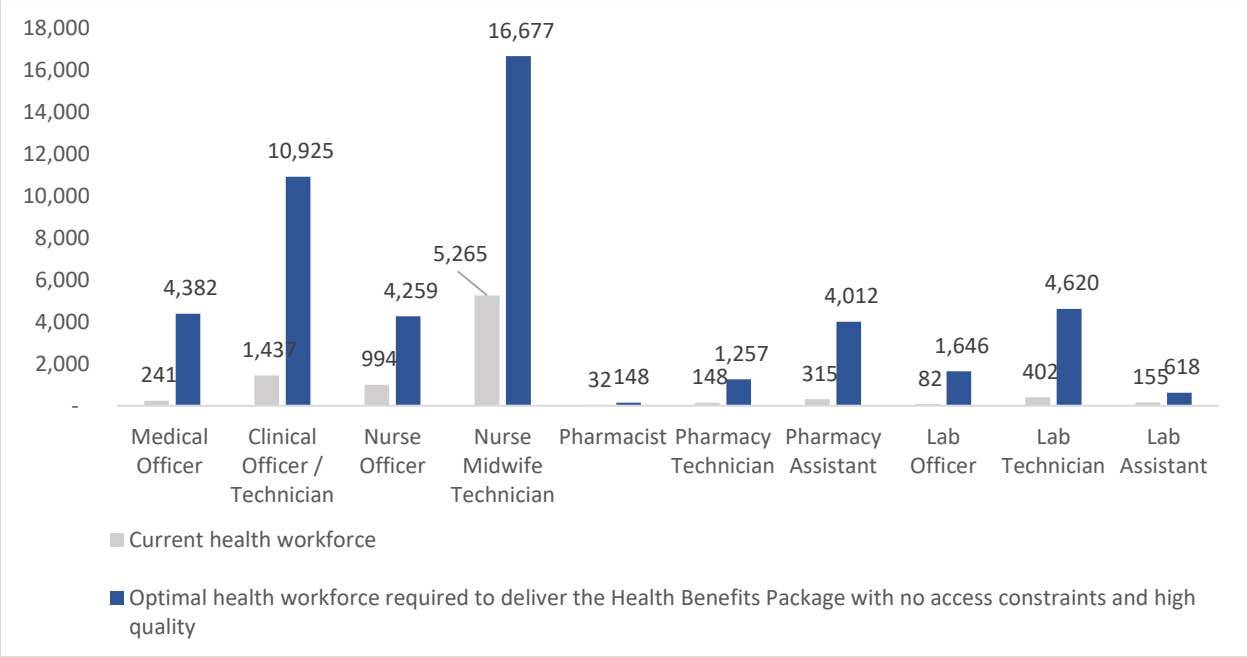



Table 18 below calculates the vacancy rates of this scenario's optimal health workforce target against the current health workforce, disaggregated by districts and by cadres. Phalombe district has the highest vacancy rate across all cadres (87% of the positions required for an optimal health workforce in the district are vacant).

Table 18: Vacancy Rate of health workforce required to deliver HBP with no access constraints and at high quality in 2030, against current staff - by district and cadre

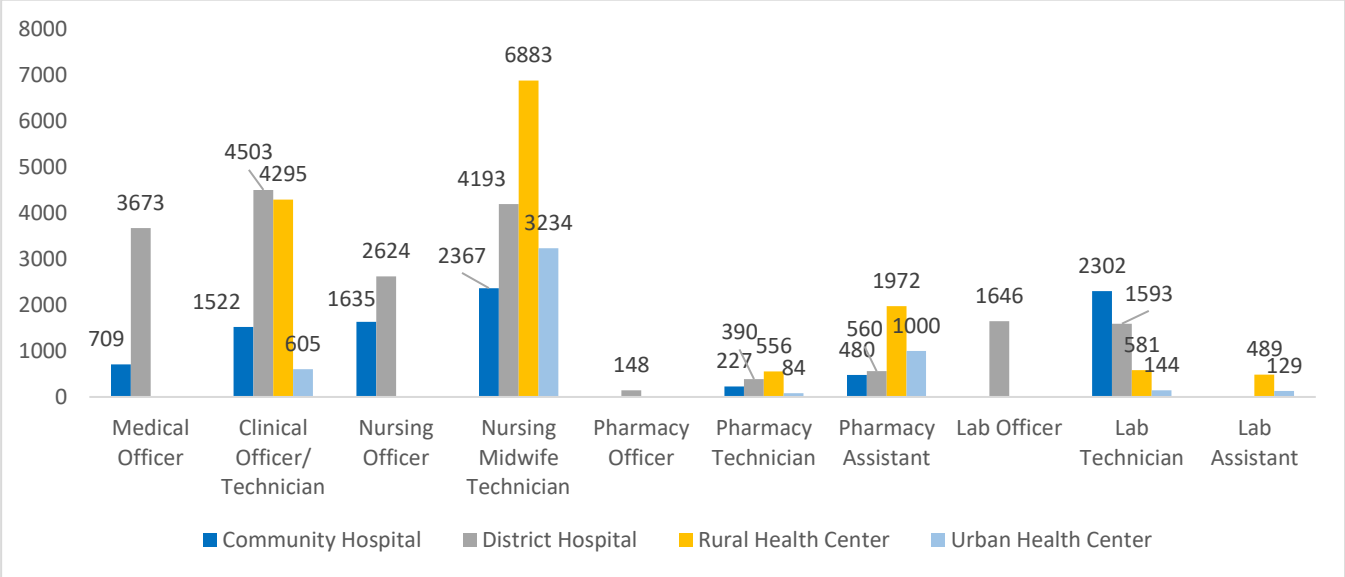
| District | Medical Ofc. / Specialist | Clinical Ofc. / Tech. | Nurse Ofc. | Nurse Midwife Tech. | Pharmacist | Pharm. Tech. | Pharm. Asst. | Lab Ofc. | Lab Tech. | Lab Asst. | All Cadres |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Balaka | 96% | 88% | 67% | 66% | 100% | 84% | 91% | 97% | 87% | 83% | **77%** |
| Blantyre | 22% | 84% | -11% | 74% | | 88% | 95% | | 85% | 85% | **74%** |
| Chikwawa | 95% | 90% | 82% | 71% | 75% | 87% | 91% | 95% | 93% | 50% | **81%** |
| Chiradzulu | 94% | 84% | 74% | 61% | 67% | 84% | 90% | 95% | 92% | 60% | **76%** |
| Chitipa | 94% | 83% | 76% | 56% | 80% | 88% | 87% | 97% | 89% | 88% | **74%** |
| Dedza | 95% | 82% | 73% | 64% | 67% | 92% | 90% | 97% | 82% | 80% | **72%** |
| Dowa | 93% | 85% | 81% | 46% | 50% | 84% | 88% | 94% | 93% | 30% | **71%** |
| Karonga | 97% | 85% | 87% | 65% | 83% | 94% | 90% | 96% | 95% | 93% | **81%** |
| Kasungu | 96% | 92% | 78% | 71% | 75% | 89% | 92% | 90% | 92% | 80% | **80%** |
| Likoma | 100% | 96% | 80% | 29% | | 75% | 100% | | 99% | | **86%** |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lilongwe | 90% | 85% | 72% | 71% | 50% | 80% | 94% | 83% | 85% | -38% | **75%** |
| Machinga | 95% | 90% | 78% | 83% | 83% | 92% | 92% | 95% | 93% | 93% | **85%** |
| Mangochi | 97% | 89% | 86% | 67% | 100% | 92% | 92% | 96% | 94% | 85% | **80%** |
| Mchinji | 95% | 87% | 86% | 74% | 0% | 92% | 90% | 92% | 92% | | **82%** |
| Mulanje | 94% | 87% | 76% | 67% | 100% | 100% | 92% | 96% | 85% | 84% | **78%** |
| Mwanza | 99% | 88% | 75% | 63% | 75% | 73% | 88% | 90% | 80% | 80% | **79%** |
| Mzimba North | 54% | 88% | 54% | 83% | | 90% | 99% | | 90% | 78% | **84%** |
| Mzimba South | 96% | 89% | 77% | 55% | 83% | 92% | 94% | 98% | 94% | 73% | **77%** |
| Neno | 97% | 86% | 76% | 60% | 67% | 80% | 93% | 90% | 80% | 70% | **76%** |
| Nkhata Bay | 95% | 87% | 72% | 58% | 75% | 92% | 89% | 97% | 90% | 90% | **77%** |
| Nkhotakota | 96% | 90% | 77% | 65% | 88% | 87% | 90% | 98% | 92% | 70% | **79%** |
| Nsanje | 96% | 89% | 79% | 71% | 80% | 84% | 92% | 99% | 95% | 60% | **82%** |
| Ntcheu | 96% | 88% | 81% | 70% | 86% | 91% | 92% | 97% | 93% | 95% | **80%** |
| Ntchisi | 97% | 88% | 76% | 71% | 100% | 91% | 90% | 84% | 83% | 80% | **80%** |
| Phalombe | 97% | 94% | 87% | 80% | 100% | 90% | 92% | 96% | 95% | 98% | **87%** |
| Rumphi | 96% | 87% | 82% | 59% | 67% | 93% | 82% | 97% | 95% | 80% | **81%** |
| Salima | 96% | 85% | 79% | 73% | 88% | 94% | 91% | 95% | 89% | 93% | **81%** |
| Thyolo | 95% | 86% | 80% | 69% | 89% | 88% | 92% | 98% | 95% | 60% | **81%** |
| Zomba | 63% | 79% | 39% | 58% | | 79% | 89% | | 90% | 77% | **65%** |
| **All Districts** | **95%** | **87%** | **77%** | **68%** | **78%** | **88%** | **92%** | **95%** | **91%** | **75%** | **78%** |

Note: 'Vacancy Rate' refers to the percentage of optimal health worker posts that are currently vacant. Blank cells indicate that the target for the given cadre and district was zero.

Figure 6 below shows the optimal health workforce requirement distributed across community hospitals, district hospitals, urban health centers and rural health centers. The highest requirement of health workers is as rural health centers, particularly for Nurse Midwife Technicians and Pharmacy staff.

*Figure 6: Optimal Health Workforce Required to Deliver HBP With No Access Constraints and at High Quality In 2030, By Facility Type*



This scenario would cost $193 million in salaries to meet the parameters of the HBP at primary and secondary level, and $559 million annually in associated pre-service education costs to train the additional health workers (note that the pre-service education costs also includes those for tertiary level health workers).

#### 3.7.3.1.2 Optimal pre-service enrollment target-setting to deliver HBP with no access constraints and at high quality

The above targets were fed into the pre-service enrollment pipeline tool to model the necessary enrollment – at a cadre, program, and training institution level – to produce the target health workforce required to deliver an HBP with no access constraints and at high quality. The results are displayed below.

*Table 19. Pipeline Results Displaying Enrollment Required to Deliver HBP Scenario with No Access Constraints at High Quality*

| | | Without Intervention | | With Intervention | |
|---|---|---|---|---|---|
| **Cadres** | **Public Sector HW Target for Scenario (2030)[1]** | **Current Public Sector HW (2022)[2]** | **Baseline Enrollment (Annual)[3]** | **Target Enrollment to Deliver HBP Scenario (Annual)[4]** | **Enrollment Scale Up Factor Targeted [5]** |
| Medical Officer | 5540 | 559 | 107 | 6621 | 62.1 |
| Clinical Technician | 12150 | 1819 | 258 | 2391 | 9.3 |
| Nurse Midwifery Officer | 5676 | 1656 | 408 | 751 | 1.8 |
| Nurse Midwife Technician | 19090 | 5265 | 1330 | 5724 | 4.3 |
| Community Midwifery Assistant[6] | 4868 | 530 | 299 | 1593 | 5.3 |
| Pharmacist | 333 | 83 | 47 | 154 | 3.3 |
| Pharmacy Technician | 1477 | 192 | 34 | 633 | 18.7 |
| Pharmacy Assistant | 4014 | 315 | 274 | 1291 | 4.7 |
| Lab Officer | 4914 | 159 | 95 | 6231 | 65.3 |
| Lab Technician | 4736 | 454 | 74 | 1407 | 18.9 |
| Lab Assistant | 618 | 155 | 75 | 146 | 2.0 |

[1] The 2030 public sector health workforce targets are a sum of targets from several sources: the WFOM targets for the primary and secondary levels of care for the particular HBP scenario, the central establishment targets for the tertiary level of care, and the faculty targets (to account for health workforce that need to become full-time faculty and not deliver services; this is further described in the methods section on intervention design).

[2] Source is the Ministry of Health Staff Returns

[3] This is a projection, based on the assumption that the average enrollment in previous years is maintained. The average is based on enrollment data from 2012-2021, and only accounts for years that the program was operational

[4] The enrollment targets come from the pipeline tool. It considers an 80% graduation rate and 90% licensing exam passing rate as well as an array of attrition rates. See the Methods and Results section for more details on the rates and the rationale for only scaling up enrollment from 2024-2029

[5] The scale-up factor is the scaled-up enrollment divided by the projected annual enrollment

Note that even if funds were available, most cadres have enrollment scale-up factors that will not be logistically feasible – especially 62X scale-up for medical officers, 65X for lab officers. Training institutions

have shared that even a scale-up of several-fold would be difficult to achieve – this scenario would be a moonshot even without cost considerations, which are detailed below.

#### 3.7.3.1.3 Costs to deliver HBP with no access constraints and at high quality

The intervention costs below are the resultant output from feeding pipeline targets into the intervention design and costing tool, for which the methodology is described in Section 3.6.

*Table 20. Intervention Costs by Domain and by Year to Deliver the HBP with No Access Constraints and High Quality*

| Intervention Domain | FY 23/24 | FY 24/25 | FY 25/26 | FY 26/27 | FY 27/28 | FY 28/29 | FY 29/30 | FY 30/31 | Grand Total |
|---|---|---|---|---|---|---|---|---|---|
| Scholarships | $3M | $6M | $29M | $58M | $86M | $111M | $140M | $167M | $600M |
| Faculty Development | $0 | $8M | $166M | $197M | $231M | $280M | $338M | $390M | $1,610M |
| Infrastructure | $0 | $1,577M | $5M | $0 | $0 | $0 | $0 | $0 | $1,582M |
| Skills Lab Equipment | $0 | $540M | $0 | $0 | $0 | $138M | $0 | $0 | $678M |
| Total | $3M | $2,130M | $201M | $255M | $318M | $529M | $478M | $557M | $4,470M |

At an eight-year cost of $4.4 billion, government and stakeholders concluded that this scenario is neither logically nor financially feasible with available resources, and considered a scenario with lowered service delivery targets that were less ideal, but more realistic.

### *3.7.3.2 Optimal health workforce required to deliver HBP with access constraints and at high quality*

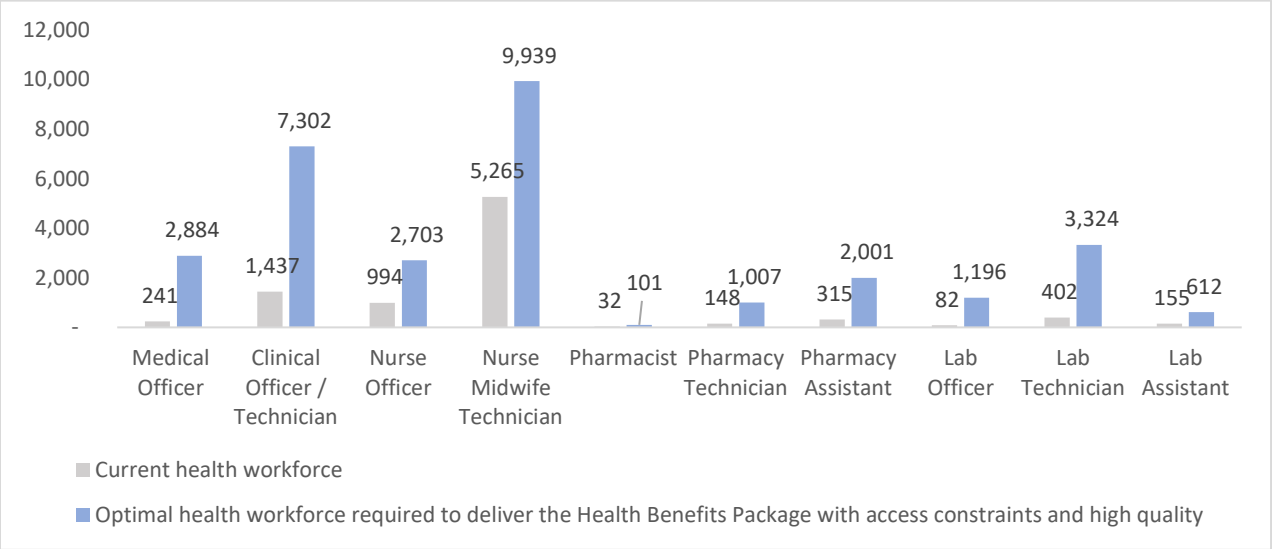
As the costs of the previous scenario were considered unrealistic relative to the existing resource envelope, a new scenario was calculated to estimate the **optimal health workforce required to deliver the Health Benefits Package at high quality, with access constraints**. Here, an 'access constraint' was applied to the 2030 service coverage target described in the previous scenario, based on the assumption that out of all patients who seek a service, not all of them receive that service (due to supply side constraints such as unavailability of drugs). The access constraint was based on fungibility of source funding utilizing CEA and MCDA prioritization. As with the previous scenario, the 'high quality' aspect of interventions were accounted for in the time required to deliver the service such that health workers spend adequate time with each patient, and follow clinical guidelines.

Similar to the previous scenario, the service volume data (now with the access constraint applied where appropriate) and activity times were run through the WFOM logic, to output the optimal health workforce required in 2030 to deliver the Health Benefits Package with access constraints and at high quality. The resulting optimal health workforce for 2030 was divided equally across the 8-year period of the HSSP III, with the same rounding-up methodology described in the previous scenario. The salaries for the additional cadres were calculated the same way as described before, by using a weighted salary average for each cadre, and multiplying it with the number of additional health workers to be hired each year.

### 3.7.3.2.1 Optimal health workforce target-setting to deliver HBP with access constraints and at high quality

This scenario resulted in an optimal health workforce of 31,069, requiring the current health workforce to scale up 2.9 times by 2030. Figure 7 below shows the optimal health workforce required per cadre under this scenario.

Figure 7: Optimal health workforce required to deliver the HBP with access constraints and at high quality




The district- and cadre-level vacancy rates against the workforce targets are displayed in Table 21, and facility-level workforce targets are in Figure 8 below.

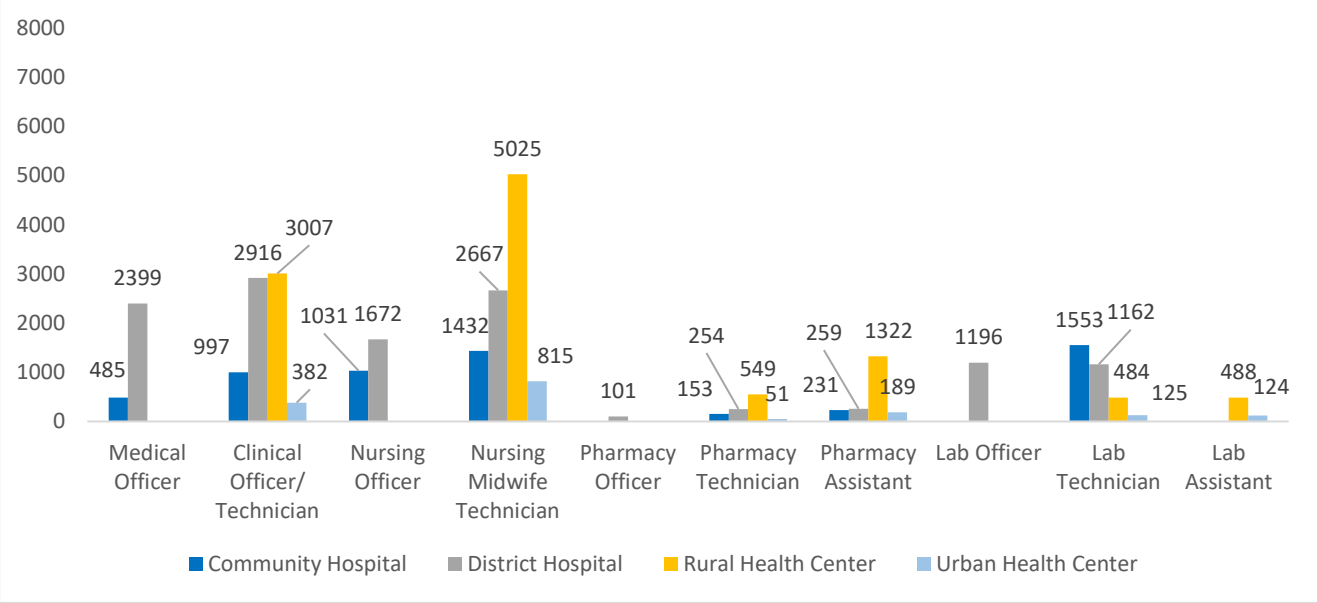
Table 21: Vacancy Rate of health workforce required to deliver HBP with access constraints and at high quality in 2030, against current staff - by district and cadre

| District | Medical Ofc. / Specialist | Clinical Ofc. / Tech. | Nurse Ofc. | Nurse Midwife Tech. | Pharmacist | Pharm. Tech. | Pharm. Asst. | Lab Ofc. | Lab Tech. | Lab Asst. | All Cadres |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Balaka | 95% | 82% | 48% | 44% | 100% | 81% | 83% | 96% | 84% | 83% | **66%** |
| Blantyre | -17% | 75% | -78% | 27% | | 84% | 84% | | 80% | 85% | **43%** |
| Chikwawa | 92% | 85% | 71% | 57% | 67% | 85% | 86% | 95% | 91% | 50% | **73%** |
| Chiradzulu | 90% | 75% | 60% | 42% | 50% | 80% | 83% | 93% | 88% | 60% | **64%** |
| Chitipa | 91% | 75% | 62% | 26% | 67% | 85% | 71% | 95% | 84% | 88% | **60%** |
| Dedza | 92% | 74% | 59% | 46% | 50% | 91% | 84% | 96% | 75% | 80% | **59%** |
| Dowa | 90% | 77% | 70% | 18% | 33% | 80% | 79% | 91% | 90% | 30% | **57%** |
| Karonga | 95% | 77% | 78% | 45% | 75% | 93% | 83% | 95% | 93% | 93% | **71%** |
| Kasungu | 93% | 88% | 65% | 53% | 67% | 87% | 86% | 87% | 89% | 80% | **70%** |
| Likoma | 100% | 94% | 70% | 0% | | 67% | 100% | | 98% | | **79%** |
| Lilongwe | 85% | 77% | 54% | 34% | 29% | 72% | 82% | 77% | 79% | -38% | **52%** |
| Machinga | 93% | 86% | 65% | 76% | 75% | 91% | 85% | 94% | 91% | 93% | **78%** |
| Mangochi | 96% | 83% | 78% | 51% | 100% | 89% | 86% | 94% | 92% | 85% | **71%** |
| Mchinji | 93% | 81% | 78% | 52% | 0% | 90% | 78% | 88% | 89% | | **70%** |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mulanje | 92% | 80% | 63% | 52% | 100% | 100% | 86% | 95% | 80% | 84% | **67%** |
| Mwanza | 98% | 82% | 61% | 43% | 67% | 64% | 73% | 86% | 72% | 80% | **68%** |
| Mzimba North | 35% | 83% | 29% | 65% | | 88% | 99% | | 86% | 77% | **72%** |
| Mzimba South | 94% | 83% | 64% | 33% | 75% | 90% | 89% | 97% | 92% | 73% | **67%** |
| Neno | 96% | 78% | 63% | 42% | 50% | 76% | 89% | 85% | 71% | 70% | **65%** |
| Nkhata Bay | 93% | 82% | 58% | 41% | 67% | 91% | 84% | 96% | 86% | 90% | **68%** |
| Nkhotakota | 95% | 85% | 64% | 46% | 80% | 83% | 83% | 97% | 88% | 70% | **68%** |
| Nsanje | 94% | 83% | 66% | 55% | 67% | 80% | 86% | 98% | 94% | 60% | **74%** |
| Ntcheu | 94% | 83% | 72% | 56% | 80% | 90% | 88% | 96% | 91% | 95% | **72%** |
| Ntchisi | 96% | 83% | 63% | 57% | 100% | 88% | 84% | 76% | 75% | 80% | **71%** |
| Phalombe | 95% | 90% | 79% | 71% | 100% | 87% | 87% | 95% | 94% | 98% | **81%** |
| Rumphi | 94% | 81% | 73% | 43% | 50% | 91% | 71% | 96% | 93% | 80% | **72%** |
| Salima | 93% | 79% | 68% | 62% | 83% | 93% | 85% | 94% | 86% | 93% | **72%** |
| Thyolo | 92% | 78% | 70% | 56% | 83% | 85% | 86% | 98% | 93% | 60% | **72%** |
| Zomba | 45% | 69% | 4% | 31% | | 75% | 78% | | 87% | 76% | **45%** |
| **All Districts** | **92%** | **80%** | **63%** | **47%** | **68%** | **85%** | **84%** | **93%** | **88%** | **75%** | 66% |

Note: 'Vacancy Rate' refers to the percentage of optimal health worker posts that are currently vacant. Blank cells indicate that the target for the given cadre and district was zero.

Figure 8: Optimal health workforce required to deliver HBP with access constraints and at high quality in 2030, by facility type




This scenario would cost an average of $112 million annually for the salaries of additional health workers and $361 million annually in associated pre-service education costs (note that the pre-service education costs also includes those for tertiary level health workers).

#### 3.7.3.2.2 Optimal pre-service enrollment target-setting to deliver HBP with access constraints and at high quality

The above targets were fed into the pre-service enrollment pipeline tool to model the necessary enrollment – at a cadre, program, and training institution level – to produce the target health workforce required to deliver an HBP with no access constraints and at high quality. The results are displayed below.

*Table 22. Pipeline Results Displaying Enrollment Required to Deliver HBP Scenario with Access Constraints at High Quality*

| | | Without Intervention | | With Intervention | |
|---|---|---|---|---|---|
| **Cadres** | **Public Sector HW Target for Scenario (2030)[1]** | **Current Public Sector HW (2022)[2]** | **Baseline Enrollment (Annual)[3]** | **Target Enrollment to Deliver HBP Scenario (Annual)[4]** | **Enrollment Scale Up Factor Targeted[5]** |
| Medical Officer | 4372 | 559 | 107 | 4999 | 46.9 |
| Clinical Technician | 8802 | 1819 | 258 | 1182 | 4.6 |
| Nurse Midwifery Officer | 4079 | 1656 | 408 | 357 | 0.9 |
| Nurse Midwife Technician | 11973 | 5265 | 1330 | 2524 | 1.9 |
| Community Midwifery Assistant[6] | 4868 | 530 | 299 | 1593 | 5.3 |
| Pharmacist | 237 | 83 | 47 | 38 | 0.8 |
| Pharmacy Technician | 1168 | 192 | 34 | 479 | 14.2 |
| Pharmacy Assistant | 2006 | 315 | 274 | 446 | 1.6 |
| Lab Officer | 3575 | 159 | 95 | 4371 | 45.8 |
| Lab Technician | 3545 | 454 | 74 | 1010 | 13.6 |
| Lab Assistant | 609 | 155 | 75 | 124 | 1.6 |

[1] The 2030 public sector health workforce targets are a sum of targets from several sources: the WFOM targets for the primary and secondary levels of care for the particular HBP scenario, the central establishment targets for the tertiary level of care, and the faculty targets (to account for health workforce that need to become full-time faculty and not deliver services; this is further described in the methods section on intervention design).

[2] Source is the Ministry of Health Staff Returns

[3] This is a projection, based on the assumption that the average enrollment in previous years is maintained. The average is based on enrollment data from 2012-2021, and only accounts for years that the program was operational

[4] The enrollment targets come from the pipeline tool. It considers an 80% graduation rate and 90% licensing exam passing rate as well as an array of attrition rates. See the Methods and Results section for more details on the rates and the rationale for only scaling up enrollment from 2024-2029

[5] The scale-up factor is the scaled-up enrollment divided by the projected annual enrollment

Note that even if funds were available, most cadres have enrollment scale-up factors that will not be logistically feasible – especially 46-47X scale-up for medical officers and lab officers, but even 14X for lab technicians and pharmacy technicians. Training institutions have shared that even a scale-up of several-fold would be difficult to achieve – this scenario would be a moonshot even without cost considerations, which are detailed below.

