ADOPTION OF INTEGRATED HUMAN RESOURCES FOR HEALTH INFORMATION SYSTEM (iHRIS) TOOL AT DISTRICT LEVEL TO IMPROVE HEALTH CARE WORKERS' PLANNING AND DISTRIBUTION IN MALAWI

BY

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Zione Salima Sathamkamwa

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ABSTRACT

Background: Lack of evidence to inform Human Resources for Health (HRH) decisions contributes to inequitable HRH planning and distribution globally, affecting countries' progress towards universal health coverage and sustainable development. Adoption of HRH models and information systems to address this has been slow in developing countries with partially decentralized health systems. Malawi also plans to roll out integrated Human Resources Information System (iHRIS) at district level to enhance availability of HRH information, as evidence for equitable HRH decisions, improved HRH density and Universal Health Coverage (UHC). This review discussed the applicability of iHRIS adoption in Malawi; and how and whether its use can address the inequitable HRH planning and distribution in Malawi context.

Methods: A total of 363 international and local literatures from 2010 to 2022 were identified using a broad range of engines including Thammasat online library and Academic ultimate search. 53 were finally included in this systematic review, through a defined selection criterion.

Findings: Districts have limited influence over data use and HRH decisions in partially decentralized health systems such as Malawi. Inequitable HRH planning and distribution is contributed by not only lack of evidence but also lack of corresponding models for responsive HRH projections. additionally, varying data management support and capacity across public and non-public health institutions; more focus on data entry than use; and inefficient data coordination at sub-national levels would limit quality and interoperability of iHRIS data and would defeat the whole purpose for iHRIS.

Conclusion: Inequitable HRH planning and distribution of HRH is as a result of factors beyond just the unavailability of HRH information. Comprehensive HRH data should be considered as one of the means and not the single needed solution for inequitable HRH distribution. To achieve equitable HRH for UHC, other strategies such as responsive HRH projection models, substantial devolvement of authority for decision making in decentralized health systems like Malawi, development of Community Health Workers, and sustained support for HRH, would also be useful, along iHRIS.

Keywords: Human resource for health, universal health coverage, Low and Middle Income countries, equitable distribution, HRH models, HRH policies, iHRIS, decentralization, global health, health information systems.

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LIST OF ABBREVIATIONS

Abbreviations	Terms
CDC	Centers for Disease prevention and Control
CHAM	Christian Health Association of Malawi
CHW	Community Health Workers
DHIS	District Health Information System
DHMT	District Health Management Team
DHO	District Office
DHRMD	Department of Human Resources Management and Development
EHP	Essential Health Package
EHRP	Emergency Human Resource for Health Program
FMIS	Financial Management Information System
HCWs	Health Care Workers
HMIS	Health Management Information System
HRH	Human Resources for Health
HRIS	Human Resources Information System
HSA	Health Surveillance Assistant
HSSP	Health Sector Strategic Plan
ICT	Information and Communication Technology
iHRIS	Integrated Human Resource for Health Information System
LMIS	Logistic Management Information Systems
LMICs	Low and Middle- Income Countries
MOH	Malawi Ministry of Health
MoLG	Malawi Ministry of Local Government
NHIS	National Health Information System
NCDs	Non Communicable Diseases
OECD	Organization for Economic Cooperation and Development
PEPFAR	Presidents Emergency Plan for AIDS Relief
SDGs	Sustainable Development Goals
UN	United Nations
USAID	United States Agency for International Development
UHC	Universal Health Coverage
WISN	Workload Indicator Staffing Needs
WHO	World Health Organization

CHAPTER 1
INTRODUCTION

This chapter highlights the introduction and background information on Human Resource for Health models; equitable Human Resources for Health distribution; its significance on health of the population; and effects of lack of un-informed and comprehensive decisions on their deployment, distribution, and management globally, trickling down to Malawi context. The chapter also highlights the justification of the study and problem statement.

1.1 Background

Globally, the use of scientific Human Resources for Health (HRH) tools or models has shown to contribute to improved HRH strategic decisions, through provision of up-to-date evidence, and projections informed by actual population health needs and HRH supply (World Health Organization, 2010).

The World Health Organization (WHO) recommended the use of HRH tools as one of the means to inform enhanced planning, equitable distribution and management of HRH, towards attainment of the Global Strategy for HRH in 2030; and the United Nations (UN) Sustainable Development Goals (SDGs) (World Health Organization, 2016).

As one of the WHO's health system building blocks, HRH (particularly that which is equitably distributed); is a key determinant towards achievement of Universal Health Coverage (UHC) (World Health Organization, 2020). WHO, (2