#### 3.7.3.2.3 Costs to deliver HBP with access constraints and at high quality

Pipeline targets were fed into the intervention design and costing tool to model pre-service costs for the scenario. Detailed intervention design and costing methodology is described in Section 3.6.

*Table 23. Intervention Costs by Domain and by Year to Deliver the HBP with Access Constraints and High Quality*

| Intervention Domain | FY 23/24 | FY 24/25 | FY 25/26 | FY 26/27 | FY 27/28 | FY 28/29 | FY 29/30 | FY 30/31 | Grand Total |
|---|---|---|---|---|---|---|---|---|---|
| Scholarships | $4M | $8M | $22M | $37M | $54M | $70M | $90M | $108M | $392M |
| Faculty Development | $0 | $9M | $117M | $140M | $166M | $205M | $246M | $287M | $1,170M |
| Infrastructure | $0 | $964M | $3M | $0 | $0 | $0 | $0 | $0 | $967M |
| Skills Lab Equipment | $0 | $288M | $0 | $0 | $0 | $74M | $0 | $0 | $362M |
| Total | $4M | $1,269M | $141M | $177M | $220M | $349M | $336M | $395M | $2,890M |

At an eight-year cost of $2.9 billion, government and stakeholders concluded that whilst this scenario cost less than one at high quality with no access constraints, adding access constraints was still insufficient to make the scenario feasible with available resources, and considered a scenario with lowered quality of care – whilst this was not ideal, it was more realistic.

#### *3.7.3.3 Optimal health workforce required to deliver HBP with access constraints and at status quo quality*

The costs of the previous scenario were also considered unrealistic for Malawi's limited fiscal envelope, and therefore the 'least ambitious' scenario was developed to calculate the **optimal health workforce required to deliver the Health Benefits Package with access constraints and status quo quality**. For 'status quo quality', the activity times were calibrated to reflect realistic amounts of time that health workers currently spend with patients. The 'status quo' time for each service was calculated by dividing the current health workforce of each cadre by the optimal health workforce required to deliver current levels of that service in 2020, and multiplying this ratio with the optimal time required to deliver the service.

As with the previous scenarios, the service volume data (with the access constraint applied where appropriate) and calibrated activity times were run through the WFOM logic, to output the optimal health workforce required in 2030 to deliver the Health Benefits Package with access constraints and at status quo quality. The resulting optimal health workforce for 2030 was divided equally across the 8-year period of the HSSP III, with the same rounding-up methodology described previously. The salaries for the additional cadres were calculated the same way as described before, by using a weighted salary average for each cadre, and multiplying it with the number of additional health workers to be hired each year.

##### 3.7.3.3.1 Optimal health workforce target-setting to deliver HBP with no access constraints and at high quality

This scenario resulted in an optimal health workforce of 15,854, requiring the current health workforce to scale up 1.5 times by 2030. Figure 9 below shows the targets for this scenario by cadre.

*Figure 9: Optimal health workforce required to deliver the HBP with access constraints and at status quo quality*

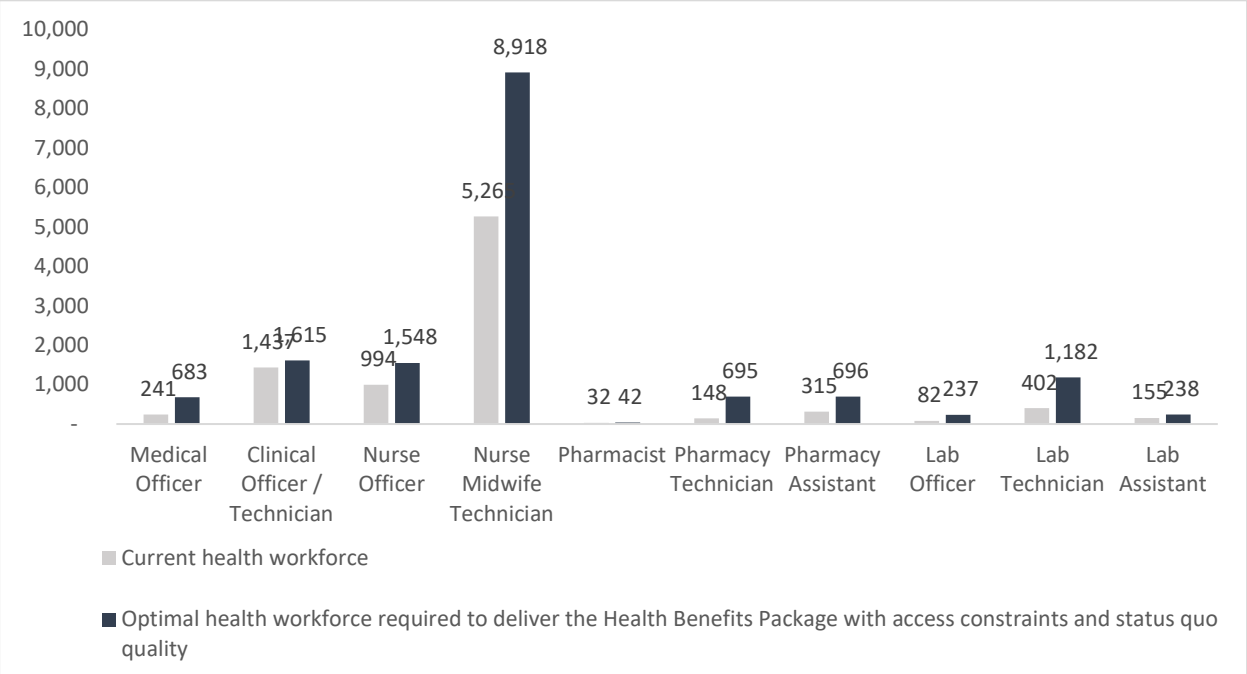



Table 11 shows the district- and cadre-level vacancy rates against the workforce targets, and Figure 10 shows the facility-level workforce targets.

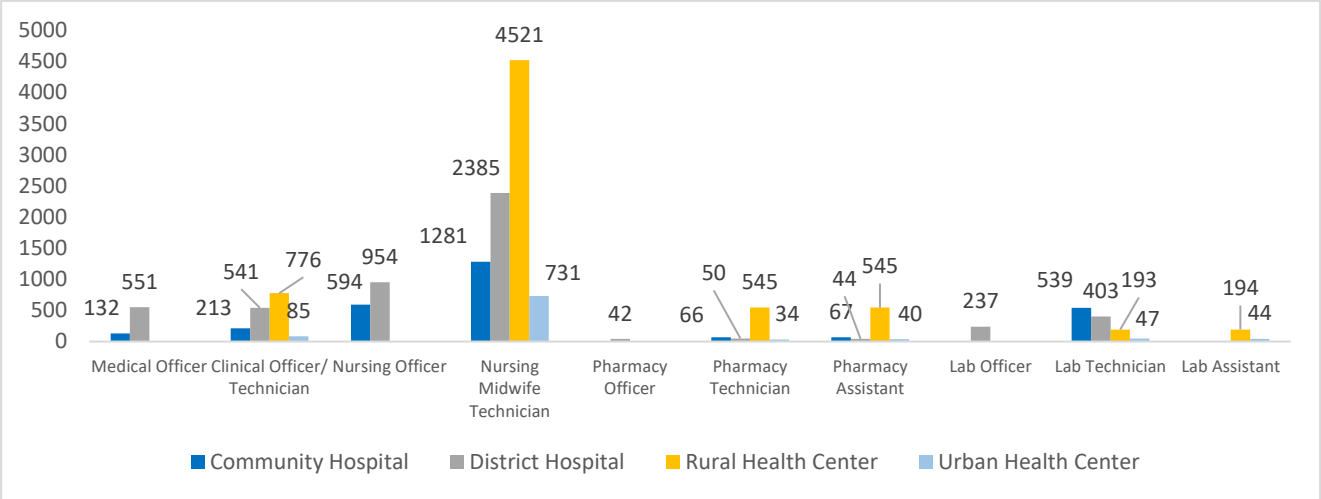
Table 24: Vacancy Rate of health workforce required to deliver HBP with access constraints and at 'status quo' quality in 2030, against current staff - by district and cadre

| District | Medical Ofc. / Specialist | Clinical Ofc. / Tech. | Nurse Ofc. | Nurse Midwife Tech. | Pharmacist | Pharm. Tech. | Pharm. Asst. | Lab Ofc. | Lab Tech. | Lab Asst. | All Cadres |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Balaka | 76% | 20% | 9% | 37% | 100% | 75% | 50% | 80% | 55% | 58% | **29%** |
| Blantyre | -367% | -11% | -215% | 19% | | 78% | 40% | | 43% | 55% | **-4%** |
| Chikwawa | 65% | 31% | 50% | 51% | 0% | 80% | 60% | 75% | 74% | -25% | **46%** |
| Chiradzulu | 58% | -18% | 30% | 35% | 0% | 67% | 53% | 64% | 65% | 0% | **26%** |
| Chitipa | 59% | -22% | 33% | 19% | 0% | 77% | 33% | 75% | 57% | 70% | **13%** |
| Dedza | 67% | -8% | 28% | 40% | 0% | 88% | 65% | 80% | 32% | 50% | **24%** |
| Dowa | 58% | -6% | 47% | 9% | -100% | 68% | 35% | 60% | 71% | -75% | **12%** |
| Karonga | 80% | -2% | 62% | 38% | 50% | 89% | 63% | 75% | 79% | 83% | **39%** |
| Kasungu | 71% | 42% | 39% | 47% | 0% | 82% | 62% | 33% | 69% | 50% | **41%** |
| Likoma | 100% | 75% | 50% | -21% | | 50% | 100% | | 94% | | **51%** |
| Lilongwe | 42% | -5% | 20% | 27% | -67% | 52% | 30% | -20% | 42% | -244% | **11%** |
| Machinga | 70% | 37% | 39% | 73% | 50% | 88% | 63% | 67% | 75% | 81% | **61%** |
| Mangochi | 83% | 25% | 62% | 45% | 100% | 85% | 60% | 69% | 77% | 63% | **44%** |
| Mchinji | 70% | 7% | 63% | 47% | 0% | 82% | 12% | 40% | 67% | | **39%** |
| Mulanje | 63% | 9% | 35% | 47% | 100% | 100% | 54% | 71% | 44% | 60% | **38%** |
| Mwanza | 90% | 5% | 31% | 37% | 0% | 20% | 0% | 33% | 25% | 50% | **26%** |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mzimba North | -160% | 25% | -25% | 61% | | 86% | 97% | | 63% | 38% | **52%** |
| Mzimba South | 75% | 25% | 37% | 26% | 50% | 87% | 74% | 85% | 78% | 33% | **34%** |
| Neno | 82% | -4% | 34% | 35% | 0% | 67% | 75% | 20% | 23% | 25% | **26%** |
| Nkhata Bay | 68% | 22% | 28% | 34% | 0% | 89% | 62% | 80% | 61% | 75% | **33%** |
| Nkhotakota | 78% | 30% | 38% | 39% | 50% | 74% | 53% | 88% | 66% | 25% | **34%** |
| Nsanje | 75% | 24% | 41% | 51% | 0% | 71% | 63% | 91% | 81% | 0% | **44%** |
| Ntcheu | 76% | 26% | 50% | 52% | 50% | 87% | 72% | 78% | 74% | 88% | **46%** |
| Ntchisi | 83% | 14% | 35% | 52% | 100% | 81% | 50% | -17% | 33% | 50% | **38%** |
| Phalombe | 78% | 53% | 64% | 68% | 100% | 73% | 53% | 73% | 83% | 94% | **64%** |
| Rumphi | 75% | 21% | 52% | 36% | 0% | 88% | 47% | 78% | 79% | 50% | **41%** |
| Salima | 71% | -4% | 44% | 57% | 50% | 89% | 56% | 69% | 59% | 83% | **44%** |
| Thyolo | 68% | 5% | 46% | 51% | 67% | 76% | 67% | 88% | 80% | 0% | **45%** |
| Zomba | -83% | -36% | -68% | 24% | | 71% | 32% | | 66% | 39% | **7%** |
| **All Districts** | **65%** | **11%** | **36%** | **41%** | **24%** | **79%** | **55%** | **65%** | **66%** | **35%** | **33%** |

Note: 'Vacancy Rate' refers to the percentage of optimal health worker posts that are currently vacant. Blank cells indicate that the target for the given cadre and district was zero.

*Figure 10: Optimal health workforce required to deliver HBP with access constraints and at status quo quality in 2030, by facility type*




This scenario would cost an average of $36 million annually for the salaries of additional health workers, and $137 million annually in associated pre-service education costs (note that the pre-service education costs also includes those for tertiary level health workers).

#### 3.7.3.3.2 Optimal pre-service enrollment target-setting to deliver HBP with access constraints and at status quo quality

The above targets were fed into the pre-service enrollment pipeline tool to model the necessary enrollment – at a cadre, program, and training institution level – to produce the target health workforce required to deliver an HBP with no access constraints and at high quality. The results are displayed below.

*Table 25 Pipeline Results Displaying Enrollment Required to Deliver HBP Scenario With Access Constraints at High Quality*

| | | Without Intervention | | With Intervention | |
|---|---|---|---|---|---|
| **Cadres** | **Public Sector HW Target for Scenario (2030)[1]** | **Current Public Sector HW (2022)[2]** | **Baseline Enrollment (Annual)[3]** | **Target Enrollment to Deliver HBP Scenario (Annual)[4]** | **Enrollment Scale Up Factor Targeted[5]** |
| Medical Officer | 1817 | 559 | 107 | 1450 | 13.6 |
| Clinical Technician | 2710 | 1819 | 258 | 205 | 0.8 |
| Nurse Midwifery Officer | 3302 | 1656 | 408 | 201 | 0.5 |
| Nurse Midwife Technician | 11212 | 5265 | 1330 | 2182 | 1.6 |
| Community Midwifery Assistant[6] | 4868 | 530 | 299 | 1593 | 5.3 |
| Pharmacist | 131 | 83 | 47 | 0 | 0.0 |
| Pharmacy Technician | 783 | 192 | 34 | 288 | 8.5 |
| Pharmacy Assistant | 698 | 315 | 274 | 65 | 0.2 |
| Lab Officer | 1144 | 159 | 95 | 995 | 10.4 |
| Lab Technician | 1298 | 454 | 74 | 260 | 3.5 |
| Lab Assistant | 238 | 155 | 75 | 13 | 0.2 |

[1] The 2030 public sector health workforce targets are a sum of targets from several sources: the WFOM targets for the primary and secondary levels of care for the particular HBP scenario, the central establishment targets for the tertiary level of care, and the faculty targets (to account for health workforce that need to become full-time faculty and not deliver services; this is further described in the methods section on intervention design).

[2] Source is the Ministry of Health Staff Returns

[3] This is a projection, based on the assumption that the average enrollment in previous years is maintained. The average is based on enrollment data from 2012-2021, and only accounts for years that the program was operational

[4] The enrollment targets come from the pipeline tool. It considers an 80% graduation rate and 90% licensing exam passing rate as well as an array of attrition rates. See the Methods and Results section for more details on the rates and the rationale for only scaling up enrollment from 2024-2029

[5] The scale-up factor is the scaled-up enrollment divided by the projected annual enrollment

Note that even if funds were available, most cadres still have enrollment scale-up factors that will not be logistically feasible – especially 14X scale-up for medical officers, but also 5X for community midwifery assistants. Training institutions have shared that even a scale-up of several-fold would be difficult to achieve – this scenario would require a multisectoral, focused, coordinated and highly prioritized and planned effort to achieve even without cost considerations, which are detailed below.

#### 3.7.3.3.3 Costs to deliver HBP with no access constraints and at high quality

The above targets were fed into the pre-service enrollment pipeline tool to model the necessary enrollment – at a cadre, program, and training institution level – to produce the target health workforce required to deliver an HBP with no access constraints and at high quality. The results are displayed below.

*Table 26: Intervention Costs by Domain and by Year to Deliver the HBP with Access Constraints and Status Quo Quality*

| Intervention Domain | FY 23/24 | FY 24/25 | FY 25/26 | FY 26/27 | FY 27/28 | FY 28/29 | FY 29/30 | FY 30/31 | Grand Total |
|---|---|---|---|---|---|---|---|---|---|
| Scholarships | $6M | $7M | $13M | $21M | $29M | $37M | $48M | $60M | **$221M** |
| Faculty Development | $0 | $6M | $33M | $45M | $57M | $77M | $98M | $123M | **$438M** |
| Infrastructure | $0 | $299M | $0 | $0 | $0 | $0 | $0 | $0 | **$299M** |
| Skills Lab Equipment | $0 | $201M | $0 | $0 | $0 | $60M | $0 | $0 | **$261M** |
| **Total** | **$6M** | **$514M** | **$46M** | **$66M** | **$86M** | **$174M** | **$146M** | **$183M** | **$1,219M** |

At an eight-year cost of $1.2 billion, government and stakeholders concluded that this scenario is the most realistic, whilst of course maintaining status quo quality and even adding access constraints is not ideal, it is what is possible. This is the scenario for which costs are included in the final costing figures and files.

#### *3.7.3.4 Prioritizing Health Workforce Interventions for The Access-Constrained, Status Quo Quality Package*

As mentioned above, health workforce interventions – inclusive of salaries and interventions for community-based cadres – were allocated $59.7M in FY24/25, out of a need of over $500M (for more details on this process, see Section 6.1 and Annex 4 in the main HSSP III document). The $59.7 million for health workforce interventions in FY2024/2025 was prioritized with a focus on value-for-money and strengthening the community health workforce.

First, absorption of graduates from pre-service training programs in FY2024/2025 was fully funded, as it is poor value-for-money to not absorb trainees that have already had pre-service capacity and scholarship costs invested in them.[13] The projected number of graduates in FY2024/2025 was distributed across districts proportional to the service delivery need, and then multiplied by the inflated average gross annual pay for each cadre to arrive at the $5.4M cost of this prioritized intervention for FY2024/2025.

Next, maintaining baseline pre-service education enrolment in FY2024/2025 was prioritized and fully funded at $6.7M. As operating costs of training institutions and salaries of current faculty are covered by the Ministry of Education, this only included scholarship costs. Scholarships included FY2024/2025 enrolment and all students currently in the pipeline regardless of their starting year,[14,15] as the next best

[13] Included in this calculation were FY2024/2025 graduates of generalist cadres and pediatric specialist cadres. Due to a lack of available, quality data at the time of publication, the calculation excludes other specialist cadres and the unabsorbed trainees currently in the labor market. Community-based cadres were excluded as those costs are addressed separately. No FY 2023/2024 graduates were included, as assumptions around the absorption rate are difficult to determine amidst insufficient clarity around availability of funding for salaries in that year. The calculation also assumed optimal licensing exam schedules and recruitment drive timing that would enable recent graduates to enter the workforce in the same fiscal year that they graduated in.

[14] For example, all students enrolled in a three-year program that started in FY2022/2023 and FY2023/24 were costed, but not students who enrolled in a two-year program in FY2022/2023 as those students will have graduated.

[15] FY2024/25 enrollment was assumed to be an average of enrollment in all years that the program has been operational since 2012. Students currently in the pipeline are extrapolated from a combination of available data and in recent years where data is not yet available, the average of previous years as described above. Included in this calculation were FY2024/25 graduates of generalist cadres and pediatric specialist cadres. However, due to a lack of available, quality data at the time of publication, the

value-for-money is to complete the pipeline for students who are partway through their education and have already had costs invested in their pre-service education.

Then, HSA and SHSA scale-up to their respective targets (1 HSA to 1000 population, and 1 SHSA to 10 HSAs) was fully funded, as a strong community health workforce will not only strengthen equitable access to care, but also increase service provision of primary care. Given the significant resource constraints for the HSSP III, investments in the community health workforce also tend to be cost-effective relative to cadres at higher levels of the health system. Salaries, pre-service education, and supplies for HSAs were costed at a total of $15.8M for FY2024/2025.

CMAs were also prioritized as a critical community health workforce cadre that increase access to care and service provision of primary care. The HSSP III prioritizes an intervention package of $15.6M in CMAs in FY2024/2025, including salaries for the FY2024/2025 CMA graduating class, scholarships for all CMA trainees enrolled at baseline in FY2024/2025, and selected investments to improve the quality of education for CMAs at baseline enrolment.

Finally, the remaining $16.1M was allocated towards improving the quality of pre-service training at baseline enrolment. The domain with the most direct link to quality of education is faculty, as training institutions have indicated that infrastructure and equipment can be reconfigured to accommodate more students. The full faculty training and salary costs to reach the ideal student: faculty ratios for baseline enrolment were therefore prioritized for the intervention package. Additionally, selected infrastructure and skills lab equipment needs were also included, though given resource constraints, these are only a subset of the full suite of infrastructure and equipment investments needed to ensure high-quality pre-service education. These costs were also allocated across the various training programs for each health workforce cadre proportional to their need.

Please see Chapter 5 for more details on the contents of the prioritized package and implications of this prioritized package on service delivery and.

calculation excludes other specialist cadres and the unabsorbed trainees currently in the labor market. Community-based cadres were excluded as those costs are addressed separately.

# 4 Proposed Interventions

## 4.1 Overview of Proposed Interventions

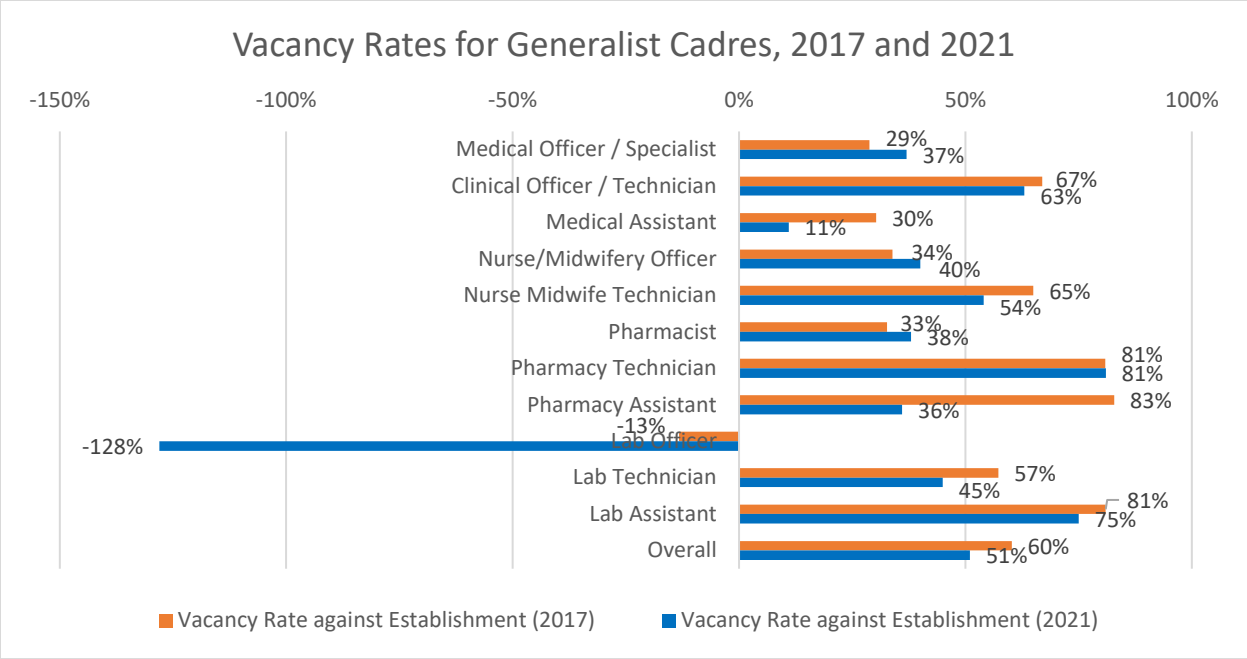
Malawi has made strides towards strengthening health systems to support delivery of essential services, as defined by the Essential Health Package (EHP) detailed in the 2018-2022 Health Sector Strategic Plan II. The EHP included 97 cost-effective health services that maximized health for all Malawians given limited resources. Prioritized cadres to deliver the EHP, as defined in the HRH Strategic Plan 2018-2022, are detailed in **Table 27** below:

*Table 27 Prioritized Cadres in The HRH Strategic Plan 2018-2022 To Deliver The EHP*

| Department | Cadre |
|---|---|
| Clinical | Medical Officer |
| | Clinical Technician |
| | Medical Assistant |
| Nursing | Nursing Officer |
| | Nurse Midwife Technician |
| Pharmacy | Pharmacist |
| | Pharmacy Technician |
| | Pharmacy Assistant |
| Laboratory | Laboratory Officer |
| | Laboratory Technician |
| | Laboratory Assistant |

**Figure 11** details the progress made within the strategic plan period towards addressing vacancy rates.

*Figure 11 Vacancy Rates by Cadre, from 2017 to 2021, for Public Facilities and CHAM Facilities that Provide Primary Care and Secondary Care, as Compared to the Establishment*




For delivery of the HSSP III's Health Benefits Package (the successor of the EHP), workforce planning included not only the cadres defined in the EHP to plan for delivery of HBP services at the primary and secondary levels of care, but also included community-based cadres and specialist cadres to support delivery along the continuum of care, from communities to health centres to hospitals. As described in Chapter 3 on Methods, targets for EHP cadres were set by the WFOM for primary and secondary level care needs for delivery of the HBP, by the establishment for tertiary care level needs, and by a combination of consultation of national strategies and MOH departments for community-level needs. There were, however, limitations on the cadres that were planned for, given data limitations: for community-based cadres, planning was limited to interventions for cadres where there was sufficient data on pre-service enrollment and current workforce; for specialist cadres, planning was limited to cadres with district-level targets (primarily pediatric and pediatric-related cadres like emergency physicians and critical care nurses that treat that patient population).

Whilst the original intent of the HSSP III was to aim for high-quality universal health care, after modeling the resources required to deliver such levels of care, the Ministry of Health was forced to limit HSSP III service delivery targets – and their accompanying health workforce targets – to what was feasible given projected resource availability in the health sector, whilst still maximizing cost-effectiveness and impact. These service delivery targets reflect delivery of the Health Benefits Package (HBP) with access constraints and status quo quality (henceforth referred to as the "access-constrained HBP"; more details on the targets can be found in Section 3.7 on Prioritization). The health workforce needed to deliver on the access-constrained HBP targets still necessitates an increase in enrollment for most pre-service training programs.

| Cadres | Public Sector HW Target for Scenario (2030)[1] | Current Public Sector HW (2023)[2] | Baseline Enrollment (Annual)[3] | Target Enrollment to Deliver HBP Scenario (Annual)[4] | Enrollment Scale Up Factor Targeted[5] |
|---|---|---|---|---|---|
| Medical Officer | 1817 | 559 | 107 | 1450 | 13.6 |
| Clinical Technician | 2710 | 1819 | 258 | 205 | 0.8 |
| Nurse Midwifery Officer | 3302 | 1656 | 408 | 201 | 0.5 |
| Nurse Midwife Technician | 11212 | 5265 | 1330 | 2182 | 1.6 |
| Community Midwifery Assistant[6] | 4868 | 530 | 299 | 1593 | 5.3 |
| Pharmacist | 131 | 83 | 47 | 0 | 0.0 |
| Pharmacy Technician | 783 | 192 | 34 | 288 | 8.5 |
| Pharmacy Assistant | 698 | 315 | 274 | 65 | 0.2 |
| Lab Officer | 1144 | 159 | 95 | 995 | 10.4 |
| Lab Technician | 1298 | 454 | 74 | 260 | 3.5 |
| Lab Assistant | 238 | 155 | 75 | 13 | 0.2 |

However, during the process to prioritize interventions to fit within the projected fungible resource envelope for fiscal year 2024-2025 (FY24/25), it became evident that the overall costs to deliver the access-constrained HBP still exceeded available resources; thus, all interventions had to be further prioritized. For pre-service interventions, health workforce targets and costs had to be reduced beyond the access-constrained HBP to focus on provision of quality education at baseline levels of enrollment, without any increase in enrollment. The final investments proposed for FY24/25 will henceforth be referred to as the investments in "the FY24/25 prioritized resource allocation". As annual operational plans are developed for the HSSP III, similar prioritization processes will be conducted.

For specialists' planning, a Delphi method was used as detailed in section 1.2 to set targets for pediatric specialists at secondary level and set by the establishment for tertiary level care needs. Pediatric cadres were chosen for the reason that a large proportion of the population is under the age of 15. These specialists are pediatricians, pediatric clinical officers, family medicine physicians, pediatric emergency medicine physicians, child health nursing specialists, critical care nursing specialists and child critical care nursing specialists, palliative care nursing specialists and neonatal nursing specialists. This example of target setting for specialists can be replicated to inform target setting for specialists of other disciplines e.g., cardiology. **Table 28** below displays the secondary level cadres that were set using the Delphi method to provide pediatric services and those cadres at tertiary level that were set by the establishment.

*Table 28 Pediatric Health Workforce Targets vs Workforce Gaps In The Absence Of Intervention*

| Cadre | Level of Health Care (Tertiary or Secondary) | Public Sector Health Workforce (HW) | 2030 Public Sector HW Target | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained | Projected 2030 Public Sector HW Gap, with Baseline Enrollment | Projected 2030 Vacancy Rate, with Baseline Enrollment |
|---|---|---|---|---|---|---|
| Pediatrician | Tertiary | 16 | 38 | 22 | 16 | 42% |
| Pediatric and Child Health Clinical Officer | Tertiary | 7 | 84 | 63 | 21 | 25% |
| Pediatric Emergency Medicine Physician | Tertiary | 0 | 15 | 0 | 15 | 100% |
| Critical Care Nursing Specialist | Tertiary | 0 | 19 | 0 | 19 | 100% |
| Family Medicine Physician | Secondary | 2 | 28 | 15 | 13 | 46% |
| Child Health Nursing Specialist | Secondary | 4 | 56 | 80 | -36 | -64% |
| Palliative Care Nursing Specialist | Secondary | 0 | 15 | 0 | 15 | 100% |
| Neonatal Nursing Specialist | Secondary | 0 | 56 | 0 | 56 | 100% |
| Child Critical Care Nursing Specialist | Secondary | 0 | 56 | 0 | 56 | 100% |

This chapter describes both pre-service health workforce interventions for cadres to provide the access-constrained HBP and specialist pediatric cadres that are costed for all years in the HSSP III to detail the envisioned direction of the health sector until 2030. Each cadre summary provides health workforce gaps and targets and the commensurate pre-service interventions in scholarships, faculty, infrastructure and equipment to ensure quality teaching, learning and production of high-quality health workforce. Within each intervention domain within each cadre, this chapter also describes prioritized interventions for FY24/25 that fit within the FY24/25 prioritized resource allocation to guide on priorities on the proposed operationalization of the HSSP III in FY24/25 given funding realities.

## 4.2 Medical Officer Interventions

This section details both the Medical Officer interventions in the access-constrained HBP that are costed for all years in the HSSP III (in tables in blue) to provide guidance on the envisioned direction of the health sector up to 2030, and also presents interventions prioritized for FY24/25 that fit within the FY24/25 prioritized resource allocation (in tables in green) to share guidance on the proposed operationalization of the HSSP III in FY24/25 given funding realities.

### 4.1.1 Public Sector Workforce Targets, Gaps, And Required Enrollment

*Table 29 Medical Officer Workforce Targets with an Access-Constrained HBP Compared to Workforce Gaps in the Absence of Intervention*

| 2023 Public Sector Health Workforce (HW)[16] | 2030 Public Sector HW Target for Access-Constrained HBP[17] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[18] | Projected 2030 Public Sector HW Gap, With Baseline Enrollment | Projected 2030 Vacancy Rate, With Baseline Enrollment |
|---|---|---|---|---|
| 390 | 1817 | 831 | 986 | 54% |

As seen in **Table 29** above, the health workforce has 390 medical officers as of 2022 against a target of 1817 by the year 2030 to deliver the access-constrained HBP. If baseline levels of enrollment are maintained, only 831 medical officers will be available in 2030, leaving a gap of 986, or a 54% vacancy rate. As scaled-up enrollment will require infrastructure and equipment to be in place, high-quality scaled-up enrollment cannot begin until 2025, leaving five years to meet the target in 2030, but the medical officer program is six years long. Thus, the medical officer interventions are unique in that they will not reach their target until 2031, and even still, an enrollment of 986 will be required to close all of the gap in one year, accounting for attrition, graduation, and licensing rates.

Although there are only resources to maintain baseline levels of enrollment in FY24/25, maintaining enrollment will be inadequate to meet the 2030 health workforce targets for an access-constrained HBP. Enrollment must be scaled up at Kamuzu University of Health Sciences as described in **Table 30** below in blue during the remainder of the HSSP III period when additional resources becomes available. As indicated **Table 30** below the projected annual enrollment of 1450 to meet the access constrained HBP is larger than the projected 2030 public sector health workforce gap of 986 in **Table 29** above to accommodate for the loss of health workers due to voluntary and involuntary attrition of health workers from the workforce , as well as for students who will enroll but not graduate or pass their licensing exams.

*Table 30 Medical Officer Enrollment at Baseline and Projected Enrollment Needed to Meet Access-Constrained HBP Health Workforce Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Meet Access-Constrained HBP |
|---|---|---|---|

[16] Ministry of Health, 2022 Staff Returns
[17] Ministry of Health and Clinton Health Access Initiative, Malawi Workforce Optimization Model
[18] Ministry of Health and Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

| | | | |
|---|---|---|---|
| Kamuzu University of Health Sciences (KUHES) | MBBS | 107 | 1450 |

* The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained. The listed enrollment includes new enrollees only in a given year and does not account for students currently enrolled in the program in their second year of the program and beyond.

### 4.1.2 Interventions to Enable High Quality Training

To reach the access-constrained HBP target of 1817 medical officers, when additional resources for health workforce become available, interventions are needed to scale-up enrollment. TI capacity assessments revealed gaps in institutional capacity to providing quality instruction, at both baseline and scaled-up enrollment. These capacity gaps are in scholarship funding, faculty, infrastructure, and skills laboratory equipment. The proposed interventions described below close the identified gaps and equip the training institutions to meet the demands of ensuring quality teaching and learning.

#### *4.1.2.1 Scholarship Interventions for Medical Officers*

To meet the access-constrained HBP target for medical officers, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific case of FY24/25, the quantities are the same at target and at baseline, as the proposal for enrollment scale-up does not begin until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 31** details scholarship needs for training medical officers to deliver on the access-constrained HBP and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 31 Medical Officers Scholarships to Meet Access-Constrained HBP Health Workforce Targets and Scholarships Prioritized in the FY24/25 Prioritized Resource Allocation*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| KUHES | $55,074,339 | 673 | 651 | 1994 | 3332 | 4670 | 6013 | 7356 | 8699 | $330,245 |

** Total enrollment includes new enrollees in the year listed, and all other students enrolled in previous years that are in the pipeline to complete the program

#### *4.1.2.2 Faculty Interventions for Medical Officer Programs*

To identify the number of faculty required to provide high-quality instruction to medical officer trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the access-constrained HBP health workforce targets and the ideal student:faculty ratio. **Table 32** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering an access-constrained HBP.

*Table 32 Faculty Needs and Gaps to High-Quality Medical Officer Training to Deliver the Access-Constrained HBP, Across All Training Institutions*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| **Faculty for MBBS Program at KUHES** | | | |
| Internal medicine lecturer | 13 | 18 | 5 |
| Surgeons | 12 | 18 | 6 |
| Pediatricians | 11 | 18 | 7 |
| Obstetricians and gynecologists | 7 | 18 | 11 |
| Public health specialists | 1 | 18 | 17 |
| Emergency medicine specialists | 3 | 18 | 15 |
| Family medicine specialists | 5 | 18 | 13 |
| Psychiatrists | 2 | 18 | 16 |
| Dermatologists | 0 | 18 | 18 |
| Ophthalmologists | 1 | 18 | 17 |
| Anesthesiologists | 2 | 18 | 16 |
| Anatomists | 1 | 18 | 17 |
| Histopathologists | 2 | 18 | 16 |
| Clinical chemists | 2 | 18 | 16 |
| Clinical microbiologists | 5 | 18 | 13 |
| Physiologists | 0 | 18 | 18 |
| Clinical pharmacologists | 0 | 18 | 18 |
| Laboratory Hematologists | 0 | 18 | 18 |
| Biology lecturer | 2 | 18 | 16 |
| Mathematics lecturer | 2 | 18 | 16 |
| Chemistry lecturer | 2 | 18 | 16 |
| Physics lecturer | 2 | 18 | 16 |
| English language lecturer | 2 | 18 | 16 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver on the access-constrained HBP, described in **Table 33** below.

*Table 33 Faculty Interventions for Medical Officers to Meet Access-Constrained HBP Health Workforce Targets*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 337 | 174 | 0 | 163 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Furthermore, to provide high quality training for medical officers, preceptors are required to provide training at clinical practice sites. These costs are broken down below in **Table 34** below.

*Table 34 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad | FY24/25 Training Costs for Preceptors |
|---|---|---|---|---|
| Medical Officer | $145,519 | $0 | $32,567 | $672,009 |

### *4.1.2.3 Infrastructure and Equipment Interventions for Medical Officer Programs*

The training institution capacity assessment revealed infrastructure and equipment gaps at both baseline and access-constrained HBP levels of enrollment at KUHES. A quality environment for teaching and learning will require investments in infrastructure and equipment.

#### 4.1.2.3.1 Infrastructure and Basic Equipment Interventions for Medical Officer Program

Detailed in **Table 35** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the medicine department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 36** below details the FY24/25 prioritized resource allocation for infrastructure development across all medical officer training institutions.

*Table 35 Planned Infrastructure and Basic Equipment Interventions to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 20 | 15 | 0 | $0 |
| | Skills Development Labs (SDLs) | 1 | 7 | 6 | $1,038,448 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 36 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Medical Officer | Classrooms and Skills Development Labs | $0 |

The proposed infrastructure allocation for medical officers in FY24/25 is $0 because current infrastructure is sufficient to provide high-quality education at baseline levels of enrollment. However, when programs scale-up as needed, infrastructure investments are required to maintain quality for the increased number of students.

#### 4.1.2.3.1 Skills Development Laboratory Equipment Interventions for Medical Officer Program

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Maternity
2. Medical/Surgery
3. Pediatrics
4. Reproductive health

**Table 37** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and

**Table** 38 provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 37 Skills Laboratory Equipment Costs to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $13,492,215 |

*Table 38 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Medical Officer | $109,025 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

### *4.1.2.4 Interventions For Medical Officer's Clinical Practice*

The training of medical officers is unique in that it requires clinical practice rotations. Currently, medical officer trainees conduct their general clinical practice at Queen Elizabeth Central Hospital and their community health practice at Mangochi District Hospital. However, these two practice sites were deemed inadequate to provide high-quality training at the scale-up enrollment levels required to deliver the access-constrained HBP, as they are unable to meet the proper trainee:bed ratios. Therefore, the number of clinical practice sites need to be expanded to meet training demands. At a stakeholder meeting with government, training institutions, and medical experts, it was suggested that all district hospitals and all central hospitals should be converted and capacitated to provide clinical practice to trainees – as this will require further consultations to agree upon and operationalize, the infrastructure, equipment, and administrative interventions required to complete this transformation are not costed. Requirements for faculty in the classroom would remain the same regardless of the final infrastructure arrangements, so the only faculty costs included for this transition are trainings for all current medical officers to become effective clinical mentors/supervisors.

## 4.3 Clinical Technician Interventions

This section details both the clinical technician interventions in the access-constrained HBP that are costed for all years in the HSSP III (in tables in blue) to provide guidance on the envisioned direction of the health sector up to 2030, and also presents interventions prioritized for FY24/25 that fit within the FY24/25 prioritized resource allocation (in tables in green) to share guidance on the proposed operationalization of the HSSP III in FY24/25 given funding realities.

### 4.2.1 Public Sector Workforce Targets, Gaps, And Required Enrollment

*Table 39 Clinical Technician Workforce Targets with an Access-Constrained HBP Compared to Workforce Gaps in the Absence of Intervention*

| 2023 Public Sector Health Workforce (HW)[19] | 2030 Public Sector HW Target for Access-Constrained HBP[20] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[21] | Projected 2030 Public Sector HW Gap, With Baseline Enrollment | Projected 2030 Vacancy Rate, With Baseline Enrollment |
|---|---|---|---|---|
| 1010 | 2710 | 2710 | 0 | 0% |

As seen in **Table 39** above, the health workforce has 1010 clinical technicians as of 2021 against a target of 2710 by the year 2030 to deliver the access-constrained HBP. If baseline levels of enrollment are maintained, 2710 clinical technicians will be available in 2030, meeting the clinical technician target for provision of an access-constrained HBP. Given that government has prioritized resources to maintain baseline enrollment in FY24/25, enrollment in each training institution (TI) will be as described in **Table 40***Table 30* below in blue.

*Table 40 Clinical Technician Enrollment at Baseline and Projected Enrollment Needed to Meet Access-Constrained HBP Health Workforce Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 202-2030 To Meet Access-Constrained HBP |
|---|---|---|---|
| Ekwendeni College of Health Sciences | Diploma in Clinical Medicine | 57 | 45 |
| Malamulo College of Health Sciences | Diploma in Clinical Medicine | 65 | 52 |
| Malawi College of Health Sciences (Lilongwe Campus) | Diploma in Clinical Medicine | 106 | 84 |
| Malawi College of Health Sciences (Blantyre Campus) | Diploma in Clinical Medicine | 101 | 81 |

* The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained. The listed enrollment includes new enrollees only in a given year and does not account for students currently enrolled in the program in their second year of the program and beyond.

[19] Ministry of Health, 2022 Staff Returns
[20] Ministry of Health and Clinton Health Access Initiative, Malawi Workforce Optimization Model
[21] Ministry of Health and Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

As shown in **Table 40** above in blue, this cadre currently produces beyond the necessary target, from 2024-2030 government funds (including donor funds) will focus on funding scholarships to meet the target and the remaining enrollment will continue to be self-funded.

### 4.2.3 Interventions to Enable High Quality Training

To reach the access-constrained HBP target of 2710 clinical technicians, enrollment will be supported to meet the target. However, TI capacity assessments revealed gaps in institutional capacity to providing quality instruction at both baseline. These capacity gaps are in scholarship funding, faculty, infrastructure, and skills laboratory equipment. The proposed interventions described below close the identified gaps and equip the training institutions to meet the demands of ensuring quality teaching and learning.

#### *4.2.3.1 Scholarship Interventions for Clinical Technicians*

To meet the access-constrained HBP target for clinical technicians, one of the capacity gaps ascertained were scholarships for enrollees. Regardless of enrollment level, students regularly dropout of pre-service training programs due to insufficient funds when their tuition is self-funded. The number of scholarships required to meet targeted enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – as this cadre currently produces beyond the necessary target, government funds (including donor funds) will focus on funding scholarships to meet the target as this is the most impactful use of limited funds – this is what is costed in the subsequent sections below. The remaining enrollment will continue to be self-funded. In blue, **Table 41** details scholarship needs for training clinical technicians to deliver on the access-constrained HBP and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 41 Clinical Technicians Scholarships to Meet Access-Constrained HBP Health Workforce Targets and Scholarships Prioritized in the FY24/25 Prioritized Resource Allocation*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| Ekwendeni College of Health Sciences | $3,110,799 | 160 | 148 | 146 | 134 | 134 | 134 | 134 | 134 | $160,997 |
| Malamulo College of Health Sciences | $3,523,787 | 122 | 173 | 168 | 154 | 154 | 154 | 154 | 154 | $188,332 |
| Malawi College of Health Sciences (Lilongwe Campus) | $2,923,091 | 280 | 254 | 232 | 219 | 219 | 219 | 219 | 219 | $158,606 |
| Malawi College of Health Sciences (Blantyre Campus) | $2,888,013 | 213 | 252 | 231 | 216 | 216 | 216 | 216 | 216 | $157,106 |

** Total enrollment includes new enrollees in the year listed, and all other students enrolled in previous years that are in the pipeline to complete the program

#### *4.2.3.2 Faculty Interventions for Clinical Technician Programs*

To identify the number of faculty required to provide high-quality instruction to clinical technician trainees, training institutions provided the types of faculty that teach in their program, with ideal

student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the access-constrained HBP health workforce targets and the ideal student:faculty ratio. **Table 42** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering an access-constrained HBP.

*Table 42 Faculty Needs and Gaps to High-Quality Clinical Technician Training to Deliver the Access-Constrained HBP, Across All Training Institutions*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| **Faculty for Clinical Technician Program at Ekwendeni College of Health Sciences** | | | |
| Clinical Officer | 6 | 1 | 0 |
| Registered Nurses | 13 | 1 | 0 |
| Laboratory Officer | 0 | 1 | 1 |
| Pharmacy technician | 1 | 1 | 0 |
| Health Services Manager | 0 | 1 | 1 |
| Ophthalmic Clinical Officer | 0 | 1 | 1 |
| Dermatology Clinical Officer | 0 | 1 | 1 |
| Dental Therapist | 0 | 1 | 1 |
| Mental Health Officer | 0 | 1 | 1 |
| Clinical orthopedics and traumatology officer | 0 | 1 | 1 |
| **Faculty for Clinical Technician Program at Malamulo College of Health Sciences** | | | |
| Clinical Officer | 10 | 1 | 0 |
| Registered Nurses | 1 | 1 | 0 |
| Laboratory Officer | 1 | 1 | 0 |
| Pharmacy technician | 1 | 1 | 0 |
| Health Services Manager | 1 | 1 | 0 |
| Ophthalmic Clinical Officer | 1 | 1 | 0 |
| Dermatology Clinical Officer | 1 | 1 | 0 |
| Dental Therapist | 1 | 1 | 0 |
| Mental Health Officer | 1 | 1 | 0 |
| Clinical orthopedics and traumatology officer | 1 | 1 | 0 |
| **Faculty for Clinical Technician Program at Malawi College of Health Sciences (Lilongwe Campus)** | | | |
| Clinical Officer | 5 | 1 | 0 |
| Registered Nurses | 1 | 1 | 0 |
| Laboratory Officer | 1 | 1 | 0 |
| Pharmacy technician | 1 | 1 | 0 |
| Health Services Manager | 1 | 1 | 0 |
| Ophthalmic Clinical Officer | 1 | 1 | 0 |
| Dermatology Clinical Officer | 1 | 1 | 0 |
| Dental Therapist | 1 | 1 | 0 |
| Mental Health Officer | 2 | 1 | 0 |

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| Clinical orthopedics and traumatology officer | 1 | 1 | 0 |
| **Faculty for Clinical Technician Program at Malawi College of Health Sciences (Blantyre Campus)** | | | |
| Clinical Officer | 9 | 1 | 0 |
| Registered Nurses | 2 | 1 | 0 |
| Laboratory Officer | 1 | 1 | 0 |
| Pharmacy technician | 1 | 1 | 0 |
| Health Services Manager | 1 | 1 | 0 |
| Ophthalmic Clinical Officer | 1 | 1 | 0 |
| Dermatology Clinical Officer | 1 | 1 | 0 |
| Dental Therapist | 1 | 1 | 0 |
| Mental Health Officer | 3 | 1 | 0 |
| Clinical orthopedics and traumatology officer | 2 | 1 | 0 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver on the access-constrained HBP, described in **Table 43** below.

*Table 43 Faculty Interventions for Clinical Technicians to Meet Access-Constrained HBP Health Workforce Targets*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **Ekwendeni College of Health Sciences** | | | | |
| 7 | 6 | 0 | 1 | 0 |
| **Malamulo College of Health Sciences** | | | | |
| 0 | 0 | 0 | 0 | 0 |
| **Malawi College of Health Sciences (Lilongwe Campus)** | | | | |
| 0 | 0 | 0 | 0 | 0 |
| **Malawi College of Health Sciences (Blantyre Campus)** | | | | |
| 0 | 0 | 0 | 0 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 44** below.

*Table 44 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Clinical Technician | $182,104 | $0 | $ 7,956 |

### *4.2.3.3 Infrastructure and Equipment Interventions for Clinical Technician Programs*

The training institution capacity assessment revealed infrastructure and equipment gaps at target enrollment, across all the four training institutions. A quality environment for teaching and learning will require investments in infrastructure and equipment.

#### 4.2.3.3.1 Infrastructure and Basic Equipment Interventions for Clinical Technician Programs

Detailed in **Table 45** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the clinical medicine department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 46** below details the FY24/25 prioritized resource allocation for infrastructure development across all clinical technician training institutions.

*Table 45 Planned Infrastructure and Basic Equipment Interventions to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| Ekwendeni College of Health Sciences | Classrooms | 5 | 2 | 0 | $0 |
| | Skills Development Labs (SDLs) | 1 | 2 | 1 | $173,075 |
| Malamulo College of Health Sciences | Classrooms | 2 | 3 | 1 | $116,187 |
| | SDLs | 1 | 2 | 1 | $173,075 |
| Malawi College of Health Sciences (Lilongwe Campus) | Classrooms | 1 | 3 | 2 | $232,402 |
| | SDLs | 0 | 2 | 2 | $346,149 |
| Malawi College of Health Sciences (Blantyre Campus) | Classrooms | 1 | 3 | 2 | $232,562 |
| | SDLs | 0 | 3 | 3 | $519,224 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 46 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Clinical Technician | Classrooms and Skills Development Labs | $177,040 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.2.3.3.2 Skills Development Laboratory Equipment Interventions for Clinical Technician Programs

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Maternity
2. Medical/Surgery
3. Pediatrics
4. Reproductive health

***Table 47*** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and

**Table** 48 provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 47 Skills Laboratory Equipment Costs to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| Ekwendeni College of Health Sciences | $4,416,571 |
| Malamulo College of Health Sciences | $4,416,571 |
| Malawi College of Health Sciences (Lilongwe Campus) | $4,416,571 |
| Malawi College of Health Sciences (Blantyre Campus) | $6,624,856 |

*Table 48 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Clinical Technician | $1,241,523 |

## 4.4 Nursing Officer Interventions

This section details both the nursing officer interventions in the access-constrained HBP that are costed for all years in the HSSP III (in tables in blue) to provide guidance on the envisioned direction of the health sector up to 2030, and also presents interventions prioritized for FY24/25 that fit within the FY24/25 prioritized resource allocation (in tables in green) to share guidance on the proposed operationalization of the HSSP III in FY24/25 given funding realities.

### 4.3.1 Public Sector Workforce Targets, Gaps, And Required Enrollment

*Table 49 Nursing Officer Workforce Targets with an Access-Constrained HBP Compared to Workforce Gaps in the Absence of Intervention*

| 2023 Public Sector Health Workforce (HW)[22] | 2030 Public Sector HW Target for Access-Constrained HBP[23] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[24] | Projected 2030 Public Sector HW Gap, With Baseline Enrollment | Projected 2030 Vacancy Rate, With Baseline Enrollment |
|---|---|---|---|---|
| 1539 | 3302 | 3302 | 0 | 0% |

As seen in **Table 49** above, the health workforce has 1539 nursing officers as of 2022 against a target of 3302 by the year 2030 to deliver the access-constrained HBP. If baseline levels of enrollment are maintained, 3302 nursing officers will be available in 2030, meeting the nursing officer target for provision of an access-constrained HBP. Given that government has prioritized resources to maintain baseline enrollment in FY24/25, enrollment in each training institution (TI) will be as described in **Table 50** below in blue.

*Table 50 Nursing Officer Enrollment at Baseline and Projected Enrollment Needed to Meet Access-Constrained HBP Health Workforce Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 202-2030 To Meet Access-Constrained HBP |
|---|---|---|---|
| Kamuzu University of Health Sciences (Lilongwe Campus) | BSc. Nursing[25] | 322 | 162 |
| Catholic University | BSc. Nursing and Midwifery | 45 | 22 |
| Daeyang University | BSc. Nursing and Midwifery | 43 | 22 |
| Mzuzu University | BSc. Nursing and Midwifery | 75 | 37 |

* The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained. The listed enrollment includes new enrollees only in a given year and does not account for students currently enrolled in the program in their second year of the program and beyond.

[22] Ministry of Health, 2022 Staff Returns
[23] Ministry of Health and Clinton Health Access Initiative, Malawi Workforce Optimization Model
[24] Ministry of Health and Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool
[25] This degree includes all BSc Nursing programs offered at Kamuzu University of Health Sciences (Lilongwe Campus)

As shown in **Table 50** above in blue, this cadre currently produces beyond the necessary target, from 2024-2030 government funds (including donor funds) will focus on funding scholarships to meet the target and the remaining enrollment will continue to be self-funded.

### 4.3.2 Interventions to Enable High Quality Training

To reach the access-constrained HBP target of 1539 nursing officers, enrollment will be supported to meet the target. However, TI capacity assessments revealed gaps in institutional capacity to providing quality instruction, even at baseline enrollment. These capacity gaps are in scholarship funding, faculty, infrastructure, and skills laboratory equipment. The proposed interventions described below close the identified gaps and equip the training institutions to meet the demands of ensuring quality teaching and learning.

#### *4.3.2.1 Scholarship Interventions for Nursing Officers*

To meet the access-constrained HBP target for nursing officers, one of the capacity gaps ascertained were scholarships for enrollees. Regardless of enrollment level, students regularly dropout of pre-service training programs due to insufficient funds when their tuition is self-funded. The number of scholarships required to meet targeted enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – as this cadre currently produces beyond the necessary target, government funds (including donor funds) will focus on funding scholarships to meet the target as this is the most impactful use of limited funds – this is what is costed in the subsequent sections below. The remaining enrollment will continue to be self-funded. In blue, **Table 51** details scholarship needs for training nursing officers to deliver on the access-constrained HBP and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 51 Nursing Officers Scholarships to Meet Access-Constrained HBP Health Workforce Targets and Scholarships Prioritized in the FY24/25 Prioritized Resource Allocation*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY32/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | Total Cost of FY24/25 Scholarships Prioritized |
| Kamuzu University of Health Sciences (Lilongwe Campus) | $7,277,911 | 1152 | 306 | 255 | 211 | 168 | 168 | 168 | 168 | $444,875 |
| Catholic University | $1,038,505 | 209 | 171 | 133 | 111 | 88 | 88 | 88 | 88 | $129,942 |
| Daeyang University | $1,283,818 | 180 | 143 | 128 | 106 | 84 | 84 | 84 | 84 | $143,074 |
| Mzuzu University | $1,268,716 | 313 | 287 | 224 | 186 | 148 | 148 | 148 | 148 | $152,793 |

** Total enrollment includes new enrollees in the year listed, and all other students enrolled in previous years that are in the pipeline to complete the program

### *4.3.2.2 Faculty Interventions for Nursing Officer Programs*

To identify the number of faculty required to provide high-quality instruction to nursing officer trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the access-constrained HBP health workforce targets and the ideal student:faculty ratio. **Table 52** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering an access-constrained HBP.

*Table 52 Faculty Needs and Gaps to High-Quality Nursing Officer Training to Deliver the Access-Constrained HBP, Across All Training Institutions*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| **Faculty for Nursing Officer Program at KUHES** | | | |
| Nurse specialists | 18 | 4 | 0 |
| Lecturer in Human Anatomy and Physiology | 1 | 4 | 3 |
| Lecturer in Communication and information System | 2 | 4 | 2 |
| Lecturer in Management and Leadership | 2 | 4 | 2 |
| Lecturer in Education | 2 | 4 | 2 |
| Lecturer in Professionalism and Bioethics | 2 | 4 | 2 |
| Lecturer in Mathematics and Biophysics | 2 | 4 | 2 |
| Lecturer in Research and Statistics | 2 | 4 | 2 |
| Lecturer in Project management | 2 | 4 | 2 |
| Lecturer in Entrepreneurship | 2 | 4 | 2 |
| **Faculty for Nursing Officer Program at Catholic University** | | | |
| Master's degree lecturers[26] | 15 | 6 | 0 |
| Skills lab instructor | 1 | 1 | 0 |
| **Faculty for Nursing Officer Program at Daeyang University** | | | |
| Master's degree lecturers | 16 | 6 | 0 |
| Skills lab instructor | 5 | 1 | 0 |
| **Faculty for Nursing Officer Program at Mzuzu University** | | | |
| Master's degree lecturers | 16 | 16 | 0 |
| Skills lab instructor | 0 | 3 | 3 |

[26] Data by faculty type was not available for Catholic University, Daeyang University and Mzuzu University but only by qualification

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver on the access-constrained HBP, described in **Table 53** below.

*Table 53 Faculty Interventions for Nursing Officers to Meet Access-Constrained HBP Health Workforce Targets*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 19 | 19 | 0 | 0 | 0 |
| **Catholic University** | | | | |
| 0 | 0 | 0 | 0 | 0 |
| **Daeyang University** | | | | |
| 0 | 0 | 0 | 0 | 0 |
| **Mzuzu University** | | | | |
| 3 | 3 | 0 | 0 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 54** below.

*Table 54 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Nursing Officer | $ 175,962 | $0 | $0 |

### *4.3.2.3 Infrastructure and Equipment Interventions for Nursing Officer Programs*

The training institution capacity assessment revealed infrastructure and equipment gaps at target enrollment, across all the four training institutions. A quality environment for teaching and learning will require investments in infrastructure and equipment.

#### 4.3.2.3.1 Infrastructure and Basic Equipment Interventions for Nursing Officer Programs

Detailed in **Table 55** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the nursing department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 56** below details the FY24/25 prioritized resource allocation for infrastructure development across all nursing officer training institutions.

*Table 55 Planned Infrastructure and Basic Equipment Interventions to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 6 | 22 | 16 | $1,970,173 |

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| | Skills Development Labs (SDLs) | 1 | 9 | 8 | $1,557,642 |
| Catholic University | Classrooms | 2 | 3 | 1 | $115,919 |
| | SDLs | 1 | 2 | 1 | $173,071 |
| Daeyang University | Classrooms | 3 | 3 | 0 | $0 |
| | SDLs | 1 | 2 | 1 | $173,071 |
| Mzuzu University | Classrooms | 3 | 9 | 6 | $695,378 |
| | SDLs | 1 | 4 | 3 | $519,214 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 56 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Nursing Officer | Classrooms and Skills Development Labs | $172,752 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.3.2.3.2 Skills Development Laboratory Equipment Interventions for Nursing Officer Programs

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Maternity
2. Medical/Surgery
3. Pediatrics
4. Reproductive health

**Table 57** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 58** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 57 Skills Laboratory Equipment Costs to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $16,841,394 |

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| Catholic University | $3,324,766 |
| Daeyang University | $3,358,733 |
| Mzuzu University | $6,662,408 |

*Table 58 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Nursing Officer | $943,038 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.5 Nursing Midwife Technician Interventions

This section details both the nurse midwife technician interventions in the access-constrained HBP that are costed for all years in the HSSP III (in tables in blue) to provide guidance on the envisioned direction of the health sector up to 2030, and also presents interventions prioritized for FY24/25 that fit within the FY24/25 prioritized resource allocation (in tables in green) to share guidance on the proposed operationalization of the HSSP III in FY24/25 given funding realities.

### 4.4.1 Public Sector Workforce Targets, Gaps, And Required Enrollment

*Table 59 Nurse Midwife Technician Workforce Targets with an Access-Constrained HBP Compared to Workforce Gaps in the Absence of Intervention*

| 2023 Public Sector Health Workforce (HW)[27] | 2030 Public Sector HW Target for Access-Constrained HBP[28] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[29] | Projected 2030 Public Sector HW Gap, With Baseline Enrollment | Projected 2030 Vacancy Rate, With Baseline Enrollment |
|---|---|---|---|---|
| 2527 | 11212 | 9318 | 1894 | 17% |

As seen in **Table 59** above, the health workforce has 2527 nurse midwife technicians as of 2022 against a target of 11212 by the year 2030 to deliver the access-constrained HBP. If baseline levels of enrollment are maintained, only 9318 nurse midwife technicians will be available in 2030, leaving a gap of 1894, or a 17% vacancy rate. Although there are only resources to maintain baseline levels of enrollment in FY24/25, maintaining enrollment will be inadequate to meet the 2030 health workforce targets for an access-constrained HBP. Enrollment must be scaled up across training institutions (TIs) as described in **Table 60** below in blue during the remainder of the HSSP III period when additional resources becomes available.

*Table 60 Nurse Midwife Technician Enrollment at Baseline and Projected Enrollment Needed to Meet Access-Constrained HBP Health Workforce Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Meet Access-Constrained HBP |
|---|---|---|---|
| Daeyang University | Diploma in Nursing and Midwifery | 85 | 140 |
| Ekwendeni College of Health Sciences | Diploma in Nursing and Midwifery | 151 | 249 |
| Holy Family College of Nursing and Midwifery | Diploma in Nursing and Midwifery | 78 | 128 |
| Malamulo College of Health Sciences | Diploma in Nursing and Midwifery | 68 | 111 |
| Malawi College of Health Sciences- Zomba | Diploma in Nursing and Midwifery | 95 | 155 |
| Mulanje Mission | Diploma in Nursing and Midwifery | 112 | 184 |

[27] Ministry of Health,2022 Staff Returns
[28] Ministry of Health and Clinton Health Access Initiative, Malawi Workforce Optimization Model
[29] Ministry of Health and Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

| | | | |
|---|---|---|---|
| Nkhoma College of Nursing and Midwifery | Diploma in Nursing and Midwifery | 95 | 156 |
| St John of God College of Health Sciences | Diploma in Nursing and Midwifery | 65 | 107 |
| St John's Institute for Health | Diploma in Nursing and Midwifery | 110 | 180 |
| St Joseph's College of Nursing and Midwifery | Diploma in Nursing and Midwifery | 142 | 232 |
| St Luke's College of Nursing and Midwifery | Diploma in Nursing and Midwifery | 196 | 321 |
| Trinity College Of Nursing and Midwifery | Diploma in Nursing and Midwifery | 62 | 102 |
| Malawi College of Health Sciences- Blantyre | Diploma in Nursing and Midwifery | 100 | 78 |

* The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained. The listed enrollment includes new enrollees only in a given year and does not account for students currently enrolled in the program in their second year of the program and beyond.

### 4.4.2 Interventions to Enable High Quality Training

To reach the access-constrained HBP target of 11212 nurse midwife technicians, when additional resources for health workforce become available, interventions are needed to scale-up enrollment. TI capacity assessments revealed gaps in institutional capacity to providing quality instruction, at both baseline and scaled-up enrollment. These capacity gaps are in scholarship funding, faculty, infrastructure, and skills laboratory equipment. The proposed interventions described below close the identified gaps and equip the training institutions to meet the demands of ensuring quality teaching and learning.

#### *4.4.2.1 Scholarship Interventions for Nurse Midwife Technicians*

To meet the access-constrained HBP target for nurse midwife technicians, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific case of FY24/25, the quantities are the same at target and at baseline, as the proposal for enrollment scale-up does not begin until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 61** details scholarship needs for training nurse midwife technicians to deliver on the access-constrained HBP and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 61 Nurse Midwife Technicians Scholarships to Meet Access-Constrained HBP Health Workforce Targets and Scholarships Prioritized in the FY24/25 Prioritized Resource Allocation*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| Daeyang University | $4,602,583 | 170 | 255 | 309 | 364 | 418 | 418 | 418 | 418 | $271,652 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Ekwendeni College of Health Sciences | $7,890,143 | 393 | 246 | 301 | 354 | 407 | 407 | 407 | 407 | $488,264 |
| Holy Family College of Nursing and Midwifery | $4,242,317 | 192 | 231 | 283 | 333 | 383 | 383 | 383 | 383 | $245,611 |
| Malamulo College of Health Sciences | $3,577,193 | 97 | 165 | 246 | 289 | 332 | 332 | 332 | 332 | $175,657 |
| Malawi College of Health Sciences-Zomba | $2,980,977 | 289 | 283 | 344 | 404 | 465 | 465 | 465 | 465 | $172,791 |
| Mulanje Mission | $6,030,954 | 241 | 295 | 407 | 479 | 551 | 551 | 551 | 551 | $314,027 |
| Nkhoma College of Nursing and Midwifery | $5,130,279 | 210 | 260 | 345 | 406 | 467 | 467 | 467 | 467 | $276,742 |
| St John of God College of Health Sciences | $6,044,911 | 340 | 329 | 399 | 469 | 539 | 539 | 539 | 539 | $350,152 |
| St John's Institute for Health | $6,044,911 | 340 | 329 | 399 | 469 | 539 | 539 | 539 | 539 | $350,152 |
| St Joseph's College of Nursing and Midwifery | $7,625,622 | 346 | 343 | 515 | 605 | 696 | 696 | 696 | 696 | $365,044 |
| St Luke's College of Nursing and Midwifery | $10,765,103 | 604 | 585 | 710 | 836 | 961 | 961 | 961 | 961 | $623,601 |
| Trinity College Of Nursing and Midwifery | $3,274,412 | 119 | 128 | 225 | 264 | 304 | 304 | 304 | 304 | $136,714 |
| Malawi College of Health Sciences-Blantyre | $2,998,877 | 166 | 95 | 173 | 203 | 234 | 234 | 234 | 234 | $121,068 |

** Total enrollment includes new enrollees in the year listed, and all other students enrolled in previous years that are in the pipeline to complete the program

### *4.4.2.2 Faculty Interventions for Nurse Midwife Technician Programs*

To identify the number of faculty required to provide high-quality instruction to nurse midwife technician trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the access-constrained HBP health workforce targets and the ideal student:faculty ratio. **Table 62** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering an access-constrained HBP.

*Table 62 Faculty Needs and Gaps to High-Quality Nurse Midwife Technician Training to Deliver the Access-Constrained HBP, Across All Training Institutions*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| **Faculty for Nurse Midwife Technician Program at Daeyang University** | | | |
| Master's degree lecturers | 16 | 35 | 16 |
| Skills lab instructor | 5 | 4 | 0 |
| **Faculty for Nurse Midwife Technician Program at Ekwendeni College of Health Sciences** | | | |
| Master's degree lecturers | 17 | 34 | 17 |
| Skills lab instructor | 7 | 3 | 0 |
| **Faculty for Nurse Midwife Technician Program at Holy Family College of Nursing and Midwifery** | | | |
| Master's degree lecturers | 15 | 32 | 17 |
| Skills lab instructor | 1 | 3 | 2 |
| **Faculty for Nurse Midwife Technician Program at Malamulo College of Health Sciences** | | | |
| Master's degree lecturers | 10 | 28 | 18 |
| Skills lab instructor | 2 | 3 | 1 |
| **Faculty for Nurse Midwife Technician Program at Malawi College of Health Sciences- Zomba** | | | |
| Master's degree lecturers | 17 | 39 | 22 |
| Skills lab instructor | 0 | 4 | 4 |
| **Faculty for Nurse Midwife Technician Program at Mulanje Mission** | | | |
| Master's degree lecturers | 19 | 46 | 27 |
| Skills lab instructor | 0 | 5 | 5 |
| **Faculty for Nurse Midwife Technician Program at Nkhoma College of Nursing and Midwifery** | | | |
| Master's degree lecturers | 16 | 46 | 30 |
| Skills lab instructor | 2 | 5 | 3 |
| **Faculty for Nurse Midwife Technician Program at St John of God College of Health Sciences** | | | |
| Master's degree lecturers | 5 | 46 | 41 |
| Skills lab instructor | 2 | 5 | 20 |
| **Faculty for Nurse Midwife Technician Program at St John's Institute for Health** | | | |
| Master's degree lecturers | 17 | 46 | 29 |
| Skills lab instructor | 0 | 5 | 5 |
| **Faculty for Nurse Midwife Technician Program at St Joseph's College of Nursing and Midwifery** | | | |
| Master's degree lecturers | 23 | 46 | 23 |
| Skills lab instructor | 3 | 5 | 2 |
| **Faculty for Nurse Midwife Technician Program at St Luke's College of Nursing and Midwifery** | | | |
| Master's degree lecturers | 18 | 46 | 28 |
| Skills lab instructor | 3 | 5 | 2 |
| **Faculty for Nurse Midwife Technician Program at Trinity College Of Nursing and Midwifery** | | | |
| Master's degree lecturers | 2 | 46 | 44 |
| Skills lab instructor | 1 | 5 | 4 |
| **Faculty for Nurse Midwife Technician Program at Malawi College of Health Sciences- Blantyre** | | | |
| Master's degree lecturers | 19 | 20 | 1 |
| Skills lab instructor | 0 | 2 | 2 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver on the access-constrained HBP, described in **Table 63** below.

*Table 63 Faculty Interventions for Nurse Midwife Technicians to Meet Access-Constrained HBP Health Workforce Targets*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **Daeyang University** | | | | |
| 16 | 16 | 0 | 0 | 0 |
| **Ekwendeni College of Health Sciences** | | | | |
| 17 | 17 | 0 | 0 | 0 |
| **Holy Family College of Nursing and Midwifery** | | | | |
| 19 | 19 | 0 | 0 | 0 |
| **Malamulo College of Health Sciences** | | | | |
| 19 | 19 | 0 | 0 | 0 |
| **Malawi College of Health Sciences- Zomba** | | | | |
| 26 | 26 | 0 | 0 | 0 |
| **Mulanje Mission** | | | | |
| 32 | 32 | 0 | 0 | 0 |
| **Nkhoma College of Nursing and Midwifery** | | | | |
| 33 | 33 | 0 | 0 | 0 |
| **St John of God College of Health Sciences** | | | | |
| 61 | 61 | 0 | 0 | 0 |
| **St John's Institute for Health** | | | | |
| 34 | 34 | 0 | 0 | 0 |
| **St Joseph's College of Nursing and Midwifery** | | | | |
| 25 | 25 | 0 | 0 | 0 |
| **St Luke's College of Nursing and Midwifery** | | | | |
| 30 | 30 | 0 | 0 | 0 |
| **Trinity College Of Nursing and Midwifery** | | | | |
| 48 | 48 | 0 | 0 | 0 |
| **Malawi College of Health Sciences- Blantyre** | | | | |
| 3 | 3 | 0 | 0 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 64** below.

*Table 64 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Nurse Midwife Technician | $776,506 | $0 | $0 |

### *4.4.2.3 Infrastructure and Equipment Interventions for Nurse Midwife Technician Programs*

The training institution capacity assessment revealed infrastructure and equipment gaps at both baseline and access-constrained HBP levels of enrollment, across all the three training institutions. A quality environment for teaching and learning will require investments in infrastructure and equipment.

#### 4.4.2.3.1 Infrastructure and Basic Equipment Interventions for Nurse Midwife Technician Programs

Detailed in **Table 65** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the nursing department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 66** below details the FY24/25 prioritized resource allocation for infrastructure development across all nurse midwife technician training institutions.

*Table 65 Planned Infrastructure and Basic Equipment Interventions to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| Daeyang University | Classrooms | 3 | 23 | 20 | $2,309,371 |
| | Skills Development Labs (SDLs) | 1 | 6 | 5 | $865,373 |
| Ekwendeni College of Health Sciences | Classrooms | 11 | 34 | 23 | $2,655,823 |
| | SDLs | 1 | 6 | 7 | $1,211,522 |
| Holy Family College of Nursing and Midwifery | Classrooms | 2 | 21 | 19 | $2,193,917 |
| | SDLs | 1 | 5 | 4 | $692,298 |
| Malamulo College of Health Sciences | Classrooms | 11 | 18 | 7 | $808,303 |
| | SDLs | 1 | 5 | 4 | $692,298 |
| Malawi College of Health Sciences-Zomba | Classrooms | 4 | 25 | 21 | $2,424,928 |
| | SDLs | 1 | 6 | 5 | $865,373 |
| Mulanje Mission | Classrooms | 4 | 29 | 25 | $2,886,881 |
| | SDLs | 0 | 7 | 7 | $1,211,522 |
| Nkhoma College of Nursing and Midwifery | Classrooms | 2 | 25 | 23 | $2,655,873 |
| | SDLs | 1 | 6 | 5 | $865,373 |
| St John of God College of Health Sciences | Classrooms | 7 | 29 | 22 | $2,539,029 |
| | SDLs | 1 | 7 | 6 | $1,038,448 |

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| St John's Institute for Health | Classrooms | 2 | 29 | 27 | $3,117,757 |
| | SDLs | 0 | 7 | 7 | $1,211,522 |
| St Joseph's College of Nursing and Midwifery | Classrooms | 3 | 37 | 34 | $3,926,125 |
| | SDLs | 1 | 9 | 8 | $1,384,597 |
| St Luke's College of Nursing and Midwifery | Classrooms | 5 | 51 | 46 | $5,311,826 |
| | SDLs | 1 | 13 | 12 | $2,076,895 |
| Trinity College Of Nursing and Midwifery | Classrooms | 3 | 16 | 13 | $1,501,185 |
| | SDLs | 1 | 4 | 3 | $519,224 |
| Malawi College of Health Sciences-Blantyre | Classrooms | 0 | 27 | 27 | $3,117,660 |
| | SDLs | 0 | 7 | 7 | $1,211,522 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 66 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Nurse Midwife Technician | Classrooms and Skills Development Labs | $2,071,211 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.4.2.3.2 Skills Development Laboratory Equipment Interventions for Nurse Midwife Technician Programs

To provide high-quality instruction, adequate laboratory equipment is required. **Table 67** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 68** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 67 Skills Laboratory Equipment Costs to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| Daeyang University | $10,083,956 |
| Ekwendeni College of Health Sciences | $15,092,592 |

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| Holy Family College of Nursing and Midwifery | $8,420,116 |
| Malamulo College of Health Sciences | $8,393,361 |
| Malawi College of Health Sciences-Zomba | $10,103,739 |
| Mulanje Mission | $11,801,237 |
| Nkhoma College of Nursing and Midwifery | $10,093,207 |
| St John of God College of Health Sciences | $11,808,690 |
| St John's Institute for Health | $11,811,014 |
| St Joseph's College of Nursing and Midwifery | $15,169,108 |
| St Luke's College of Nursing and Midwifery | $21,914,709 |
| Trinity College Of Nursing and Midwifery | $6,723,550 |
| Malawi College of Health Sciences-Blantyre | $5,041,937 |

*Table 68 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Nurse Midwife Technician | $5,511,838 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.6 Community Health Workforce Interventions

The Ministry of Health through the Health Sector Strategic Plan III (2023-2030) seeks to strengthen the community health workforce. A strong community health workforce will not only strengthen equitable access to care, but also increase service provision of primary care. The prioritized cadres to address community health needs are Health Surveillance Assistants (HSAs), Senior Health Surveillance Assistants (SHSA), Community Health Nurses (CHNs) and Community Midwifery Assistants (CMAs). Whilst other community-based cadres are also important, there was insufficient enrollment data to model their pre-service interventions.

Though the Workforce Optimization Model (WFOM) is used to set optimal health workforce targets for primary- and secondary-level health services, the limited availability and quality of service volume data for community health services renders the WFOM unsuitable for community health workforce target setting. To calculate the workforce requirements for these cadres, several discussions were held with the Community and Promotive Health Department, and in addition, reference was made to the National Community Health Strategy (2017-2022).

This section details the HSA, SHSA, CHN and CMA targets and also provides the interventions that are costed for all years in the HSSP III. This section also presents the interventions prioritized for FY24/25 that fit within the FY24/25 prioritized resource allocation.

### 4.6.1 Health Surveillance Assistants and Senior Health Surveillance Assistants

HSAs and SHSAs need to be scaled-up to their respective targets (1 HSA to 1000 population, and 1 SHSA to 10 HSAs). By the year 2030 there is a requirement of 24,999 HSAs and 2,500 SHSAs to provide comprehensive and quality community health services. **Table 69** and **Table 70** below describe the targets and scale up plan for HSAs and SHSAs respectively. Investments required to enable scale up of HSAs and SHSAs are in salaries, pre-service education, and supplies which include bicycles, motorcycles and mobile phones. Currently, once HSAs are recruited, they undergo a 12 week training conducted centrally by the community health department at the Ministry of Health. In the HSSP III, the Ministry of Health plans to review HSA pre-service and in-service training curriculum (including training manual and job aids) to expand the duration and scope and obtain accreditation from the appropriate regulatory body. These interventions in the HSSP III were costed at a total of $15.8M for FY24/25 and were fully funded.

*Table 69 Scale Up Plan For Health Surveillance Assistants*

| Scale up - HSAs | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | Requirement beyond 2030 |
|---|---|---|---|---|---|---|---|---|---|
| HSAs Required | 20,200 | 20,745 | 21,306 | 21,881 | 22,472 | 23,078 | 23,701 | 24,341 | 24,999 |
| HSAs Linear Scale up | 9,526 | 11,460 | 13,394 | 15,328 | 17,262 | 19,196 | 21,130 | 23,064 | 24,999 |
| HSAs to be Recruited | 1,934 | 1,934 | 1,934 | 1,934 | 1,934 | 1,934 | 1,934 | 1,934 | |

*Table 70 Scale Up Plan For Senior Health Surveillance Assistants*

| Scale up - SHSAs | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | Requirement beyond 2030 |
|---|---|---|---|---|---|---|---|---|---|
| Senior HSAs Required | 2,020 | 2,075 | 2,131 | 2,188 | 2,247 | 2,308 | 2,370 | 2,434 | 2,500 |
| Senior HSA's Linear Scale up | 1,155 | 1,323 | 1,491 | 1,659 | 1,827 | 1,996 | 2,164 | 2,332 | 2,500 |
| Senior HSAs to be Recruited | 168 | 168 | 168 | 168 | 168 | 168 | 168 | 168 | |

### 4.6.2 Community Health Nurse

CHNs play an integral role in delivering community health services and ensuring quality. CHNs provide clinical mentoring to all SHSAs and HSAs and these CHNs receive clinical mentoring, performance management and appraisal, and supportive supervision from registered nurses. The community health strategy proposes that there should be 2 CHNs per health center leading to a target of 1,100 CHNs by FY29/30 from the current establishment of 32 CHNs across Malawi (assuming that the number of health centers remained constant). A linear scale-up was applied across the years to reach the target from the current levels. **Table 71** below describes the targets and scale up plan for CHNs. At the time of modelling for cadres to deliver the HBP, pre-service data was not available for CHNs to model for interventions in pre-service education required to scale up CHNs. Thus, when data is available and collected, modelling to ascertain critical gaps in pre-service education for this cadre is imperative.

*Table 71 Scale Up Plan For Community Health Nurses*

| Scale up - CHN | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 |
|---|---|---|---|---|---|---|---|---|
| CHNs Linear Scale Up | 32 | 185 | 337 | 490 | 642 | 795 | 947 | 1,100 |
| CHNs at the End of Year | 32 | 185 | 337 | 490 | 642 | 795 | 947 | 1,100 |
| CHNs to be Recruited each year | 153 | 153 | 153 | 153 | 153 | 153 | 153 | |

### 4.6.3 Community Midwifery Assistants

CMAs were also prioritized as a critical community health workforce cadre that increase access to care and service provision of primary care. Based on discussions with the Community and Promotive Health

Department, a ratio of 1 CMA to a population of 5000 was used to calculate the required number of CMAs by FY29/30 which is 4,868. **Table 71** below describes the targets and scale up plan for CHNs, where were linearly scaled year to year, like the other community-based cadres. Currently, this cadre is trained at Ekwendeni College of Health Sciences, Malawi College of Health Sciences- Blantyre Campus, Mulanje Mission and Nkhoma College of Nursing and Midwifery. Whilst pre-service costs for this cadre were included, TI capacity gaps were modeled off of a similar cadre, as there was insufficient data about current training institution capacity for CMAs. In the future, a TI capacity assessment must be conducted to ascertain critical gaps to the scale up of this cadre and ensure that investments made guarantee value for money and impact. The HSSP III prioritizes an intervention package of $15.6M in CMAs in FY2024/2025, including salaries for the FY2024/2025 CMA graduating class, scholarships for all CMA trainees enrolled at baseline in FY24/25, and investments to improve the quality of education for CMAs at baseline enrolment.

*Table 72 Scale Up Plan For Community Midwifery Assistants*

| Scale up - CMAs | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 |
|---|---|---|---|---|---|---|---|---|
| CMAs population based target | 4,040 | 4,149 | 4,261 | 4,376 | 4,494 | 4,616 | 4,740 | 4,868 |
| CMAs Linear Scale Up | 530 | 1,150 | 1,770 | 2,389 | 3,009 | 3,629 | 4,249 | 4,868 |
| CMAs at the End of Year | 530 | 1,150 | 1,770 | 2,389 | 3,009 | 3,629 | 4,249 | 4,868 |
| CMAs to be Recruited each year | 620 | 620 | 620 | 620 | 620 | 620 | 620 | |

## 4.7 Laboratory Officer Interventions

This section details both the laboratory officer interventions in the access-constrained HBP that are costed for all years in the HSSP III (in tables in blue) to provide guidance on the envisioned direction of the health sector up to 2030, and also presents interventions prioritized for FY24/25 that fit within the FY24/25 prioritized resource allocation (in tables in green) to share guidance on the proposed operationalization of the HSSP III in FY24/25 given funding realities.

### 4.5.1 Public Sector Workforce Targets, Gaps, And Required Enrollment

*Table 73 Laboratory Officer Workforce Targets with an Access-Constrained HBP Compared to Workforce Gaps in the Absence of Intervention*

| 2023 Public Sector Health Workforce (HW)[30] | 2030 Public Sector HW Target for Access-Constrained HBP[31] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[32] | Projected 2030 Public Sector HW Gap, With Baseline Enrollment | Projected 2030 Vacancy Rate, With Baseline Enrollment |
|---|---|---|---|---|
| 169 | 1144 | 496 | 648 | 57% |

As seen in **Table 73** above, the health workforce has 169 laboratory officers as of 2022 against a target of 1144 by the year 2030 to deliver the access-constrained HBP. If baseline levels of enrollment are maintained, only 496 laboratory officers will be available in 2030, leaving a gap of 648, or a 57% vacancy rate. Although there are only resources to maintain baseline levels of enrollment in FY24/25, maintaining enrollment will be inadequate to meet the 2030 health workforce targets for an access-constrained HBP. Enrollment must be scaled up across training institutions (TIs) as described in **Table 74***Table 30* below in blue during the remainder of the HSSP III period when additional resources becomes available.

*Table 74 Laboratory Officer Enrollment at Baseline and Projected Enrollment Needed to Meet Access-Constrained HBP Health Workforce Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Meet Access-Constrained HBP |
|---|---|---|---|
| Kamuzu University of Health Sciences (KUHES) | BSc. Medical Laboratory Sciences | 38 | 394 |
| Malamulo College of Health Sciences | BSc. Biomedical Sciences | 31 | 322 |
| Mzuzu University | BSc. Biomedical Sciences | 27 | 280 |

* The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained. The listed enrollment includes new enrollees only in a given year and does not account for students currently enrolled in the program in their second year of the program and beyond.

[30] Ministry of Health, 2022 Staff Returns
[31] Ministry of Health and Clinton Health Access Initiative, Malawi Workforce Optimization Model
[32] Ministry of Health and Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

## 4.5.2 Interventions to Enable High Quality Training

To reach the access-constrained HBP target of 1144 laboratory officers, when additional resources for health workforce become available, interventions are needed to scale-up enrollment. TI capacity assessments revealed gaps in institutional capacity to providing quality instruction, at both baseline and scaled-up enrollment. These capacity gaps are in scholarship funding, faculty, infrastructure, and skills laboratory equipment. The proposed interventions described below close the identified gaps and equip the training institutions to meet the demands of ensuring quality teaching and learning.

### *4.5.2.1 Scholarship Interventions for Laboratory Officers*

To meet the access-constrained HBP target for laboratory officers, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific case of FY24/25, the quantities are the same at target and at baseline, as the proposal for enrollment scale-up does not begin until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 75** details scholarship needs for training laboratory officers to deliver on the access-constrained HBP and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 75 Laboratory Officers Scholarships to Meet Access-Constrained HBP Health Workforce Targets and Scholarships Prioritized in the FY24/25 Prioritized Resource Allocation*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | Total Cost of FY24/25 Scholarships Prioritized |
| KUHES | $6,656,137 | 183 | 184 | 545 | 900 | 1256 | 1612 | 1968 | 1968 | $81,669 |
| Malamulo College of Health Sciences | $12,935,170 | 139 | 122 | 405 | 726 | 1025 | 1316 | 1606 | 1606 | $129,967 |
| Mzuzu University | $4,734,374 | 138 | 134 | 388 | 640 | 893 | 1146 | 1399 | 1399 | $59,624 |

** Total enrollment includes new enrollees in the year listed, and all other students enrolled in previous years that are in the pipeline to complete the program

### *4.5.2.2 Faculty Interventions for Laboratory Officer Programs*

To identify the number of faculty required to provide high-quality instruction to laboratory officer trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the access-constrained HBP health workforce targets and the ideal student:faculty ratio. **Table 76** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering an access-constrained HBP.

*Table 76 Faculty Needs and Gaps to High-Quality Laboratory Officer Training to Deliver the Access-Constrained HBP, Across All Training Institutions*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| **Faculty for Laboratory Officer Program at KUHES** | | | |
| Biomedical Forensic Science Pathologists | 0 | 7 | 7 |
| Biomedical Forensic Lecturers | 0 | 13 | 13 |
| Biomedical Forensic Science Scientists | 0 | 20 | 20 |
| Biomedical Forensic Science Technicians | 0 | 20 | 20 |
| Clinical Chemistry Lecturers | 0 | 20 | 20 |
| Clinical Chemistry Laboratory Scientists | 0 | 20 | 20 |
| Clinical Chemistry Technologists | 0 | 20 | 20 |
| Medical Microbiology Lecturers | 0 | 13 | 13 |
| Medical Microbiology Laboratory Scientists | 0 | 20 | 20 |
| Medical Microbiology Technologists | 0 | 20 | 20 |
| Medical Virologists | 0 | 7 | 7 |
| Medical Virology Scientists | 1 | 20 | 20 |
| Medical Virology Technologists | 0 | 20 | 20 |
| Mycology Lecturers | 0 | 13 | 13 |
| Mycology Scientists | 1 | 20 | 20 |
| Parasitology Lecturers | 0 | 7 | 7 |
| Parasitology Scientists | 0 | 20 | 20 |
| Haematology Laboratory Consultants | 0 | 7 | 7 |
| Haematology Lecturers | 0 | 13 | 13 |
| Haematology Scientists | 1 | 20 | 20 |
| Haematology Technologists | 1 | 20 | 20 |
| Molecular Biology Lecturers | 1 | 13 | 13 |
| Molecular Biology Scientists | 1 | 20 | 20 |
| Molecular Biology Technologists | 0 | 20 | 20 |
| Clinical Histology/Cytology Pathologists | 0 | 7 | 7 |
| Clinical Histology/Cytology Lecturers | 0 | 13 | 13 |
| Clinical Histology/Cytology Scientists | 1 | 20 | 20 |
| Clinical Histology/Cytology Technologists | 0 | 20 | 20 |
| Immunology Lecturers | 0 | 13 | 13 |
| Immunology Scientists | 0 | 20 | 20 |
| Immunology Technologists | 0 | 20 | 20 |
| Transfusion Science Lecturers | 0 | 13 | 13 |
| Transfusion Science Scientists | 0 | 20 | 20 |

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| Medical Laboratory Research Experts | 0 | 13 | 13 |
| Quantitative Research Scientists | 0 | 20 | 20 |
| Quality Assurance Manager | 0 | 20 | 20 |
| MLS Mobile Lab Clinic Medical Officer | 0 | 2 | 2 |
| MLS Mobile Lab Clinic Manager | 0 | 2 | 2 |
| MLS Mobile Lab Clinic Scientist | 0 | 2 | 2 |
| MLS Mobile Lab Clinic Van Drivers | 0 | 2 | 2 |
| MLS Mobile Lab Clinic and IGA Cashier | 0 | 2 | 2 |
| MLS Diagnostic Services Coordinator | 0 | 2 | 2 |
| **Faculty for Laboratory Officer Program at Malamulo College of Health Sciences** | | | |
| Lecturer in Clinical Hematology and Transfusion Science | 4 | 8 | 4 |
| Lecturer in Clinical Immunology, Serology, Cytology, and Histology | 0 | 8 | 8 |
| Lecturer in Medical Microbiology and Medical Parasitology | 0 | 8 | 8 |
| Lecturer in Clinical Chemistry, Urinalysis, and Laboratory Mathematics | 0 | 8 | 8 |
| Lecturer in Molecular Diagnostics and Laboratory Instrumentation | 0 | 8 | 8 |
| Lecturer in Epidemiology, Biostatistics, and Research Methodology | 0 | 8 | 8 |
| Lecturer in Laboratory Management, Laboratory Safety, and Lab Ethics | 0 | 8 | 8 |
| **Faculty for Laboratory Officer Program at Mzuzu University** | | | |
| Hematology Specialist | 1 | 7 | 6 |
| Immunology Specialist | 1 | 7 | 6 |
| Parasitology Specialist | 1 | 7 | 6 |
| Clinical Chemistry Specialist | 1 | 7 | 6 |
| Molecular Biology Specialist | 1 | 7 | 6 |
| Cytology/Histology Specialist | 1 | 7 | 6 |
| Microbiology Specialist | 1 | 7 | 6 |
| Blood Transfusion Science Specialist | 1 | 7 | 6 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver on the access-constrained HBP, described in **Table 77** below.

*Table 77 Faculty Interventions for Laboratory Officers to Meet Access-Constrained HBP Health Workforce Targets*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 604 | 506 | 0 | 98 | 0 |
| **Malamulo College of Health Sciences** | | | | |
| 52 | 52 | 0 | 0 | 0 |
| **Mzuzu University** | | | | |
| 56 | 56 | 0 | 0 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 78** below.

*Table 78 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Laboratory Officer | $ 1,336,983 | $0 | $39,946 |

### *4.5.2.3 Infrastructure and Equipment Interventions for Laboratory Officer Programs*

The training institution capacity assessment revealed infrastructure and equipment gaps at both baseline and access-constrained HBP levels of enrollment, across all the three training institutions. A quality environment for teaching and learning will require investments in infrastructure and equipment.

#### 4.5.2.3.1 Infrastructure and Basic Equipment Interventions for Laboratory Officer Programs

Detailed in **Table 79** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the biomedical sciences/medical laboratory sciences department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 80** below details the FY24/25 prioritized resource allocation for infrastructure development across all laboratory officer training institutions.

*Table 79 Planned Infrastructure and Basic Equipment Interventions to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 3 | 35 | 32 | $3,691,585 |
| | Skills Development Labs (SDLs) | 1 | 13 | 12 | $2,076,857 |
| Mzuzu University | Classrooms | 5 | 25 | 20 | $2,307,236 |
| | SDLs | 1 | 9 | 8 | $1,384,571 |

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| Malamulo College of Health Sciences | Classrooms | 3 | 6 | 3 | $346,576 |
| | SDLs | 1 | 11 | 10 | $1,730,714 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 80 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Laboratory Officer | Classrooms and Skills Development Labs | $ 0 |

The proposed infrastructure allocation for laboratory officers in FY24/25 is $0 because current infrastructure is sufficient to provide high-quality education at baseline levels of enrollment. However, when programs scale-up as needed, infrastructure investments are required to maintain quality for the increased number of students.

#### 4.5.2.3.2 Skills Development Laboratory Equipment Interventions for Laboratory Officer Programs

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Haematology
2. Clinical Chemistry
3. Medical Microbiology
4. Medical Parasitology
5. Immunology and serology
6. Blood transfusion

**Table 81** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 82** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 81 Skills Laboratory Equipment Costs to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $5,892,165 |
| Malamulo College of Health Sciences | $2,159,536 |
| Mzuzu University | $1,702,798 |

*Table 82 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|

| | |
|---|---|
| Laboratory Officer | $31,213 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.8 Laboratory Technician Interventions

This section details both the laboratory technician interventions in the access-constrained HBP that are costed for all years in the HSSP III (in tables in blue) to provide guidance on the envisioned direction of the health sector up to 2030, and also presents interventions prioritized for FY24/25 that fit within the FY24/25 prioritized resource allocation (in tables in green) to share guidance on the proposed operationalization of the HSSP III in FY24/25 given funding realities.

### 4.6.1 Public Sector Workforce Targets, Gaps, And Required Enrollment

*Table 83 Laboratory Technician Workforce Targets with an Access-Constrained HBP Compared to Workforce Gaps in the Absence of Intervention*

| 2023 Public Sector Health Workforce (HW)[33] | 2030 Public Sector HW Target for Access-Constrained HBP[34] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[35] | Projected 2030 Public Sector HW Gap, With Baseline Enrollment | Projected 2030 Vacancy Rate, With Baseline Enrollment |
|---|---|---|---|---|
| 1093 | 1298 | 743 | 555 | 43% |

As seen in **Table 83** above, the health workforce has 1093 laboratory technicians as of 2022 against a target of 1298 by the year 2030 to deliver the access-constrained HBP. If baseline levels of enrollment are maintained, only 743 laboratory officers will be available in 2030, leaving a gap of 555, or a 43% vacancy rate. Although there are only resources to maintain baseline levels of enrollment in FY24/25, maintaining enrollment will be inadequate to meet the 2030 health workforce targets for an access-constrained HBP. Enrollment must be scaled up across training institutions (TIs) as described in **Table 84***Table 30* below in blue during the remainder of the HSSP III period when additional resources becomes available.

*Table 84 Laboratory Technician Enrollment at Baseline and Projected Enrollment Needed to Meet Access-Constrained HBP Health Workforce Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Meet Access-Constrained HBP |
|---|---|---|---|
| Malamulo College of Health Sciences | Diploma. Biomedical Sciences | 45 | 156 |
| Malawi College of Health Sciences (Lilongwe Campus) | Diploma. Biomedical Sciences | 30 | 104 |

* The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained. The listed enrollment includes new enrollees only in a given year and does not account for students currently enrolled in the program in their second year of the program and beyond.

### 4.6.2 Interventions to Enable High Quality Training

To reach the access-constrained HBP target of 1298 laboratory technicians, when additional resources for health workforce become available, interventions are needed to scale-up enrollment. TI capacity assessments revealed gaps in institutional capacity to providing quality instruction, at both baseline and

[33] Ministry of Health, 2022 Staff Returns
[34] Ministry of Health and Clinton Health Access Initiative, Malawi Workforce Optimization Model
[35] Ministry of Health and Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

scaled-up enrollment. These capacity gaps are in scholarship funding, faculty, infrastructure, and skills laboratory equipment. The proposed interventions described below close the identified gaps and equip the training institutions to meet the demands of ensuring quality teaching and learning.

### *4.6.2.1 Scholarship Interventions for Laboratory Technicians*

To meet the access-constrained HBP target for laboratory technicians, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific case of FY24/25, the quantities are the same at target and at baseline, as the proposal for enrollment scale-up does not begin until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 85** details scholarship needs for training laboratory technicians to deliver on the access-constrained HBP and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 85 Laboratory Technicians Scholarships to Meet Access-Constrained HBP Health Workforce Targets and Scholarships Prioritized in the FY24/25 Prioritized Resource Allocation*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| Malamulo College of Health Sciences | $4,602,261 | 45 | 89 | 245 | 356 | 467 | 467 | 467 | 467 | $94,812 |
| Malawi College of Health Sciences (Lilongwe Campus) | $1,811,484 | 95 | 90 | 164 | 238 | 311 | 311 | 311 | 311 | $54,723 |

** Total enrollment includes new enrollees in the year listed, and all other students enrolled in previous years that are in the pipeline to complete the program

### *4.6.2.2 Faculty Interventions for Laboratory Technician Programs*

To identify the number of faculty required to provide high-quality instruction to laboratory technician trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the access-constrained HBP health workforce targets and the ideal student:faculty ratio. **Table 86** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering an access-constrained HBP.

*Table 86 Faculty Needs and Gaps to High-Quality Laboratory Technician Training to Deliver the Access-Constrained HBP, Across All Training Institutions*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| **Faculty for Laboratory Technician Program at Malamulo College of Health Sciences** | | | |
| Clinical Hematology/Transfusion Science Lecturer | 1 | 4 | 3 |

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| Clinical immunology/serology/cytology/Histology | 1 | 4 | 3 |
| Medical Microbiology/Medical Parasitology Lecturer | 1 | 4 | 3 |
| Clinical Chemistry/Urinalysis/Laboratory Mathematics Lecturer | 1 | 4 | 3 |
| Molecular Diagnostics/Laboratory Instrumentation Lecturer | 1 | 4 | 3 |
| Epidemiology/Biostatistics/Research Methods Lecturer | 1 | 4 | 3 |
| Laboratory Management/Laboratory Safety/Lab Ethics Lecturer | 1 | 4 | 3 |
| **Faculty for Laboratory Technician Program at Malawi College of Health Sciences (Lilongwe Campus)** | | | |
| Lecturer in clinical hematology/Transfusion Science | 4 | 3 | 1 |
| Lecturer in Clinical immunology/serology/cytology/Histology | 0 | 3 | 3 |
| Lecturer in Medical Microbiology/Medical Parasitology | 0 | 3 | 3 |
| Lecturer in Clinical Chemistry/Urinalysis/Laboratory Mathematics | 0 | 3 | 3 |
| Lecturer in Molecular diagnostic/Laboratory instrumentation | 0 | 3 | 3 |
| Lecturer in epidemiology/Biostatistics/research methodology | 0 | 3 | 3 |
| Lecturer in Laboratory management/Laboratory safety/Lab ethics | 0 | 3 | 3 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver on the access-constrained HBP, described in **Table 87** below.

*Table 87 Faculty Interventions for Laboratory Technician to Meet Access-Constrained HBP Health Workforce Targets*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **Malamulo College of Health Sciences** | | | | |
| 21 | 21 | 0 | 0 | 0 |
| **Malawi College of Health Sciences (Lilongwe Campus)** | | | | |
| 19 | 19 | 0 | 0 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 88** below.

*Table 88 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Laboratory Technician | $ $35,956 | $0 | $0 |

### *4.6.2.3 Infrastructure and Equipment Interventions for Laboratory Technician Programs*

The training institution capacity assessment revealed infrastructure and equipment gaps at both baseline and access-constrained HBP levels of enrollment, across all the three training institutions. A quality environment for teaching and learning will require investments in infrastructure and equipment.

#### 4.6.2.3.1 Infrastructure and Basic Equipment Interventions for Laboratory Technician Programs

Detailed in **Table 89** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the biomedical sciences department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 90** below details the FY24/25 prioritized resource allocation for infrastructure development across all laboratory technician training institutions.

*Table 89 Planned Infrastructure and Basic Equipment Interventions to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| Malamulo College of Health Sciences | Classrooms | 1 | 19 | 18 | $2,077,440 |
| | Skills Development Labs (SDLs) | 1 | 3 | 2 | $346,143 |
| Malawi College of Health Sciences (Lilongwe Campus) | Classrooms | 2 | 13 | 11 | $1,269,520 |
| | SDLs | 1 | 2 | 1 | $173,071 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 90 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Laboratory Technician | Classrooms and Skills Development Labs | $49,272 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.6.2.3.2 Skills Development Laboratory Equipment Interventions for Laboratory Technician Programs

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Haematology
2. Clinical Chemistry
3. Medical Microbiology
4. Medical Parasitology
5. Immunology and serology
6. Blood transfusion

**Table 91** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 92** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 91 Skills Laboratory Equipment Costs to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| Malamulo College of Health Sciences | $585,265 |
| Malawi College of Health Sciences (Lilongwe Campus) | $364,495 |

*Table 92 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Laboratory Technician | $20,741 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of

the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.9 Laboratory Assistant Interventions

This section details both the laboratory assistant interventions in the access-constrained HBP that are costed for all years in the HSSP III (in tables in blue) to provide guidance on the envisioned direction of the health sector up to 2030, and also presents interventions prioritized for FY24/25 that fit within the FY24/25 prioritized resource allocation (in tables in green) to share guidance on the proposed operationalization of the HSSP III in FY24/25 given funding realities.

### 4.7.1 Public Sector Workforce Targets, Gaps, And Required Enrollment

*Table 93 Laboratory Assistant Workforce Targets with an Access-Constrained HBP Compared to Workforce Gaps in the Absence of Intervention*

| 2023 Public Sector Health Workforce (HW)[36] | 2030 Public Sector HW Target for Access-Constrained HBP[37] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[38] | Projected 2030 Public Sector HW Gap, With Baseline Enrollment | Projected 2030 Vacancy Rate, With Baseline Enrollment |
|---|---|---|---|---|
| 366 | 238 | 238 | 0 | 0% |

As seen in **Table 93** above, the health workforce has 366 laboratory assistants as of 2022 against a target of 238 by the year 2030 to deliver the access-constrained HBP. If baseline levels of enrollment are maintained, 238 laboratory assistants will be available in 2030, meeting the laboratory assistant target for provision of an access-constrained HBP. Given that government has prioritized resources to maintain baseline enrollment in FY24/25, enrollment in each training institution (TI) will be as described in **Table 94** below in blue. FY24/25

*Table 94 Laboratory Assistant Enrollment at Baseline and Projected Enrollment Needed to Meet Access-Constrained HBP Health Workforce Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Meet Access-Constrained HBP |
|---|---|---|---|
| Malawi College of Health Sciences (Lilongwe Campus) | Certificate in Biomedical Sciences | 75 | 13 |

* The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained. The listed enrollment includes new enrollees only in a given year and does not account for students currently enrolled in the program in their second year of the program and beyond.

As shown in **Table 94** above in blue, this cadre currently produces beyond the necessary target, from 2024-2030 government funds (including donor funds) will focus on funding scholarships to meet the target and the remaining enrollment will continue to be self-funded.

### 4.7.2 Interventions to Enable High Quality Training

To reach the access-constrained HBP target of 238 laboratory assistants, enrollment will be supported to meet the target. However, TI capacity assessments revealed gaps in institutional capacity to providing

[36] Ministry of Health, 2022 Staff Returns
[37] Ministry of Health and Clinton Health Access Initiative, Malawi Workforce Optimization Model
[38] Ministry of Health and Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

quality instruction, even at baseline enrollment. These capacity gaps are in scholarship funding, faculty, infrastructure, and skills laboratory equipment. The proposed interventions described below close the identified gaps and equip the training institutions to meet the demands of ensuring quality teaching and learning.

### *4.7.2.1 Scholarship Interventions for Laboratory Assistants*

To meet the access-constrained HBP target for laboratory assistants, one of the capacity gaps ascertained were scholarships for enrollees. Regardless of enrollment level, students regularly dropout of pre-service training programs due to insufficient funds when their tuition is self-funded. The number of scholarships required to meet targeted enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – as this cadre currently produces beyond the necessary target, government funds (including donor funds) will focus on funding scholarships to meet the target as this is the most impactful use of limited funds – this is what is costed in the subsequent sections below. The remaining enrollment will continue to be self-funded. In blue, **Table 95** details scholarship needs for training laboratory assistants to deliver on the access-constrained HBP and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 95 Laboratory Assistants Scholarships to Meet Access-Constrained HBP Health Workforce Targets and Scholarships Prioritized in the FY24/25 Prioritized Resource Allocation*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| Malawi College of Health Sciences (Lilongwe Campus) | $284,703 | 150 | 88 | 25 | 25 | 25 | 25 | 25 | 25 | $53,325 |

** Total enrollment includes new enrollees in the year listed, and all other students enrolled in previous years that are in the pipeline to complete the program

### *4.7.2.2 Faculty Interventions for Laboratory Assistant Programs*

To identify the number of faculty required to provide high-quality instruction to laboratory assistant trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the access-constrained HBP health workforce targets and the ideal student:faculty ratio. **Table 96** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering an access-constrained HBP.

*Table 96 Faculty Needs and Gaps to High-Quality Laboratory Assistant Training to Deliver the Access-Constrained HBP, Across All Training Institutions*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| **Faculty for Laboratory Assistant Program at Malawi College of Health Sciences (Lilongwe Campus)** | | | |
| Hematology specialist | 0 | 1 | 1 |

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| Immunology specialist | 0 | 0 | 0 |
| Parasitology specialist | 0 | 0 | 0 |
| Clinical Chemistry specialist | 0 | 0 | 0 |
| Molecular Biology specialist | 0 | 0 | 0 |
| Cytology/Histology specialist | 0 | 0 | 0 |
| Microbiology specialist | 0 | 0 | 0 |
| Blood Transfusion Science specialist | 0 | 0 | 0 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver on the access-constrained HBP, described in **Table 97** below.

*Table 97 Faculty Interventions for Laboratory Assistants to Meet Access-Constrained HBP Health Workforce Targets*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **Malawi College of Health Sciences (Lilongwe Campus)** | | | | |
| 1 | 0 | 0 | 1 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 98** below.

*Table 98 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Laboratory Assistant | $4,501 | $0 | $10,611 |

### *4.7.2.3 Infrastructure and Equipment Interventions for Laboratory Assistant Programs*

The training institution capacity assessment revealed infrastructure and equipment gaps at target enrollment, across all the three training institutions. A quality environment for teaching and learning will require investments in infrastructure and equipment.

#### 4.7.2.3.1 Infrastructure and Basic Equipment Interventions for Laboratory Assistant Programs

Detailed in **Table 35** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the biomedical sciences department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 100** below details the FY24/25 prioritized resource allocation for infrastructure development across all laboratory officer training institutions.

*Table 99 Planned Infrastructure and Basic Equipment Interventions to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| Malawi College of Health Sciences (Lilongwe Campus) | Classrooms | 1 | 2 | 1 | $116,819 |
| | Skills Development Labs (SDLs) | 1 | 1 | 0 | $0 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 100 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Laboratory Assistant | Classrooms and Skills Development Labs | $36,940 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.7.3.2.2 Skills Development Laboratory Equipment Interventions for Laboratory Assistant Programs

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Haematology
2. Clinical Chemistry
3. Medical Microbiology
4. Medical Parasitology
5. Immunology and serology
6. Blood transfusion

**Table 101** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 102** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 101 Skills Laboratory Equipment Costs to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| Malawi College of Health Sciences (Lilongwe Campus) | $0 |

*Table 102 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|

| | |
|---|---|
| Laboratory Assistant | $0 |

The proposed skills laboratory equipment allocation for laboratory assistants in FY24/25 is $0 because current equipment is sufficient to provide high-quality education at baseline levels of enrollment. However, when programs scale-up as needed, infrastructure investments are required to maintain quality for the increased number of students.

## 4.10 Pharmacist Interventions

This section details both the pharmacist interventions in the access-constrained HBP that are costed for all years in the HSSP III (in tables in blue) to provide guidance on the envisioned direction of the health sector up to 2030, and also presents interventions prioritized for FY24/25 that fit within the FY24/25 prioritized resource allocation (in tables in green) to share guidance on the proposed operationalization of the HSSP III in FY24/25 given funding realities.

### 4.8.1 Public Sector Workforce Targets, Gaps, And Required Enrollment

*Table 103 Pharmacist Workforce Targets with an Access-Constrained HBP Compared to Workforce Gaps in the Absence of Intervention*

| 2023 Public Sector Health Workforce (HW)[39] | 2030 Public Sector HW Target for Access-Constrained HBP[40] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[41] | Projected 2030 Public Sector HW Gap, With Baseline Enrollment | Projected 2030 Vacancy Rate, With Baseline Enrollment |
|---|---|---|---|---|
| 108 | 131 | 190 | -59 | -45% |

As seen in **Table 103** above, the health workforce has 108 pharmacists as of 2022 against a target of 131 by the year 2030 to deliver the access-constrained HBP. If baseline levels of enrollment are maintained, 190 pharmacists will be available in 2030, even still surpassing the pharmacist target for provision of an access-constrained HBP. Even at no enrollment, there will still be more pharmacists in the system than the access-constrained HBP calls for. Given that government has prioritized resources to maintain baseline enrollment in FY24/25 for cadres that will not reach their target for an access-constrained HBP, enrollment in each training institution (TI) will be as described in FY24/25 in **Table 104***Table 30* below in blue.

*Table 104 Pharmacist Enrollment at Baseline and Projected Enrollment Needed to Meet Access-Constrained HBP Health Workforce Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Meet Access-Constrained HBP |
|---|---|---|---|
| Kamuzu University of Health Sciences (KUHES) | BSc. Pharmacy | 48 | 0 |

* The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained. The listed enrollment includes new enrollees only in a given year and does not account for students currently enrolled in the program in their second year of the program and beyond.

### 4.8.2 Interventions to Enable High Quality Training

To reach the access-constrained HBP target of 131 pharmacists, enrollment will be supported to meet the target. However, TI capacity assessments revealed gaps in institutional capacity to providing quality instruction even at baseline enrollment. These capacity gaps are in scholarship funding, faculty, infrastructure, and skills laboratory equipment. The proposed interventions described below close the

[39] Ministry of Health, 2022 Staff Returns
[40] Ministry of Health and Clinton Health Access Initiative, Malawi Workforce Optimization Model
[41] Ministry of Health and Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

identified gaps and equip the training institutions to meet the demands of ensuring quality teaching and learning.

### *4.8.2.1 Scholarship Interventions for Pharmacists*

To meet the access-constrained HBP target for pharmacists, one of the capacity gaps ascertained were scholarships for enrollees. Regardless of enrollment level, students regularly dropout of pre-service training programs due to insufficient funds when their tuition is self-funded. The number of scholarships required to meet targeted enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – as this cadre currently produces beyond the necessary target, government funds (including donor funds) will focus on funding scholarships to meet the target as this is the most impactful use of limited funds – this is what is costed in the subsequent sections below. The remaining enrollment will continue to be self-funded. In blue, **Table 105** details scholarship needs for training pharmacists to deliver on the access-constrained HBP and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 105 Pharmacist Scholarships to Meet Access-Constrained HBP Health Workforce Targets and Scholarships Prioritized in the FY24/25 Prioritized Resource Allocation*

| | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| KUHES | $325,271 | 219 | 186 | 140 | 94 | 47 | 0 | 0 | 0 | $82,754 |

** Total enrollment includes new enrollees in the year listed, and all other students enrolled in previous years that are in the pipeline to complete the program

### *4.8.2.2 Faculty Interventions for Pharmacist Programs*

To identify the number of faculty required to provide high-quality instruction to pharmacist trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the access-constrained HBP health workforce targets and the ideal student:faculty ratio. **Table 106** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering an access-constrained HBP.

*Table 106 Faculty Needs and Gaps to High-Quality Pharmacist Training to Deliver the Access-Constrained HBP, Across All Training Institutions*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| **Faculty for Pharmacy Program at KUHES** | | | |
| Chemist | 3 | 0 | 0 |
| Pharmacologist | 3 | 0 | 0 |
| Pharmacognosy Specialist | 1 | 0 | 0 |
| Pharmaceutics Specialist | 2 | 0 | 0 |
| Health Economist | 1 | 0 | 0 |

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| Microbiologist | 1 | 0 | 0 |
| Pathologist | 1 | 0 | 0 |
| Pharmacy practice, pharmacovigilance | 3 | 0 | 0 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver on the access-constrained HBP, described in **Table 107** below.

*Table 107 Faculty Interventions for Pharmacists to Meet Access-Constrained HBP Health Workforce Targets*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 0 | 0 | 0 | 0 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 108** below.

*Table 108 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Pharmacist | $ 0 | $0 | $0 |

The proposed faculty development allocation for pharmacists in FY24/25 is $0 because current faculty are sufficient to provide high-quality education at baseline levels of enrollment. However, when the program scales up as needed, investments in faculty are required to maintain quality for the increased number of students.

### *4.8.2.3 Infrastructure and Equipment Interventions for Pharmacy Program*

The training institution capacity assessment revealed infrastructure and equipment gaps at both baseline and access-constrained HBP levels of enrollment. A quality environment for teaching and learning will require investments in infrastructure and equipment.

#### 4.8.2.3.1 Infrastructure and Basic Equipment Interventions for Pharmacy Program

Detailed in **Table 109** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the pharmacy department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 110** below details the FY24/25 prioritized resource allocation for infrastructure development at KUHES.

*Table 109 Planned Infrastructure and Basic Equipment Interventions to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 3 | 0 | 0 | $0 |
| | Skills Development Labs (SDLs) | 2 | 0 | 0 | $0 |

*Table 110 Prioritized Allocation for Infrastructure Development At KUHES for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Pharmacist | Classrooms and Skills Development Labs | $ 0 |

The proposed infrastructure allocation for pharmacists in FY24/25 is $0 because current infrastructure is sufficient to provide high-quality education at baseline levels of enrollment. However, when programs scale-up as needed, infrastructure investments are required to maintain quality for the increased number of students.

#### 4.8.2.3.2 Skills Development Laboratory Equipment Interventions for Pharmacy Program

To provide high-quality instruction, adequate laboratory equipment is required. **Table 111** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 112** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 111 Skills Laboratory Equipment Costs to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $0 |

*Table 112 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Pharmacist | $0 |

The proposed skills laboratory equipment allocation for pharmacists in FY24/25 is $0 because current equipment is sufficient to provide high-quality education at baseline levels of enrollment. However, when programs scale-up as needed, infrastructure investments are required to maintain quality for the increased number of students.

## 4.11 Pharmacy Technician Interventions

This section details both the pharmacy technician interventions in the access-constrained HBP that are costed for all years in the HSSP III (in tables in blue) to provide guidance on the envisioned direction of the health sector up to 2030, and also presents interventions prioritized for FY24/25 that fit within the FY24/25 prioritized resource allocation (in tables in green) to share guidance on the proposed operationalization of the HSSP III in FY24/25 given funding realities.

### 4.9.1 Public Sector Workforce Targets, Gaps, And Required Enrollment

*Table 113 Pharmacy Technician Workforce Targets with an Access-Constrained HBP Compared to Workforce Gaps in the Absence of Intervention*

| 2023 Public Sector Health Workforce (HW)[42] | 2030 Public Sector HW Target for Access-Constrained HBP[43] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[44] | Projected 2030 Public Sector HW Gap, With Baseline Enrollment | Projected 2030 Vacancy Rate, With Baseline Enrollment |
|---|---|---|---|---|
| 889 | 783 | 272 | 511 | 65% |

As seen in **Table 113** above, the health workforce has 889 pharmacy technicians as of 2022 against a target of 783 by the year 2030 to deliver the access-constrained HBP. If baseline levels of enrollment are maintained, only 272 pharmacy technicians will be available in 2030, leaving a gap of 511, or a 65% vacancy rate. There are only resources to maintain baseline levels of enrollment in FY24/25, thus maintaining enrollment will be inadequate to meet the 2030 health workforce targets for an access-constrained HBP. Baseline enrollment will be maintained at Malawi College of Health Sciences (Lilongwe Campus) in **Table 114** below.

*Table 114 Pharmacy Technician Enrollment at Baseline and Projected Enrollment Needed to Meet Access-Constrained HBP Health Workforce Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Meet Access-Constrained HBP |
|---|---|---|---|
| Malawi College of Health Sciences (Lilongwe Campus) | Diploma in Pharmacy | 34 | 288 |

* The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained. The listed enrollment includes new enrollees only in a given year and does not account for students currently enrolled in the program in their second year of the program and beyond.

### 4.9.2 Interventions to Enable High Quality Training

To reach the access-constrained HBP target of 783 pharmacy technicians. TI capacity assessments revealed gaps in institutional capacity to providing quality instruction even at baseline enrollment. These capacity gaps are in scholarship funding, faculty, infrastructure, and skills laboratory equipment. The

[42] Ministry of Health, Staff Returns
[43] Ministry of Health and Clinton Health Access Initiative, Malawi Workforce Optimization Model
[44] Ministry of Health and Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

proposed interventions described below close the identified gaps and equip the training institution to meet the demands of ensuring quality teaching and learning.

### *4.9.2.1 Scholarship Interventions for Pharmacy Technicians*

To meet the access-constrained HBP target for pharmacy technicians, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific case of FY24/25, the quantities are the same at target and at baseline, as the proposal for enrollment scale-up does not begin until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 115** details scholarship needs for training pharmacy technicians to deliver on the access-constrained HBP and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 115 Pharmacy Technician Scholarships to Meet Access-Constrained HBP Health Workforce Targets and Scholarships Prioritized in the FY24/25 Prioritized Resource Allocation*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| Malawi College of Health Sciences (Lilongwe Campus) | $4,735,681 | 103 | 101 | 355 | 609 | 863 | 863 | 863 | 863 | $61,843 |

** Total enrollment includes new enrollees in the year listed, and all other students enrolled in previous years that are in the pipeline to complete the program

### *4.9.2.2 Faculty Interventions for Pharmacy Technician Program*

To identify the number of faculty required to provide high-quality instruction to pharmacy technician trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the access-constrained HBP health workforce targets and the ideal student:faculty ratio. **Table 116** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering an access-constrained HBP.

*Table 116 Faculty Needs and Gaps to High-Quality Pharmacy Technician Training to Deliver the Access-Constrained HBP, Across All Training Institutions*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| **Faculty for Pharmacy Technician Program at Malawi College of Health Sciences (Lilongwe Campus)** | | | |
| Pharmacy Specialist | 0 | 6 | 6 |
| Pharmacist | 3 | 10 | 7 |
| Pharmacy Technician | 0 | 10 | 10 |
| Skills Lab Technician | 0 | 7 | 7 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver on the access-constrained HBP, described in **Table 117** below.

*Table 117 Faculty Interventions for Pharmacy Technicians to Meet Access-Constrained HBP Health Workforce Targets*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **Malawi College of Health Sciences (Lilongwe Campus)** | | | | |
| 30 | 24 | 6 | 0 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 118** below.

*Table 118 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Malawi College of Health Sciences (Lilongwe Campus) | $8,504 | $3,395 | $0 |

### *4.9.2.3 Infrastructure and Equipment Interventions for Pharmacy Technician Program*

The training institution capacity assessment revealed infrastructure and equipment gaps even at baseline enrollment at Malawi College of Health Sciences (Lilongwe Campus). A quality environment for teaching and learning will require investments in infrastructure and equipment.

#### 4.9.2.3.1 Infrastructure and Basic Equipment Interventions for Pharmacy Technician Program

Detailed in **Table 119** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the pharmacy department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 120** below details the FY24/25 prioritized resource allocation for infrastructure development at Malawi College of Health Sciences (Lilongwe Campus).

*Table 119 Planned Infrastructure and Basic Equipment Interventions to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| | Classrooms | 2 | 24 | 22 | $2,538,256 |

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| Malawi College of Health Sciences (Lilongwe Campus) | Skills Development Labs (SDLs) | 0 | 6 | 6 | $1,038,428 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 120 Prioritized Allocation for Infrastructure Development at Malawi College of Health Sciences (Lilongwe Campus) for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Pharmacy Technician | Classrooms and Skills Development Labs | $20,513 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.9.2.3.2. Skills Development Laboratory Equipment Interventions for Pharmacy Technician Program

To provide high-quality instruction, adequate laboratory equipment is required. **Table 121** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 122** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 121 Skills Laboratory Equipment Costs to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| Malawi College of Health Sciences (Lilongwe Campus) | $340,358 |

*Table 122 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Pharmacy Technician | $3,208 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for

investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.12 Pharmacy Assistant Interventions

This section details both the pharmacy assistant interventions in the access-constrained HBP that are costed for all years in the HSSP III (in tables in blue) to provide guidance on the envisioned direction of the health sector up to 2030, and also presents interventions prioritized for FY24/25 that fit within the FY24/25 prioritized resource allocation (in tables in green) to share guidance on the proposed operationalization of the HSSP III in FY24/25 given funding realities.

### 4.10.1 Public Sector Workforce Targets, Gaps, And Required Enrollment

*Table 123 Pharmacy Assistant Workforce Targets with an Access-Constrained HBP Compared to Workforce Gaps in the Absence of Intervention*

| 2023 Public Sector Health Workforce (HW)[45] | 2030 Public Sector HW Target for Access-Constrained HBP[46] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[47] | Projected 2030 Public Sector HW Gap, With Baseline Enrollment | Projected 2030 Vacancy Rate, With Baseline Enrollment |
|---|---|---|---|---|
| 2632 | 689 | 689 | 0 | 0% |

As seen in **Table 123** above, the health workforce has 2632 pharmacy assistant as of 2022 against a target of 689 by the year 2030 to deliver the access-constrained HBP. If baseline levels of enrollment are maintained, only 689 pharmacy assistants will be available in 2030, meeting the pharmacy assistant target for provision of an access-constrained HBP. Given that government has prioritized resources to maintain baseline enrollment in FY24/25, enrollment in each training institution (TI) will be as described in **Table 124** below in blue.

*Table 124 Pharmacy Assistant Enrollment at Baseline and Projected Enrollment Needed to Meet Access-Constrained HBP Health Workforce Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Meet Access-Constrained HBP |
|---|---|---|---|
| Ekwendeni College of Health Sciences | Certificate in Pharmacy | 75 | 18 |
| Malawi College of Health Sciences (Lilongwe Campus) | Certificate in Pharmacy | 72 | 17 |
| St John's Institute for Health | Certificate in Pharmacy | 18 | 19 |
| St Joseph's College of Nursing | Certificate in Pharmacy | 52 | 13 |

* The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained. The listed enrollment includes new enrollees only in a given year and does not account for students currently enrolled in the program in their second year of the program and beyond.

[45] Ministry of Health, 2022 Staff Returns
[46] Ministry of Health and Clinton Health Access Initiative, Malawi Workforce Optimization Model
[47] Ministry of Health and Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

As shown in **Table 124** above in blue, this cadre currently produces beyond the necessary target, from 2024-2030 government funds (including donor funds) will focus on funding scholarships to meet the target and the remaining enrollment will continue to be self-funded.

### 4.10.2 Interventions to Enable High Quality Training

To reach the access-constrained HBP target of 689 pharmacy assistants, enrollment will be supported to meet the target. However, TI capacity assessments revealed gaps in institutional capacity to providing quality instruction even at baseline enrollment. These capacity gaps are in scholarship funding, faculty, infrastructure, and skills laboratory equipment. The proposed interventions described below close the identified gaps and equip the training institutions to meet the demands of ensuring quality teaching and learning.

#### *4.10.2.1 Scholarship Interventions for Pharmacy Assistants*

To meet the access-constrained HBP target for pharmacy assistants, one of the capacity gaps ascertained were scholarships for enrollees. Regardless of enrollment level, students regularly dropout of pre-service training programs due to insufficient funds when their tuition is self-funded. The number of scholarships required to meet targeted enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – as this cadre currently produces beyond the necessary target, government funds (including donor funds) will focus on funding scholarships to meet the target as this is the most impactful use of limited funds – this is what is costed in the subsequent sections below. The remaining enrollment will continue to be self-funded. In blue, **Table 125** details scholarship needs for training pharmacy assistants to deliver on the access-constrained HBP and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 125 Pharmacy Assistant Scholarships to Meet Access-Constrained HBP Health Workforce Targets and Scholarships Prioritized in the FY24/25 Prioritized Resource Allocation*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| Ekwendeni College of Health Sciences | $611,508 | 149 | 93 | 36 | 36 | 36 | 36 | 36 | 36 | $98,319 |
| Malawi College of Health Sciences (Lilongwe Campus) | $332,590 | 143 | 88 | 34 | 34 | 34 | 34 | 34 | 34 | $53,667 |
| St John's Institute for Health | $434,139 | 18 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | $38,053 |
| St Joseph's College of Nursing | $432,112 | 112 | 64 | 25 | 25 | 25 | 25 | 25 | 25 | $68,414 |

** Total enrollment includes new enrollees in the year listed, and all other students enrolled in previous years that are in the pipeline to complete the program

### *4.10.2.2 Faculty Interventions for Pharmacy Assistant Program*

To identify the number of faculty required to provide high-quality instruction to pharmacy assistant trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the access-constrained HBP health workforce targets and the ideal student:faculty ratio. **Table 126** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering an access-constrained HBP.

*Table 126 Faculty Needs and Gaps to High-Quality Pharmacy Technician Training to Deliver the Access-Constrained HBP, Across All Training Institutions*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training to Deliver Access Constrained HBP | Gap in Faculty |
|---|---|---|---|
| **Faculty for Pharmacy Assistant Program at Ekwendeni College of Health Sciences** | | | |
| Pharmacy Specialist | 0 | 0 | 0 |
| Pharmacist | 3 | 1 | 0 |
| Pharmacy Technician | 2 | 1 | 0 |
| Skills Lab Technician | 0 | 1 | 0 |
| **Faculty for Pharmacy Assistant Program at Malawi College of Health Sciences (Lilongwe Campus)** | | | |
| Pharmacy Specialist | 0 | 0 | 0 |
| Pharmacist | 3 | 1 | 0 |
| Pharmacy Technician | 0 | 1 | 1 |
| Skills Lab Technician | 0 | 0 | 0 |
| **Faculty for Pharmacy Assistant Program at St John's Institute for Health** | | | |
| Pharmacy Specialist | 0 | 0 | 0 |
| Pharmacist | 2 | 1 | 0 |
| Pharmacy Technician | 1 | 1 | 0 |
| Skills Lab Technician | 0 | 0 | 0 |
| **Faculty for Pharmacy Assistant Program at St Joseph's College of Nursing** | | | |
| Pharmacy Specialist | 1 | 0 | 0 |
| Pharmacist | 3 | 0 | 0 |
| Pharmacy Technician | 2 | 0 | 0 |
| Skills Lab Technician | 0 | 0 | 0 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver on the access-constrained HBP, described in **Table 127** below.

*Table 127 Faculty Interventions for Pharmacy Assistants to Meet Access-Constrained HBP Health Workforce Targets*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **Ekwendeni College of Health Sciences** | | | | |
| 1 | 1 | 0 | 0 | 0 |
| **Malawi College of Health Sciences (Lilongwe Campus)** | | | | |

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0 |
| **St John's Institute for Health** | | | | |
| 0 | 0 | 0 | 0 | 0 |
| **St Joseph's College of Nursing** | | | | |
| 0 | 0 | 0 | 0 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 128** below.

*Table 128 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Ekwendeni College of Health Sciences | $1,929 | $1,798 | $0 |
| Malawi College of Health Sciences (Lilongwe Campus) | $4,252 | $1,698 | $0 |
| St John's Institute for Health | $1,929 | $1,798 | $0 |
| St Joseph's College of Nursing | $1,393 | $0 | $0 |

### *4.10.2.3 Infrastructure and Equipment Interventions for Pharmacy Assistant Programs*

The training institution capacity assessment revealed infrastructure and equipment gaps at target enrollment, across all the four training institutions. A quality environment for teaching and learning will require investments in infrastructure and equipment.

#### 4.10.2.3.1 Infrastructure and Basic Equipment Interventions for Pharmacy Assistant Programs

Detailed in **Table 129** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the pharmacy department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 130** below details the FY24/25 prioritized resource allocation for infrastructure development at all four training institutions.

*Table 129 Planned Infrastructure and Basic Equipment Interventions to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| Ekwendeni College of Health Sciences | Classrooms | 1 | 1 | 0 | $0 |
| | Skills Development Labs (SDLs) | 0 | 1 | 1 | $173,071 |
| Malawi College of Health Sciences (Lilongwe Campus) | Classrooms | 2 | 1 | 0 | $0 |
| | SDLs | 0 | 1 | 1 | $173,071 |
| St John's Institute for Health | Classrooms | 2 | 1 | 0 | $ 0 |
| | SDLs | 0 | 1 | 1 | $173,071 |
| St Joseph's College of Nursing | Classrooms | 2 | 1 | 0 | $0 |
| | SDLs | 1 | 1 | 0 | $0 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 130 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Pharmacy Assistant | Classrooms and Skills Development Labs | $24,582 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.10.2.3.2. Skills Development Laboratory Equipment Interventions for Pharmacy Assistant Program

To provide high-quality instruction, adequate laboratory equipment is required. **Table 131** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 132** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 131 Skills Laboratory Equipment Costs to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| Ekwendeni College of Health Sciences | $56,726 |
| Malawi College of Health Sciences (Lilongwe Campus) | $56,607 |
| St John's Institute for Health | $56,081 |
| St Joseph's College of Nursing | $56,726 |

*Table 132 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Pharmacy Assistant | $12,787 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.13 Pediatrician Interventions

### 4.13.1 Public Sector Workforce Targets, Gaps, And Enrollment Scale-Up Required

Malawi's population is largely under 15 years of age at 42.51% as at 2021[48]. As such there is an increasing demand for pediatric services in the public sector both clinical and nursing. As seen in **Table 29**below, the health workforce has 16 paediatricians as of 2022 against a target of 38 by the year 2030 to deliver quality paediatric services. If baseline levels of enrollment are maintained, only 22 paediatricians will be available in 2030, leaving a gap of 16, or a 42% vacancy rate. Although there are only resources to maintain baseline levels of enrollment in FY24/25, maintaining enrollment will be inadequate to meet the 2030 health workforce targets for quality paediatric services. Enrollment must be scaled up at KUHES as described in **Table 134***Table 30* below in blue during the remainder of the HSSP III period when additional resources becomes available.

*Table 133 Pediatricians Workforce Targets versus Workforce Gaps in the Absence of Intervention*

| Cadre | 2023 Public Sector Health Workforce (HW) [49] | 2030 Public Sector HW Target[50] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[51] | Projected 2030 Public Sector HW Gap, with Baseline Enrollment | Projected 2030 Vacancy Rate, with Baseline Enrollment |
|---|---|---|---|---|---|
| Pediatrician | 16 | 38 | 22 | 16 | 42% |

*Table 134 Planned Pediatrician Enrollment Required to Meet 2030 HW Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Provide High Quality Pediatric Services |
|---|---|---|---|
| Kamuzu University of Health Sciences (KUHES) | MMed. Pediatrics and Child Health | 2 | 27 |

[#] The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained

[+] Enrollment required considers an 80% graduation rate and 90% licensing exam passing rate, see the Methods and Results section for more details

### 4.13.2 Interventions to provide high quality training for Pediatricians

Whilst Kamuzu University of Health Sciences currently enrolls pediatrician trainees, TI capacity assessments revealed gaps in institutional capacity to provide quality instruction despite maintaining current enrollment. These capacity gaps are in scholarship funding, faculty and infrastructure. The interventions described below close the identified gaps and equip the training institutions and ensure quality teaching and learning.

[48] Statista.com

[49] Ministry of Health, 2022 Staff Returns

[50] Clinton Health Access Initiative, Malawi Workforce Optimization Model and Malawi Pre-Service Intervention Design and Costing Tool

[51] Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

### *4.13.2.1 Scholarship Interventions for Pediatricians*

To meet the target pediatricians, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific case of FY24/25, the quantities are the same at target and at baseline, as the proposal for enrollment scale-up does not begin until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 135** details scholarship needs for training pediatricians to deliver high quality pediatric services and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 135 Planned Pediatricians Scholarships to Meet 2030 HW Targets*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| KUHES | $4,402,355 | 6 | 7 | 32 | 57 | 83 | 108 | 108 | 108 | $34,953 |

### *4.13.2.2 Faculty Interventions for Pediatrician Program*

To identify the number of faculty required to provide high-quality instruction to pediatrician trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the health workforce targets and the ideal student:faculty ratio. **Table 136** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering high-quality paediatric services.

*Table 136 Faculty Needs and Gaps for High-Quality training at Kamuzu University of Health Sciences (Lilongwe Campus)*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Pediatrician Program at KUHES** | | | |
| General Pediatrician | 6 | 7 | 1 |
| Pediatric Emergency | 1 | 7 | 6 |
| Pediatric intensivist | 1 | 7 | 6 |
| Pediatric Neonatologist | 1 | 7 | 6 |
| Pediatric Cardiologist | 1 | 7 | 6 |
| Pediatric Haematology-Oncologist | 1 | 7 | 6 |
| Pediatric Neurologist | 1 | 7 | 6 |
| Pediatric Pulmonologist | 0 | 7 | 7 |
| Pediatric Nephrologist | 0 | 7 | 7 |
| Pediatric Endocrinologist | 0 | 7 | 7 |
| Pediatric Rheumatologist | 0 | 7 | 7 |
| Pediatric infectious disease specialist | 0 | 7 | 7 |
| pediatric allergologist | 0 | 7 | 7 |

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Pediatrician Program at KUHES** | | | |
| Pediatric Neurodevelopment specialist | 0 | 7 | 7 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver high-quality paediatric services, described in **Table 137** below.

*Table 137 Faculty Interventions for Pediatrician Program*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 86 | 1 | 0 | 85 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 138** below.

*Table 138 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Pediatrician | 0 | $0 | $18,633 |

### *4.13.2.3 Infrastructure and Equipment Interventions for Pediatricians Programs*

The training institution capacity assessment revealed gaps in infrastructure and equipment at KUHES. To provide a quality environment for teaching and learning, investments in infrastructure and equipment must be made.

#### 4.13.2.3.1 Infrastructure and Basic Equipment Interventions for Pediatricians Programs

Detailed in **Table 139** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the paediatric department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 140** below details the FY24/25 prioritized resource allocation for infrastructure development at KUHES.

*Table 139 Planned Infrastructure Interventions for Pediatrician Program*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 1 | 4 | 3 | $346,001 |
| | Skills Development Labs (SDLs) | 0 | 2 | 2 | $346,143 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 140 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Pediatrician | Classrooms and Skills Development Labs | $12,291 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.11.2.3.2 Skills Development Laboratory Equipment Interventions for Pediatrician Program

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Haematology
2. Clinical Chemistry
3. Medical Microbiology
4. Medical Parasitology
5. Immunology and serology
6. Blood transfusion

**Table 141** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 142** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 141 Skills Laboratory Equipment Costs to Meet the Access-Constrained HBP Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $3,378,033 |

*Table 142 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Pediatrician | $95,503 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for

investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.14 Pediatrics and Child Health Clinical Officer Interventions

### 4.14.1 Public Sector Workforce Targets, Gaps, And Enrollment Scale-Up Required

As seen in **Table 143 Table 29**below, the health workforce has 7 pediatric and child health clinical officers as of 2022 against a target of 84 by the year 2030 to deliver quality paediatric services. If baseline levels of enrollment are maintained, only 63 paediatric and child health clinical officers will be available in 2030, leaving a gap of 21, or a 25% vacancy rate. Although there are only resources to maintain baseline levels of enrollment in FY24/25, maintaining enrollment will be inadequate to meet the 2030 health workforce targets for quality paediatric services. Enrollment must be scaled up at KUHES as described in **Table 144** below in blue during the remainder of the HSSP III period when additional resources becomes available.

*Table 143 Pediatric and Child Health Clinical Officer Workforce Targets versus Workforce Gaps in the Absence of Intervention*

| Cadre | 2022 Public Sector Health Workforce (HW) [52] | 2030 Public Sector HW Target[53] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[54] | Projected 2030 Public Sector HW Gap, with Baseline Enrollment | Projected 2030 Vacancy Rate, with Baseline Enrollment |
|---|---|---|---|---|---|
| Pediatric and Child Health Clinical Officer | 7 | 84 | 63 | 21 | 25% |

*Table 144 Planned Pediatric and Child Health Clinical Officer Enrollment Required to Meet 2030 HW Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Provide High Quality Pediatric Services |
|---|---|---|---|
| Kamuzu University of Health Sciences (KUHES) | BSc. Paediatrics and Child Health | 6 | 16 |

[#] The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained

[+] Enrollment required considers an 80% graduation rate and 90% licensing exam passing rate, see the Methods and Results section for more details

### 4.14.2 Interventions to provide high quality training for Pediatric and Child Health Clinical Officers

Whilst Kamuzu University of Health Sciences currently enrolls pediatric and child health clinical officer trainees, TI capacity assessments revealed gaps in institutional capacity to provide quality instruction despite maintaining current enrollment. These capacity gaps are in scholarship funding, faculty and

[52] Ministry of Health, 2022 Staff Returns

[53] Clinton Health Access Initiative, Malawi Workforce Optimization Model and Malawi Pre-Service Intervention Design and Costing Tool

[54] Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

infrastructure. The interventions described below close the identified gaps and equip the training institutions and ensure quality teaching and learning.

### *4.14.2.1 Scholarship Interventions for Pediatric and Child Health Clinical Officers*

To meet the target for pediatric and child health clinical officers, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific case of FY24/25, the quantities are the same at target and at baseline, as the proposal for enrollment scale-up does not begin until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 145** details scholarship needs for training pediatric and child health clinical officers to deliver high quality paediatric services and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 145 Planned Pediatric and Child Health Clinical Officers Scholarships to Meet 2030 HW Targets*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| KUHES | $208,599 | 17 | 18 | 28 | 38 | 48 | 48 | 48 | 48 | $8,167 |

### *4.14.2.2 Faculty Interventions for Pediatric and Child Health Clinical Officers Program*

To identify the number of faculty required to provide high-quality instruction to pediatric and child health clinical officer trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the health workforce targets and the ideal student:faculty ratio. **Table 146** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering high-quality paediatric services.

*Table 146 Faculty Needs and Gaps for High-Quality training at Kamuzu University of Health Sciences (Lilongwe Campus)*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Pediatric and Child Health Clinical Officer Program at KUHES** | | | |
| General Pediatrician | 6 | 6 | 0 |
| Anatomist | 1 | 6 | 5 |
| Physiologist | 1 | 6 | 5 |
| Epidemiologist | 1 | 6 | 5 |
| Statistician | 1 | 6 | 5 |
| Pathologist | 1 | 6 | 5 |
| Biochemist | 1 | 6 | 5 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver high-quality paediatric services, described in **Table 147** below.

*Table 147 Faculty Interventions for Pediatric and Child Health Program*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 46 | 17 | 0 | 29 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 148** below.

*Table 148 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Pediatric and Child Health Clinical Officer | $0 | $0 | $45,273 |

### *4.14.2.3 Infrastructure and Equipment Interventions for Pediatric and Child Health Clinical Officer Programs*

The training institution capacity assessment revealed gaps in infrastructure and equipment at KUHES. To provide a quality environment for teaching and learning, investments in infrastructure and equipment must be made.

#### 4.14.2.3.1 Infrastructure and Basic Equipment Interventions for Pediatric and Child Health Clinical Officer Program

Detailed in **Table 149** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the paediatric and child health department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 150** below details the FY24/25 prioritized resource allocation for infrastructure development at KUHES.

*Table 149 Planned Infrastructure Interventions for Pediatric and Child Health Program*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 1 | 6 | 5 | $576,793 |
| | Skills Development Labs (SDLs) | 1 | 1 | 0 | $0 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 150 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Pediatric and Child Health Clinical Officer | Classrooms and Skills Development Labs | $16,391 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.11.2.3.2 Skills Development Laboratory Equipment Interventions for Pediatric and Child Health Clinical Officer Program

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Haematology
2. Clinical Chemistry
3. Medical Microbiology
4. Medical Parasitology
5. Immunology and serology
6. Blood transfusion

**Table 151** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 152** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 151 Skills Laboratory Equipment Costs to Meet Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $1,689,016 |

*Table 152 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|

| | |
|---|---|
| Pediatric and Child Health Clinical Officer | $95,503 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.15 Pediatric Emergency Medicine Physician Interventions

### 4.15.1 Public Sector Workforce Targets, Gaps, And Enrollment Scale-Up Required

As seen in **Table 153** below, the health workforce has 0 pediatric emergency medicine physicians as of 2022 against a target of 15 by the year 2030 to deliver quality paediatric services. However, there is currently no in country training program for this cadre, leaving a gap of 15, or a 100% vacancy rate. The Kamuzu University of Health Sciences (Main Campus) has indicated that it has plans to start this training program provided availability of adequate funding. Planned enrollment at KUHES is described in **Table 144***Table 30* below in blue.

*Table 153 Pediatric Emergency Medicine Physician Workforce Targets versus Workforce Gaps in the Absence of Intervention*

| Cadre | 2023 Public Sector Health Workforce (HW) [55] | 2030 Public Sector HW Target[56] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[57] | Projected 2030 Public Sector HW Gap, with Baseline Enrollment | Projected 2030 Vacancy Rate, with Baseline Enrollment |
|---|---|---|---|---|---|
| Pediatric Emergency Medicine Physician | 0 | 15 | 0 | 15 | 100% |

*Table 154 Planned Pediatric Emergency Medicine Physician Enrollment Required to Meet 2030 HW Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Provide High Quality Pediatric Services |
|---|---|---|---|
| Kamuzu University of Health Sciences (KUHES) | Pediatric Emergency Medicine, Fellowship | 0 | 17 |

[55] Ministry of Health, 2022 Staff Returns
[56] Clinton Health Access Initiative, Malawi Workforce Optimization Model and Malawi Pre-Service Intervention Design and Costing Tool
[57] Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

[#] The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained

[+] Enrollment required considers an 80% graduation rate and 90% licensing exam passing rate, see the Methods and Results section for more details

### 4.15.2 Interventions to provide high quality training for Pediatric Emergency Medicine Physicians

Whilst Kamuzu University of Health Sciences currently enrolls general emergency medicine physician trainees, TI capacity assessments revealed gaps in institutional capacity to introduce a new program. TI capacity assessments revealed gaps in institutional capacity to provide quality instruction despite maintaining current enrollment. These capacity gaps are in scholarship funding, faculty and infrastructure. The interventions described below close the identified gaps and equip the training institutions and ensure quality teaching and learning.

#### *4.15.2.1 Scholarship Interventions for Pediatric Emergency Medicine Physicians*

To meet the target for pediatric emergency medicine physician, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific case of FY24/25, the quantities are the same at target and at baseline, as the new program does not begin until FY24/25, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 155** details scholarship needs for training pediatric emergency medicine physicians to deliver high quality paediatric services and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 155 Planned Pediatric Emergency Medicine Physician Scholarships to Meet 2030 HW Targets*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| KUHES | $2,697,388 | 0 | 0 | 17 | 34 | 51 | 68 | 68 | 68 | $0 |

#### *4.15.2.2 Faculty Interventions for Pediatric Emergency Medicine Physician Program*

To identify the number of faculty required to provide high-quality instruction to pediatric emergency medicine physician trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the health workforce targets and the ideal student:faculty ratio. **Table 156** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering high-quality paediatric services.

*Table 156 Faculty Needs and Gaps for High-Quality training at Kamuzu University of Health Sciences (Lilongwe Campus)*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Pediatric Emergency Medicine Program at KUHES** | | | |
| Emergency Medicine Physicians | 3 | 1 | 0 |

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Pediatric Emergency Medicine Program at KUHES** | | | |
| General Surgeon | 3 | 1 | 0 |
| Physician (Internal Medicine) | 1 | 0 | 1 |
| Pediatrician | 1 | 0 | 1 |
| Dermatologist | 1 | 0 | 1 |
| Obstetric and Gynecologist | 1 | 0 | 1 |
| ENT Surgery | 1 | 0 | 1 |
| Ophthalmology | 1 | 0 | 1 |
| Anesthetist | 1 | 0 | 1 |
| Statistician | 1 | 0 | 1 |
| Epidemiologist | 1 | 0 | 1 |
| Health System Specialists | 1 | 0 | 1 |
| Information Technology Specialist | 1 | 0 | 1 |
| Physiotherapy | 1 | 0 | 1 |
| Public Health Specialist | 1 | 0 | 1 |
| Clinical Skills Instructor /Technologist | 1 | 0 | 1 |
| Bioethics | 1 | 0 | 1 |
| Forensics /Pathology | 1 | 0 | 1 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver high-quality paediatric services, described in **Table 157** below.

*Table 157 Faculty Interventions for Pediatric Emergency Medicine Physician Program*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 8 | 7 | 0 | 1 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 158** below.

*Table 158 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Pediatric Emergency Medicine Physician | $0 | $0 | $2,663 |

### *4.15.2.3 Infrastructure and Equipment Interventions for Pediatric Emergency Medicine Program*

The training institution capacity assessment revealed gaps in infrastructure and equipment at KUHES. To provide a quality environment for teaching and learning, investments in infrastructure and equipment must be made.

#### 4.15.2.3.1 Infrastructure and Basic Equipment Interventions for Pediatric Emergency Medicine Program

Detailed in **Table 159** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the paediatric and child health department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 140** below details the FY24/25 prioritized resource allocation for infrastructure development at KUHES.

*Table 159 Planned Infrastructure Interventions for Pediatric Emergency Medicine Program*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 1 | 3 | 2 | $230,744 |
| | Skills Development Labs (SDLs) | 1 | 1 | 0 | $0 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 160 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Pediatric Emergency Medicine Physician | Classrooms and Skills Development Labs | $16,387 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.11.2.3.2 Skills Development Laboratory Equipment Interventions for Pediatric Emergency Medicine Physician Program

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Haematology
2. Clinical Chemistry
3. Medical Microbiology
4. Medical Parasitology
5. Immunology and serology

6. Blood transfusion

**Table 161** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 162** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 161 Skills Laboratory Equipment Costs to Meet Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $1,686,433 |

*Table 162 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Pediatric Emergency Medicine Physician | $95,357 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.16 Family Medicine Physician Interventions

### 4.16.1 Public Sector Workforce Targets, Gaps, And Enrollment Scale-Up Required

As seen in **Table 29**below, the health workforce has 2 family medicine physicians as of 2022 against a target of 28 by the year 2030 to deliver quality paediatric services. If baseline levels of enrollment are maintained, only 15 family medicine physicians will be available in 2030, leaving a gap of 13, or a 46% vacancy rate. Although there are only resources to maintain baseline levels of enrollment in FY24/25, maintaining enrollment will be inadequate to meet the 2030 health workforce targets for quality paediatric services. Enrollment must be scaled up at KUHES as described in **Table 144***Table 30* below in blue during the remainder of the HSSP III period when additional resources becomes available.

*Table 163 Family Medicine Physician Workforce Targets versus Workforce Gaps in the Absence of Intervention*

| Cadre | 2023 Public Sector Health Workforce (HW) [58] | 2030 Public Sector HW Target[59] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[60] | Projected 2030 Public Sector HW Gap, with Baseline Enrollment | Projected 2030 Vacancy Rate, with Baseline Enrollment |
|---|---|---|---|---|---|
| Family Medicine Physician | 2 | 28 | 15 | 13 | 46% |

*Table 164 Planned Family Medicine Physician Enrollment Required to Meet 2030 HW Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Provide High Quality Pediatric Services |
|---|---|---|---|
| Kamuzu University of Health Sciences (KUHES) | MMed. Family Medicine | 2 | 10 |

[58] Ministry of Health, 2022 Staff Returns
[59] Clinton Health Access Initiative, Malawi Workforce Optimization Model and Malawi Pre-Service Intervention Design and Costing Tool
[60] Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

[#] The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained

[+] Enrollment required considers an 80% graduation rate and 90% licensing exam passing rate, see the Methods and Results section for more details

### 4.16.2 Interventions to provide high quality training Family Medicine Physician

Whilst Kamuzu University of Health Sciences currently enrolls family medicine trainees, TI capacity assessments revealed gaps in institutional capacity to provide quality instruction despite maintaining current enrollment. These capacity gaps are in scholarship funding, faculty and infrastructure. The interventions described below close the identified gaps and equip the training institutions and ensure quality teaching and learning.

#### *4.16.2.1 Scholarship Interventions for Family Medicine Physician*

To meet the target for family medicine physicians, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific case of FY24/25, the quantities are the same at target and at baseline, as the proposal for enrollment scale-up does not begin until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 145** details scholarship needs for training family medicine physicians to deliver high quality paediatric services and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 165 Planned Family Medicine Physicians Scholarships to Meet 2030 HW Targets*

| | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| KUHES | $1,746,202 | 9 | 9 | 16 | 24 | 32 | 40 | 40 | 40 | $44,940 |

#### *4.16.2.2 Faculty Interventions for Family Medicine Physician Program*

To identify the number of faculty required to provide high-quality instruction to family medicine physicians trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the health workforce targets and the ideal student:faculty ratio. **Table 146** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering high-quality paediatric services.

*Table 166 Faculty Needs and Gaps for High-Quality training at Kamuzu University of Health Sciences (Lilongwe Campus)*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Family Medicine Program at KUHES** | | | |
| Family physicians | 3 | 2 | 1 |
| General surgeon | 3 | 1 | 2 |

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Family Medicine Program at KUHES** | | | |
| Obstetrics and gynecology lecturer | 0 | 1 | 1 |
| Internal Medicine lecturer | 0 | 1 | 1 |
| Pediatrician | 0 | 1 | 1 |
| Palliative care lecturer | 0 | 2 | 2 |
| Occupational health lecturer | 2 | 2 | 0 |
| Statistician | 0 | 1 | 1 |
| Epidemiologist | 0 | 1 | 1 |
| IT Specialist | 0 | 1 | 1 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver high-quality paediatric services, described in **Table 167** below.

*Table 167 Faculty Interventions for Family Medicine Physician Program*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 8 | 6 | 0 | 2 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 168** below.

*Table 168 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Family Medicine Physician | $30,145 | $0 | $2,130 |

### *4.16.2.3 Infrastructure and Equipment Interventions for Family Medicine Physician Program*

The training institution capacity assessment revealed gaps in infrastructure and equipment at KUHES. To provide a quality environment for teaching and learning, investments in infrastructure and equipment must be made.

#### 4.16.2.3.1 Infrastructure and Basic Equipment Interventions for Family Medicine Physician Program

Detailed in **Table 169** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the paediatric and child health department. Detailed

methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 170** below details the FY24/25 prioritized resource allocation for infrastructure development at KUHES.

*Table 169 Planned Infrastructure Interventions for Family Medicine Physician Program*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 1 | 2 | 1 | $115,359 |
| | Skills Development Labs (SDLs) | 0 | 1 | 1 | $173,071 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 170 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Family Medicine Physician | Classrooms and Skills Development Labs | $12,291 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.11.2.3.2 Skills Development Laboratory Equipment Interventions for Family Medicine Physician Program

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Haematology
2. Clinical Chemistry
3. Medical Microbiology
4. Medical Parasitology
5. Immunology and serology
6. Blood transfusion

**Table 171** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 172** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 171 Skills Laboratory Equipment Costs to Meet Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $1,689,016 |

*Table 172 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Family Medicine Physician | $95,503 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.17 Child Health Nursing Specialist Interventions

### 4.17.1 Public Sector Workforce Targets, Gaps, And Enrollment Scale-Up Required

As seen in **Table 173** below, the health workforce has 4 child health nursing specialist as of 2022 against a target of 56 by the year 2030 to deliver quality paediatric services. If baseline levels of enrollment are maintained, 80 child health nursing specialists will be available in 2030, meeting the child health nursing specialist target for provision of pediatric services. Given that government has prioritized resources to maintain baseline enrollment in FY24/25, enrollment in each training institution (TI) will be as described in FY24/25 in **Table 174***Table 30* below in blue.

*Table 173 Child Health Nursing Specialist Workforce Targets versus Workforce Gaps in the Absence of Intervention*

| Cadre | 2023 Public Sector Health Workforce (HW) [61] | 2030 Public Sector HW Target[62] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[63] | Projected 2030 Public Sector HW Gap, with Baseline Enrollment | Projected 2030 Vacancy Rate, with Baseline Enrollment |
|---|---|---|---|---|---|
| Child Health Nursing Specialist | 4 | 56 | 80 | 0 | 0 |

*Table 174 Planned Child Health Nursing Specialist Enrollment Required to Meet 2030 HW Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Provide High Quality Pediatric Services |
|---|---|---|---|
| Kamuzu University of Health Sciences (KUHES) | MSc. Child Health Nursing | 8 | 3 |

[#] The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained

[+] Enrollment required considers an 80% graduation rate and 90% licensing exam passing rate, see the Methods and Results section for more details

### 4.17.2 Interventions to provide high quality training for Child Health Nursing Specialist

Whilst Kamuzu University of Health Sciences currently enrolls child health nursing specialist trainees, TI capacity assessments revealed gaps in institutional capacity to provide quality instruction despite maintaining current enrollment. These capacity gaps are in scholarship funding, faculty and infrastructure. The interventions described below close the identified gaps and equip the training institutions and ensure quality teaching and learning.

#### *4.17.2.1 Scholarship Interventions for Child Health Nursing Specialists*

To meet the target for child health nursing specialists, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific case of FY24/25, the quantities are the same at target and at baseline, as the proposal for enrollment scale-up does not begin until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 175** details scholarship needs for training child health nursing specialists to deliver high quality paediatric services and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 175 Planned Child Health Nursing Specialists Scholarships to Meet 2030 HW Targets*

[61] Ministry of Health, Staff Returns

[62] Clinton Health Access Initiative, Malawi Workforce Optimization Model and Malawi Pre-Service Intervention Design and Costing Tool

[63] Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

| Training Institution | Total Cost of Scholarships | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| | | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| KUHES | $432,373 | 19 | 11 | 6 | 6 | 6 | 6 | 6 | 6 | $54,927 |

### *4.17.2.2 Faculty Interventions for Child Health Nursing Specialist Program*

To identify the number of faculty required to provide high-quality instruction to child health nursing specialist trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the health workforce targets and the ideal student:faculty ratio. **Table 176** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering high-quality paediatric services.

*Table 176 Faculty Needs and Gaps for High-Quality training at Kamuzu University of Health Sciences (Lilongwe Campus)*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Child Health Nursing Specialist Program at KUHES** | | | |
| Child Health Nurse specialists | 2 | 5 | 3 |
| Lecturer in Human Anatomy and Physiology | 1 | 3 | 2 |
| Lecturer in Communication and information System | 2 | 1 | 0 |
| Lecturer in Management and Leadership | 2 | 1 | 0 |
| Lecturer in Education | 2 | 1 | 0 |
| Lecturer in Professionalism and Bioethics | 2 | 1 | 0 |
| Lecturer in Mathematics and Biophysics | 2 | 1 | 0 |
| Lecturer in Research and Statistics | 2 | 1 | 0 |
| Lecturer in Project management | 2 | 1 | 0 |
| Lecturer in Entrepreneurship | 2 | 1 | 0 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver high-quality paediatric services, described in **Table 177** below.

*Table 177 Faculty Interventions for Child Health Nursing Specialist Program*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 5 | 2 | 0 | 3 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 178** below.

*Table 178 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Child Health Nursing Specialist | $0 | $0 | $0 |

The proposed faculty development allocation for child health nursing specialists in FY24/25 is $0 because current faculty are sufficient to provide high-quality education at baseline levels of enrollment. However, when the program scales up as needed, investments in faculty are required to maintain quality for the increased number of students.

### *4.17.2.3 Infrastructure and Equipment Interventions for Child Health Nursing Specialist Programs*

The training institution capacity assessment revealed gaps in infrastructure and equipment at KUHES. To provide a quality environment for teaching and learning, investments in infrastructure and equipment must be made.

#### 4.17.2.3.1 Infrastructure and Basic Equipment Interventions for Child Health Nursing Specialist Program

Detailed in **Table 179** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the child health nursing department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 180** below details the FY24/25 prioritized resource allocation for infrastructure development at KUHES.

*Table 179 Planned Infrastructure Interventions for Child Health Nursing Specialist Program*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 1 | 1 | 0 | $0 |
| | Skills Development Labs (SDLs) | 0 | 1 | 1 | $173,071 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 180 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Child Health Nursing Specialist | Classrooms and Skills Development Labs | $12,291 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that

6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.11.2.3.2 Skills Development Laboratory Equipment Interventions for Child Health Nursing Specialist Program

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Haematology
2. Clinical Chemistry
3. Medical Microbiology
4. Medical Parasitology
5. Immunology and serology
6. Blood transfusion

**Table 181** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 182** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 181 Skills Laboratory Equipment Costs to Meet Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $1,685,444 |

*Table 182 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Child Health Nursing Specialist | $95,301 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.18 Palliative Care Nursing Specialist Interventions

### 4.18.1 Public Sector Workforce Targets, Gaps, And Enrollment Scale-Up Required

As seen in **Table 183Table 29**below, the health workforce has 0 palliative care nursing specialist as of 2022 against a target of 15 by the year 2030 to deliver quality paediatric services. However, there is currently no in country training program for this cadre, leaving a gap of 15, or a 100% vacancy rate. The Kamuzu

University of Health Sciences (Main Campus) has indicated that it has plans to start this training program provided availability of adequate funding. Planned enrollment at KUHES is described in **Table 184**below in blue.

*Table 183 Palliative Care Nursing Specialist Workforce Targets versus Workforce Gaps in the Absence of Intervention*

| Cadre | 2023 Public Sector Health Workforce (HW) [64] | 2030 Public Sector HW Target[65] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[66] | Projected 2030 Public Sector HW Gap, with Baseline Enrollment | Projected 2030 Vacancy Rate, with Baseline Enrollment |
|---|---|---|---|---|---|
| Palliative Care Nursing Specialist | 0 | 15 | 0 | 15 | 100% |

*Table 184 Planned Palliative Care Nursing Specialist Enrollment Required to Meet 2030 HW Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Provide High Quality Pediatric Services |
|---|---|---|---|
| Kamuzu University of Health Sciences (KUHES) | MSc. Palliative Care Nursing | 0 | 17 |

[#] The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained

[+] Enrollment required considers an 80% graduation rate and 90% licensing exam passing rate, see the Methods and Results section for more details

### 4.18.2 Interventions to provide high quality training for Palliative Care Nursing Specialist

Whilst Kamuzu University of Health Sciences currently enrolls nursing specialist trainees, TI capacity assessments revealed gaps in institutional capacity to introduce a new program. TI capacity assessments revealed gaps in institutional capacity to provide quality instruction despite maintaining current enrollment. These capacity gaps are in scholarship funding, faculty and infrastructure. The interventions described below close the identified gaps and equip the training institutions and ensure quality teaching and learning.

#### *4.18.2.1 Scholarship Interventions for Palliative Care Nursing Specialists*

To meet the target for palliative care nursing specialist, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific

[64] Ministry of Health, 2022 Staff Returns

[65] Clinton Health Access Initiative, Malawi Workforce Optimization Model and Malawi Pre-Service Intervention Design and Costing Tool

[66] Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

case of FY24/25, the quantities are the same at target and at baseline, as the new program does not begin until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 185** details scholarship needs for training palliative care nursing specialists to deliver high quality paediatric services and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 185 Planned Palliative Care Nursing Specialist Scholarships to Meet 2030 HW Targets*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| KUHES | $1,571,455 | 0 | 0 | 17 | 34 | 34 | 34 | 34 | 34 | $0 |

### *4.18.2.2 Faculty Interventions for Palliative Care Nursing Specialists Program*

To identify the number of faculty required to provide high-quality instruction to palliative care nursing specialist trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the health workforce targets and the ideal student:faculty ratio. **Table 186** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering high-quality paediatric services.

*Table 186 Faculty Needs and Gaps for High-Quality training at Kamuzu University of Health Sciences (Lilongwe Campus)*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Palliative Care Nursing Specialist Program at KUHES** | | | |
| Palliative Care Nurse specialists | 4 | 3 | 0 |
| Lecturer in Human Anatomy and Physiology | 1 | 3 | 2 |
| Lecturer in Communication and information System | 0 | 1 | 1 |
| Lecturer in Management and Leadership | 0 | 1 | 1 |
| Lecturer in Education | 1 | 1 | 0 |
| Lecturer in Professionalism and Bioethics | 1 | 1 | 0 |
| Lecturer in Mathematics and Biophysics | 1 | 1 | 0 |
| Lecturer in Research and Statistics | 1 | 1 | 0 |
| Lecturer in Project management | 1 | 1 | 0 |
| Lecturer in Entrepreneurship | 1 | 1 | 0 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver high-quality paediatric services, described in **Table 187** below.

*Table 187 Faculty Interventions for Palliative Care Nursing Specialist Program*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 4 | 4 | 0 | 0 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 188** below.

*Table 188 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Palliative Care Nursing Specialist | $0 | $0 | $0 |

The proposed faculty development allocation for pharmacists in FY24/25 is $0 because the program is yet to begin. However, when the program starts and scale up is needed, investments in faculty are required to maintain quality for the increased number of students.

### *4.18.2.3 Infrastructure and Equipment Interventions for Palliative Care Nursing Specialist Program*

The training institution capacity assessment revealed gaps in infrastructure and equipment at KUHES. To provide a quality environment for teaching and learning, investments in infrastructure and equipment must be made.

#### 4.18.2.3.1 Infrastructure and Basic Equipment Interventions for Palliative Care Nursing Specialist Program

Detailed in **Table 189** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the nursing specialist department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 190** below details the FY24/25 prioritized resource allocation for infrastructure development at KUHES.

*Table 189 Planned Infrastructure Interventions for Palliative Care Nursing Specialist Program*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 0 | 2 | 2 | $231,317 |
| | Skills Development Labs (SDLs) | 0 | 1 | 1 | $173,071 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 190 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Palliative Care Nursing Specialist | Classrooms and Skills Development Labs | $28,719 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.11.2.3.2 Skills Development Laboratory Equipment Interventions for Palliative Care Nursing Specialist Program

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Haematology
2. Clinical Chemistry
3. Medical Microbiology
4. Medical Parasitology
5. Immunology and serology
6. Blood transfusion

**Table 191** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and

**Table 38** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 191 Skills Laboratory Equipment Costs to Meet Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $1,685,444 |

*Table 192 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Palliative Care Nursing Specialist | $95,301 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.19 Neonatal Nursing Specialist Interventions

### 4.19.1 Public Sector Workforce Targets, Gaps, And Enrollment Scale-Up Required

As seen in **Table 193Table 29**below, the health workforce has 0 neonatal nursing specialist as of 2022 against a target of 56 by the year 2030 to deliver quality paediatric services. However, there is currently no in country training program for this cadre, leaving a gap of 56, or a 100% vacancy rate. The Kamuzu University of Health Sciences (Main Campus) has indicated that it has plans to start this training program provided availability of adequate funding. Planned enrollment at KUHES is described in **Table 194***Table 30* below in blue.

*Table 193 Neonatal Nursing Specialist Workforce Targets versus Workforce Gaps in the Absence of Intervention*

| Cadre | 2022 Public Sector Health Workforce (HW) [67] | 2030 Public Sector HW Target[68] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[69] | Projected 2030 Public Sector HW Gap, with Baseline Enrollment | Projected 2030 Vacancy Rate, with Baseline Enrollment |
|---|---|---|---|---|---|
| Neonatal Nursing Specialist | 0 | 56 | 0 | 56 | 100% |

*Table 194 Planned Neonatal Nursing Specialist Enrollment Required to Meet 2030 HW Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Provide High Quality Pediatric Services |
|---|---|---|---|
| Kamuzu University of Health Sciences (KUHES) | MSc. Neonatal Nursing | 0 | 25 |

[#] The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained

[+] Enrollment required considers a 90% graduation rate and does not consider a licensing exam passing rate as this is an upgrade program for already licensed health workers, see the Methods and Results section for more details

### 4.19.2 Interventions to provide high quality training for Neonatal Nursing Specialist

Whilst Kamuzu University of Health Sciences currently enrolls nursing specialist trainees, TI capacity assessments revealed gaps in institutional capacity to introduce a new program. TI capacity assessments revealed gaps in institutional capacity to provide quality instruction despite maintaining current enrollment. These capacity gaps are in scholarship funding, faculty and infrastructure. The interventions described below close the identified gaps and equip the training institutions and ensure quality teaching and learning.

[67] Ministry of Health, 2022 Staff Returns

[68] Clinton Health Access Initiative, Malawi Workforce Optimization Model and Malawi Pre-Service Intervention Design and Costing Tool

[69] Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

### *4.19.2.1 Scholarship Interventions for Neonatal Nursing Specialist*

To meet the target for neonatal nursing specialist, one of the capacity gaps ascertained were scholarships for enrollees. As new programs are not planned to commence until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality, there are no scholarships prioritized for this program in FY24/25. In blue, **Table 195** details scholarship needs for training neonatal nursing specialists to deliver high quality paediatric services and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 195 Planned Neonatal Nursing Specialist Scholarships to Meet 2030 HW Targets*

| | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | Total Cost of FY24/25 Scholarships Prioritized |
| KUHES | $2,310,963 | 0 | 0 | 25 | 50 | 50 | 50 | 50 | 50 | $0 |

### *4.19.2.2 Faculty Interventions for Neonatal Nursing Specialist Program*

To identify the number of faculty required to provide high-quality instruction to neonatal nursing specialist trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the health workforce targets and the ideal student:faculty ratio. **Table 196** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering high-quality paediatric services.

*Table 196 Faculty Needs and Gaps for High-Quality training at Kamuzu University of Health Sciences (Lilongwe Campus)*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Neonatal Nursing Specialist Program at KUHES** | | | |
| Neonatal Nurse specialists | 2 | 5 | 3 |
| Lecturer in Human Anatomy and Physiology | 1 | 3 | 2 |
| Lecturer in Communication and information System | 2 | 1 | 0 |
| Lecturer in Management and Leadership | 2 | 1 | 0 |
| Lecturer in Education | 2 | 1 | 0 |
| Lecturer in Professionalism and Bioethics | 2 | 1 | 0 |
| Lecturer in Mathematics and Biophysics | 2 | 1 | 0 |
| Lecturer in Research and Statistics | 2 | 1 | 0 |
| Lecturer in Project management | 2 | 1 | 0 |
| Lecturer in Entrepreneurship | 2 | 1 | 0 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver high-quality paediatric services, described in **Table 197** below.

*Table 197 Faculty Interventions for Neonatal Nursing Specialist Program*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 5 | 0 | 0 | 5 | 0 |

Whilst the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation in the proposed FY24/25 allocation, all new programs by definition have no baseline enrollment. Thus, no program start-up costs were prioritized in the FY24/25 allocation.

### *4.19.2.3 Infrastructure and Equipment Interventions for Neonatal Nursing Specialist Program*

The training institution capacity assessment revealed gaps in infrastructure and equipment at KUHES. To provide a quality environment for teaching and learning, investments in infrastructure and equipment must be made.

#### 4.19.2.3.1 Infrastructure and Basic Equipment Interventions for Neonatal Nursing Specialist Program

Detailed in **Table 198** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the nursing specialist department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 199** below details the FY24/25 prioritized resource allocation for infrastructure development at KUHES.

*Table 198 Planned Infrastructure Interventions for Neonatal Nursing Specialist Program*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 0 | 2 | 2 | $231,637 |
| | Skills Development Labs (SDLs) | 1 | 1 | 0 | $0 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 199 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Neonatal Nursing Specialist | Classrooms and Skills Development Labs | $16,450 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that

6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.11.2.3.2 Skills Development Laboratory Equipment Interventions for Neonatal Nursing Specialist Program

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Haematology
2. Clinical Chemistry
3. Medical Microbiology
4. Medical Parasitology
5. Immunology and serology
6. Blood transfusion

**Table 200** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and

**Table 38** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 200 Skills Laboratory Equipment Costs to Meet Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $1,752,574 |

*Table 201 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Neonatal Nursing Specialist | $99,097 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.20 Child Critical Care Nursing Specialist Interventions

### 4.20.1 Public Sector Workforce Targets, Gaps, And Enrollment Scale-Up Required

As seen in **Table 202Table 29**below, the health workforce has 0 child critical care nursing specialists as of 2022 against a target of 56 by the year 2030 to deliver quality paediatric services. However, there is currently no in country training program for this cadre, leaving a gap of 56, or a 100% vacancy rate. The Kamuzu University of Health Sciences (Main Campus) has indicated that it has plans to start this training program provided availability of adequate funding. Planned enrollment at KUHES is described in **Table 144***Table 30* below in blue.

*Table 202 Child Critical Care Nursing Specialist Workforce Targets versus Workforce Gaps in the Absence of Intervention*

| Cadre | 2022 Public Sector Health Workforce (HW) [70] | 2030 Public Sector HW Target[71] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[72] | Projected 2030 Public Sector HW Gap, with Baseline Enrollment | Projected 2030 Vacancy Rate, with Baseline Enrollment |
|---|---|---|---|---|---|
| Child Critical Care Nursing Specialist | 0 | 56 | 0 | 56 | 100% |

*Table 203 Planned Child Critical Care Nursing Specialist Enrollment Required to Meet 2030 HW Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Provide High Quality Pediatric Services |
|---|---|---|---|
| Kamuzu University of Health Sciences (KUHES) | MSc. Child Critical Care Nursing | 0 | 17 |

[#] The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained

[+] Enrollment required considers an 80% graduation rate and 90% licensing exam passing rate, see the Methods and Results section for more details

### 4.20.2 Interventions to provide high quality training for Child Critical Care Nursing

Whilst Kamuzu University of Health Sciences currently enrolls nursing specialist trainees, TI capacity assessments revealed gaps in institutional capacity to introduce a new program. TI capacity assessments revealed gaps in institutional capacity to provide quality instruction despite maintaining current enrollment. These capacity gaps are in scholarship funding, faculty and infrastructure. The interventions described below close the identified gaps and equip the training institutions and ensure quality teaching and learning.

[70] Ministry of Health, 2022 Staff Returns

[71] Clinton Health Access Initiative, Malawi Workforce Optimization Model and Malawi Pre-Service Intervention Design and Costing Tool

[72] Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

### *4.20.2.1 Scholarship Interventions for Child Critical Care Nursing Specialist*

To meet the target for child critical care nursing specialist, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific case of FY24/25, the quantities are the same at target and at baseline, as the proposal for starting the program does not begin until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 204** details scholarship needs for training child critical care nursing specialist to deliver high quality paediatric services and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 204 Planned Child Critical Care Nursing Specialist Scholarships to Meet 2030 HW Targets*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| KUHES | $1,571,455 | 0 | 0 | 17 | 34 | 34 | 34 | 34 | 34 | $0 |

### *4.20.2.2 Faculty Interventions for Child Critical Care Nursing Specialist Program*

To identify the number of faculty required to provide high-quality instruction to child critical care nursing specialist trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the health workforce targets and the ideal student:faculty ratio. **Table 205** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering high-quality paediatric services.

*Table 205 Faculty Needs and Gaps for High-Quality training at Kamuzu University of Health Sciences (Lilongwe Campus)*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Child Critical Care Nursing Specialist Program at KUHES** | | | |
| Pediatric or child health Critical care and /or Trauma Nurse specialists | 3 | 1 | 0 |
| Theatre nurse | 4 | 1 | 0 |
| Orthopaedics nurses | 1 | 1 | 0 |
| Anesthetic Nurse | 0 | 1 | 1 |
| Biologist /Physiologist | 0 | 0 | 0 |
| Pharmacist | 1 | 0 | 0 |
| Educationist | 1 | 0 | 0 |
| Statisticians | 1 | 0 | 0 |
| Administrators | 1 | 0 | 0 |
| Intensivist | 1 | 1 | 0 |
| Orthopaedics Surgeon | 1 | 1 | 0 |
| Neurosurgeon | 1 | 1 | 0 |

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Child Critical Care Nursing Specialist Program at KUHES** | | | |
| Anesthetist | 1 | 1 | 0 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver high-quality paediatric services, described in **Table 206** below.

*Table 206 Faculty Interventions for Child Critical Care Nursing Specialist Program*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 4 | 1 | 0 | 3 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 207** below.

*Table 207 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Child Critical Care Nursing Specialist | $0 | $0 | $0 |

The proposed faculty development allocation for pharmacists in FY24/25 is $0 because the program is yet to begin. However, when the program starts and scale up is needed, investments in faculty are required to maintain quality for the increased number of students.

### *4.20.2.3 Infrastructure and Equipment Interventions for Child Critical Nursing Specialist Program*

The training institution capacity assessment revealed gaps in infrastructure and equipment at KUHES. To provide a quality environment for teaching and learning, investments in infrastructure and equipment must be made.

#### 4.20.2.3.1 Infrastructure and Basic Equipment Interventions for Child Critical Care Nursing Specialist Program

Detailed in **Table 208** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the nursing specialist department. Detailed methodology of the

intervention design process is available in Section 3.5 on Intervention Design. **Table 209** below details the FY24/25 prioritized resource allocation for infrastructure development at KUHES.

*Table 208 Planned Infrastructure Interventions for Child Critical Care Nursing Specialist Program*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 0 | 2 | 2 | $231,317 |
| | Skills Development Labs (SDLs) | 0 | 1 | 1 | $173,071 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 209 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Child Critical Care Nursing Specialist | Classrooms and Skills Development Labs | $28,719 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.11.2.3.2 Skills Development Laboratory Equipment Interventions for Child Critical Care Nursing Specialist Program

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Haematology
2. Clinical Chemistry
3. Medical Microbiology
4. Medical Parasitology
5. Immunology and serology
6. Blood transfusion

**Table 210** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 211** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 210 Skills Laboratory Equipment Costs to Meet Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $1,752,185 |

*Table 211 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Child Critical Care Nursing Specialist | $99,075 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

## 4.21 Critical Care Nursing Specialist Interventions

### 4.21.1 Public Sector Workforce Targets, Gaps, And Enrollment Scale-Up Required

As seen in **Table 212 Table 29**below, the health workforce has 0 critical care nursing specialists as of 2022 against a target of 19 by the year 2030 to deliver quality paediatric services. However, there is currently no in country training program for this cadre, leaving a gap of 19, or a 100% vacancy rate. The Kamuzu University of Health Sciences (Main Campus) has indicated that it has plans to start this training program provided availability of adequate funding. Planned enrollment at KUHES is described in **Table 213***Table 30* below in blue.

*Table 212 Critical Care Nursing Specialist Workforce Targets versus Workforce Gaps in the Absence of Intervention*

| Cadre | 2022 Public Sector Health Workforce (HW) [73] | 2030 Public Sector HW Target[74] | Projected 2030 Public Sector HW, with Baseline Enrollment Maintained[75] | Projected 2030 Public Sector HW Gap, with Baseline Enrollment | Projected 2030 Vacancy Rate, with Baseline Enrollment |
|---|---|---|---|---|---|
| Critical Care Nursing Specialist | 0 | 19 | 0 | 19 | 100% |

*Table 213 Planned Critical Care Nursing Specialist Enrollment Required to Meet 2030 HW Targets*

| Training Institution | Degree Offered | Projected Annual Enrollment for 2023-2030 at Baseline* | Projected Annual Enrollment for 2024-2030 To Provide High Quality Pediatric Services |
|---|---|---|---|
| Kamuzu University of Health Sciences (KUHES) | MSc. Critical Care Nursing | 0 | 6 |

[#] The projection assumes that the average enrollment in previous years (from 2012-2021 data, only for years when the program has been operational) is maintained

[+] Enrollment required considers an 80% graduation rate and 90% licensing exam passing rate, see the Methods and Results section for more details

### 4.21.2 Interventions to provide high quality training for Critical Care Nursing

Whilst Kamuzu University of Health Sciences currently enrolls nursing specialist trainees, TI capacity assessments revealed gaps in institutional capacity to introduce a new program. TI capacity assessments revealed gaps in institutional capacity to provide quality instruction despite maintaining current enrollment. These capacity gaps are in scholarship funding, faculty and infrastructure. The interventions described below close the identified gaps and equip the training institutions and ensure quality teaching and learning.

[73] Ministry of Health, 2022 Staff Returns

[74] Clinton Health Access Initiative, Malawi Workforce Optimization Model and Malawi Pre-Service Intervention Design and Costing Tool

[75] Clinton Health Access Initiative, Malawi Pre-Service Planning Pipeline Tool

#### *4.21.2.1 Scholarship Interventions for Critical Care Nursing Specialist*

To meet the target for critical care nursing specialists, one of the capacity gaps ascertained were scholarships for enrollees. The number of scholarships required to maintain baseline enrollment in FY24/25 has been fully funded in the proposed FY24/25 prioritized resource allocation – in the specific case of FY24/25, the quantities are the same at target and at baseline, as the new program does not begin until FY25/26, when sufficient infrastructure and equipment could be in place to ensure instruction is done at high-quality. In blue, **Table 214** details scholarship needs for training critical care nursing specialist to deliver high quality paediatric services and in green, it details the cost of scholarships included in the FY24/25 prioritized resource allocation.

*Table 214 Planned Critical Care Nursing Specialist Scholarships to Meet 2030 HW Targets*

| | | | Scholarships Per Year, Inclusive of Total Enrollment** | | | | | | | Total Cost of FY24/25 Scholarships Prioritized |
|---|---|---|---|---|---|---|---|---|---|---|
| Training Institution | Total Cost of Scholarships | FY23/24 | FY24/25 | FY25/26 | FY26/27 | FY27/28 | FY28/29 | FY29/30 | FY30/31 | |
| KUHES | $554,631 | 0 | 0 | 6 | 12 | 12 | 12 | 12 | 12 | $0 |

#### *4.21.2.2 Faculty Interventions for Critical Care Nursing Specialist Program*

To identify the number of faculty required to provide high-quality instruction to critical care nursing specialist trainees, training institutions provided the types of faculty that teach in their program, with ideal student:faculty ratios for each faculty type. The total need for each faculty type was deduced from the health workforce targets and the ideal student:faculty ratio. **Table 215** below details the faculty types required to train enrollees at each training institution, current training institution faculty capacity, and assessed faculty gaps to delivering high-quality paediatric services.

*Table 215 Faculty Needs and Gaps for High-Quality training at Kamuzu University of Health Sciences (Lilongwe Campus)*

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Critical Care Nursing Specialist Program at KUHES** | | | |
| Critical care and Trauma Nurse specialists | 4 | 1 | 0 |
| Theatre nurse | 1 | 1 | 0 |
| Orthopaedics nurses | 0 | 1 | 1 |
| Anesthetic Nurse | 0 | 1 | 1 |
| Biologist /Physiologist | 1 | 0 | 0 |
| Pharmacist | 1 | 0 | 0 |
| Educationist | 1 | 0 | 0 |
| Statisticians | 1 | 0 | 0 |
| Administrators | 1 | 0 | 0 |
| Intensivist | 1 | 0 | 0 |
| Orthopaedics Surgeon | 1 | 0 | 0 |
| Neurosurgeon | 1 | 0 | 0 |

| Faculty Type | Total Currently Employed | Total Needed for High-Quality Training | Gap in Faculty |
|---|---|---|---|
| **Faculty for Critical Care Nursing Specialist Program at KUHES** | | | |
| Anesthetist | 1 | 0 | 0 |

After assessing the faculty gaps, the guidelines further detailed in Section 3.5 on the Intervention Design approach were used to determine and quantify appropriate faculty interventions to ensure sufficient availability of high-quality faculty to deliver high-quality paediatric services, described in **Table 216** below.

*Table 216 Faculty Interventions for Critical Care Nursing Specialist Program*

| Gap in Faculty | Faculty Hired from Existing Labor Pool | Faculty Enrolled in In-Country Training for Advanced Qualifications, and Then Hired | Faculty Sent to Study Abroad, and Then Hired | Faculty Gap Beyond 2030 |
|---|---|---|---|---|
| **KUHES** | | | | |
| 3 | 0 | 0 | 3 | 0 |

In the proposed allocation for the FY24/25 fungible resource envelope, the full need of faculty development and salaries for high quality education at baseline enrollment was given the full allocation. Those costs are broken down below in **Table 217** below.

*Table 217 Prioritized Allocation for Faculty Development and Hiring Across All Training Institutions for FY24/25*

| Cadre | FY24/25 Salary Costs for New Faculty Hires from the Existing Labor Pool | FY24/25 Scholarship Costs for Faculty Enrolled in In-Country Training for Advanced Qualifications | FY24/25 Scholarship Costs for Faculty Study Abroad |
|---|---|---|---|
| Critical Care Nursing Specialist | $0 | $0 | $0 |

The proposed faculty development allocation for pharmacists in FY24/25 is $0 because the program is yet to begin. However, when the program starts and scale up is needed, investments in faculty are required to maintain quality for the increased number of students.

### *4.21.2.3 Infrastructure and Equipment Interventions for Critical Nursing Specialist Program*

The training institution capacity assessment revealed gaps in infrastructure and equipment at KUHES. To provide a quality environment for teaching and learning, investments in infrastructure and equipment must be made.

#### 4.21.2.3.1 Infrastructure and Basic Equipment Interventions for Critical Care Nursing Specialist Program

Detailed in **Table 218** below is an assessment of infrastructure gaps and the associated cost of interventions for infrastructure specific to the nursing specialist department. Detailed methodology of the intervention design process is available in Section 3.5 on Intervention Design. **Table 219** below details the FY24/25 prioritized resource allocation for infrastructure development at KUHES.

*Table 218 Planned Infrastructure Interventions for Critical Care Nursing Specialist Program*

| Institution | Infrastructure Type | Total Capacity Available | Total Capacity Required | Gap in Infrastructure | Cost of Infrastructure & Basic Equipment Interventions |
|---|---|---|---|---|---|
| KUHES | Classrooms | 0 | 1 | 1 | $115,679 |
| | Skills Development Labs (SDLs) | 0 | 1 | 1 | $173,071 |

**SDL costs here only include infrastructure and basic equipment (chairs, blackboards, projectors, TVs), whereas lab equipment is costed separately below as equipment needs are unique to the cadre. Classroom costs above include the building, lighting, ventilation, projector/TV, and chairs

*Table 219 Prioritized Allocation for Infrastructure Development Across All Training Institutions for FY24/25*

| Cadre | Infrastructure type | Cost of Infrastructure Development across all TIs |
|---|---|---|
| Critical Care Nursing Specialist | Classrooms and Skills Development Labs | $20,498 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to build the infrastructure to provide a high-quality education at baseline, instead of proposing that 6% of the need of each infrastructure project is constructed at each training institution, it will be more cost-effective to target a few full-scale projects to achieve economies of scale. Thus, the allocation for investments in infrastructure is not prescriptive – potential funders should work with government and training institutions to determine the most impactful way to invest available allocated funds.

#### 4.11.2.3.2 Skills Development Laboratory Equipment Interventions for Critical Care Nursing Specialist Program

To provide high-quality instruction, adequate laboratory equipment is required for the following workstations in the trainees' skills development labs:

1. Haematology
2. Clinical Chemistry
3. Medical Microbiology
4. Medical Parasitology
5. Immunology and serology
6. Blood transfusion

**Table 220** below details the cost of skills laboratory equipment and maintenance required for high quality training by training institution and **Table 221** provides the FY24/25 prioritized resource allocation for skills laboratory equipment across all training institutions.

*Table 220 Skills Laboratory Equipment Costs to Meet Health Workforce Targets*

| Institution | Cost of Skills Laboratory Equipment and Maintenance Required for Access-Constrained HBP |
|---|---|
| KUHES | $1,685,444 |

*Table 221 Prioritized Allocation for Skills Lab Equipment Across All Training Programs for FY24/25*

| Cadre | Cost of Skills Lab Equipment across all TIs |
|---|---|
| Child Critical Care Nursing Specialist | $95,301 |

As the FY24/25 prioritized resource allocation could only accommodate a small percentage (about 6%) of costs to purchase equipment to provide a high-quality education at baseline, instead of purchasing 6% of the need of each equipment type at each training institution, it will be more cost-effective to conduct pooled purchasing for the full need of the equipment types that will most impact the quality of a trainees' education. As there is insufficient data on the level of impact on each equipment type, the allocation for investments in equipment is not prescriptive – potential funders should work with government and training institutions to determine the most effective way to invest available funds.

# 5 Costs of Implementing HSSP III Pre-Service Activities

This chapter provides an overview of the costs for pre-service education interventions to meet the health workforce targets to deliver the access constrained health benefits package. A comprehensive costing was conducted to provide a basis for budgeting of investments in interventions, resource mobilization and strategic planning for pre-service education. These pre-service education interventions are scholarships, faculty development, infrastructure, and skills laboratory equipment. The tables below disaggregate the costs by domain by year and by department by domain. Note that, the cross-cutting infrastructure-that is infrastructure that is used across the training institution- costs represent costs related to accommodation hostels, lecture theatres, assembly halls, administration offices, and recreation facilities for both students and staff. Structurally, the chapter is organized as follows: 1.1 provides the costs by intervention by domain by year- these domains are scholarships, faculty development, infrastructure and skills laboratory equipment; 1.2 provides costs by department by domain- the departments are the several programs provided at training institutions; 1.3 provides the FY2024/2025 pre-service education costs by domain- these are costs required to provide high quality education to trainees at baseline enrollment; and 1.4 provides the FY2024/2025 pre-service education costs by department by domain.

## 5.1 Costs by Intervention Domain, by Year

Costs for pre-service education interventions by cadre by domain are available below. Costs reflect the timing of interventions described in the intervention design and costing methods section:

- To meet the required number of health workers to provide the access constrained HBP, scholarships were identified as a critical input to train the target number of health workers. These scholarship costs as seen in the table below increase substantially in FY2025/26 when enrollment scale up begins across several training programs. In subsequent years, costs increase primarily because of an annual inflation rate of 14.29%.
- Faculty development costs also increase in FY2024/25 when all study abroad and in-country training interventions (and their incurred costs) begin; they also increase substantially in FY2025/26 when enrollment scale-up begins and salary costs will increase as the system hires the requisite additional faculty from the labor pool to meet the needs of additional students. Similar to the above, in subsequent years, costs increase because of inflation, in addition to paying for salaries of trainees returning from study abroad and in-country training who are hired as faculty.
- Given that infrastructure can take years to build and are a requirement for quality teaching and learning when enrollment is scaled up in FY2025/26, all costs are concentrated in FY 2024/25. This gives training institutions time to conduct all procurement processes and ensure construction is done on time to meet the enrollment scale up in FY2025/2026

- Skills laboratory equipment costs are concentrated in FY2024/25 to accommodate for long lead times of procurement and to ensure that equipment is available for scale-up of enrollment in FY2025/26. In FY2028/29, costs are included for maintenance.

| *Pre-Service Education Costs In USD To Meet Access Constrained HBP, Inflated, By Domain by Year* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Intervention** | **FY 2023/24 (USD)** | **FY 2024/25 (USD)** | **FY 2025/26 (USD)** | **FY 2026/27 (USD)** | **FY 2027/28 (USD)** | **FY 2028/29 (USD)** | **FY 2029/30 (USD)** | **FY 2030/31 (USD)** | **Grand Total (USD)** |
| Scholarships | 6 M | 8 M | 14 M | 22 M | 30 M | 39 M | 50 M | 63 M | **232 M** |
| Faculty Development | 0 | 6 M | 33 M | 45 M | 57 M | 77 M | 98 M | 123 M | **438 M** |
| Infrastructure | 0 | 299 M | 0 | 0 | 0 | 0 | 0 | 0 | **299 M** |
| Skills Lab Equipment | 0 | 201 M | 0 | 0 | 0 | 60 M | 0 | 0 | **261 M** |
| **Total** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | **1,231M** |

*Table 222. Costs to meet Access Constrained HBP, by domain, by cadre (USD) Inflated*

## 5.2 Costs by Department, by Domain

The table below describes costs by department, cadre, and domain. Note the following:

- Medical officers, nursing cadres and laboratory cadres represent the highest proportion of scholarships. This is due to the high number of these cadres needed to provide the access constrained HBP.
- Faculty development costs are inflated by medical officers and laboratory cadres. These programs require a high contingent of faculty given their specialized nature to train high quality cadres. Also, training programs for these specialized faculty are costly as most of these programs are offered abroad and are not available in-country.

- Infrastructure costs are significantly high for nursing cadres because this cadre represents the highest number of health workers needed in the public sector. Given the poor quality and insufficient quantity of existing infrastructure in training institutions offering nursing programs, there is a substantial gap to reach the ideal student:infrastructure ratios required to provide a high-quality education.
- Skills laboratory equipment is also significantly high for nursing cadres due to the above-mentioned reasons.
- The cross-cutting infrastructure costs represent costs related to accommodation hostels, lecture theatres, assembly halls, administration offices, and recreation facilities for both students and staff.

*Table 223. Costs to meet access constrained HBP, by cadre by domain (USD)*

| *Pre-Service Education Costs In USD To Meet Access Constrained HBP, Inflated, By Cadre by Domain* | | | | | |
|---|---|---|---|---|---|
| **Cadre** | **Scholarships** | **Faculty Development** | **Infrastructure** | **Skills Lab Equipment** | **Grand Total (USD)** |
| **Biomedical Sciences Cadres** | **32.0 M** | **186.2 M** | **16.0 M** | **11.0 M** | **238.0 M** |
| Lab Officer | 25.1 M | 184.0 M | 11.9 M | 10.0 M | 224.3 M |
| Lab Technician | 6.6 M | 2.0 M | 4.0 M | 1.0 M | 13.1 M |
| Lab Assistant | 0.3 M | 0.2 M | 0.1 M | 0.0 M | 0.6 M |
| **Clinical Medicine** | **12.8 M** | **3.8 M** | **2.2 M** | **25.0 M** | **42.6 M** |
| Clinical Technician | 12.8 M | 3.8 M | 2.2 M | 25.0 M | 42.6 M |
| **Medicine** | **56.7 M** | **187.4 M** | **1.1 M** | **15.9 M** | **253.5 M** |
| Medical Officer | 56.7 M | 187.4 M | 1.1 M | 15.9 M | 253.5 M |
| **Nursing Cadres** | **121.4 M** | **54.3 M** | **124.4 M** | **207.6 M** | **493.0 M** |
| Nurse Midwife Technician | 73.3 M | 18.7 M | 53.2 M | 150.9 M | 287.4 M |
| Nursing Officer (BSc) | 7.5 M | 7.3 M | 5.1 M | 29.4 M | 47.8 M |
| Nursing Officer (Bsc) - Child Health Nursing | 0.2 M | 0.0 M | 0.3 M | 1.7 M | 2.2 M |
| Nursing Officer (Msc) - Child Health Nursing | 0.4 M | 0.0 M | 0.2 M | 1.7 M | 2.3 M |
| Nursing Officer (Msc) - Child Critical Care Nursing | 1.6 M | 0.6 M | 0.4 M | 1.8 M | 4.3 M |
| Nursing Officer (Msc) - Critical Care Nursing | 0.6 M | 0.8 M | 0.3 M | 1.7 M | 3.3 M |
| Nursing Officer (Msc) - Palliative Care Nursing | 1.6 M | 1.3 M | 0.4 M | 1.7 M | 4.9 M |
| Nursing Officer (Msc) - Neonatal Nursing | 2.4 M | 0.8 M | 0.2 M | 1.8 M | 5.1 M |
| Community Midwifery Assistant | 33.8 M | 24.8 M | 64.4 M | 16.9 M | 135.7 M |

| | | | | | |
|---|---|---|---|---|---|
| **Pharmacy Dept Cadres** | **7.1 M** | **0.4 M** | **4.0 M** | **0.6 M** | **11.7 M** |
| Pharmacist | 0.3 M | 0.0 M | 0.0 M | 0.0 M | 0.3 M |
| Pharmacy Assistant | 1.9 M | 0.1 M | 0.4 M | 0.2 M | 2.5 M |
| Pharmacy Technician | 4.9 M | 0.2 M | 3.7 M | 0.4 M | 8.9 M |
| **Specialist Clinical Training** | **9.3 M** | **23.3 M** | **1.8 M** | **8.7 M** | **41.9 M** |
| Family Medicine Doctor (Paediatrics) | 1.8 M | 2.1 M | 0.3 M | 1.7 M | 5.8 M |
| Paediatric Clinical Officer (Bsc) | 0.2 M | 1.1 M | 0.6 M | 1.7 M | 3.5 M |
| Paediatrician (MMed) | 4.5 M | 17.6 M | 0.7 M | 3.5 M | 25.5 M |
| Emergency Medicine Physician | 0.0 M | 0.0 M | 0.0 M | 0.0 M | 0.0 M |
| Paediatric Emergency Medicine Physician | 2.8 M | 2.5 M | 0.2 M | 1.7 M | 7.0 M |
| **Cross-Cutting Infrastructure** | **0.0 M** | **0.0 M** | **158.8 M** | **0.0 M** | **154.2 M** |
| Across All Programs | 0.0 M | 0.0 M | 158.8 M | 0.0 M | 154.2 M |
| **TOTAL** | **239.3 M** | **455.3 M** | **308.4 M** | **268.9 M** | **1271.9 M** |

## 5.3 FY24/25 Prioritized Pre-Service Education Costs, By Domain

The table below describes prioritized pre-service education costs by domain for FY24/25. These are costs required to provide high quality education to trainees at baseline enrollment. Note the following:

- Even at baseline enrollment, there are students who cannot afford tuition fees. Some institutions cannot achieve target enrollment, and often students begin the program but dropout due to an inability to continue paying tuition. Thus, the best way to achieve targets and ensure educational investments are seen through, is to provide scholarships to students.
- Faculty development costs represent salaries for faculty at baseline enrollment.

*Table 224. Prioritized Pre-Service Education Costs to meet access constrained HBP by domain (USD)*

***FY24/25 Prioritized Pre-Service Education Costs In USD To Meet Access Constrained HBP, Inflated, By Domain***

| Intervention | FY 24/25 (USD) |
|---|---|
| Scholarships | 7 M |
| Faculty Development | 4 M |
| Infrastructure | 4 M |
| Skills Lab Equipment | 9 M |
| **Total** | 24 M |
| | |

- Even at baseline, infrastructure and skills laboratory equipment are inadequate to provide high quality education to trainees. Therefore, the costs represent what is required to provide a high quality teaching and learning environment.

## 5.4 FY24/25 Prioritized Pre-Service Education Costs By Department, By Domain

The table below describes costs by department, cadre, and domain for FY24/25. These costs represent inputs required at baseline to provide high quality teaching and learning. Note that:

- Even at baseline enrollment the nursing cadres represent the highest proportion of scholarships required. This is due to the high number of trainees that are enrolled in nursing programs.
- Faculty development costs are inflated by laboratory cadres. This program requires a high contingent of faculty given the specialized nature of the program.
- Infrastructure costs are significantly high for nursing cadres because this cadre represents the highest number of trainees enrolled in health training programs across all training institutions. This is also exacerbated by the poor quality of existing infrastructure in the training institutions offering nursing programs thus the gap is high.
- Skills laboratory equipment costs are also significantly high for nursing cadres and clinical medicine cadres due to the above-mentioned reasons.
- The cross-cutting infrastructure costs represent costs related to accommodation hostels, lecture theatres, assembly halls, administration offices, and recreation facilities for both students and staff. The costs are high even at baseline enrollment because in most training institutions there is a huge gap.

*Table 225. Prioritized Pre-service costs to meet access constrained HBP, by cadre (USD)*

| *FY24/25 Prioritized Pre-Service Education Costs In USD To Meet Access Constrained HBP, Inflated, By Cadre* | | | | | |
|---|---|---|---|---|---|
| **Cadre** | **Scholarships** | **Faculty Development** | **Infrastructure** | **Skills Lab Equipment** | **Grand Total (USD)** |
| **Biomedical Sciences Cadres** | **$474,120** | **$1,428,006** | **$85,984** | **$51,816** | **$1,565,806** |
| Lab Officer | $271,260 | $1,376,929 | $0 | $31,130 | $1,408,059 |
| Lab Technician | $149,535 | $35,956 | $49,142 | $20,686 | $105,784 |
| Lab Assistant | $53,325 | $15,120 | $36,842 | $0 | $51,962 |
| **Clinical Medicine** | **$665,042** | **$190,201** | **$176,001** | **$1,238,224** | **$1,604,427** |
| Clinical Technician | $665,042 | $190,201 | $176,001 | $1,238,224 | $1,604,427 |
| **Medicine** | **$330,245** | **$850,099** | **$0** | **$108,694** | **$958,794** |
| Medical Officer | $330,245 | $850,099 | $0 | $108,694 | $958,794 |
| **Nursing Cadres** | **$4,817,083** | **$996,143** | **$2,344,361** | **$6,920,569** | **$10,261,073** |
| Nurse Midwife Technician | $3,891,473 | $776,506 | $2,065,674 | $5,497,245 | $8,339,426 |
| Nursing Officer (BSc) | $851,153 | $175,962 | $151,843 | $845,495 | $1,173,300 |
| Nursing Officer (Bsc) - Child Health Nursing | $19,530 | $0 | $20,451 | $95,047 | $115,498 |
| Nursing Officer (Msc) - Child Health Nursing | $54,927 | $0 | $12,258 | $95,047 | $107,305 |
| Nursing Officer (Msc) - Child Critical Care Nursing | $0 | $9,587 | $28,642 | $98,810 | $137,039 |
| Nursing Officer (Msc) - Critical Care Nursing | $0 | $13,848 | $20,443 | $95,047 | $129,338 |
| Nursing Officer (Msc) - Palliative Care Nursing | $0 | $0 | $28,642 | $95,047 | $123,688 |
| Nursing Officer (Msc) - Neonatal Nursing | $0 | $20,240 | $16,406.32 | $98,832 | $135,478 |
| **Pharmacy Dept Cadres** | **$403,049** | **$26,730** | **$44,975** | **$15,952** | **$87,656** |
| Pharmacist | $82,754 | $0 | $0 | $0 | $0 |
| Pharmacy Assistant | $258,451 | $14,816 | $24,516 | $12,753 | $52,085 |

| | | | | | |
|---|---|---|---|---|---|
| Pharmacy Technician | $61,843 | $11,914 | $20,458 | $3,199 | $35,571 |
| **Specialist Clinical Training** | **$88,060** | **$99,189** | **$57,212** | **$380,846** | **$537,248** |
| Family Medicine Doctor (Paediatrics) | $44,940 | $32,334 | $12,258 | $95,248 | $139,841 |
| Paediatric Clinical Officer (Bsc) | $8,167 | $45,283 | $16,347 | $95,248 | $156,878 |
| Paediatrician (MMed) | $34,953 | $18,678 | $12,258 | $95,248 | $126,184 |
| Emergency Medicine Physician | $0 | $0 | $6 | $0 | $6 |
| Paediatric Emergency Medicine Physician | $0 | $2,894 | $16,343 | $95,102 | $114,340 |
| **Community Midwifery** | $637,051 | **$451,088** | **$841,466** | **$184,766** | **$1,477,320** |
| Community Midwifery Assistant | $637,051 | $451,088 | $841,466 | $184,766 | $1,477,320 |
| **Cross-Cutting Infrastructure** | | **$0** | **$1,093,062** | **$0** | **$1,093,062** |
| across all programs | | $0 | $1,093,062 | $0 | $1,093,062 |
| **TOTAL** | **$7,414,650** | **$4,041,457** | **$4,643,061** | **$8,900,867** | **$17,585,385** |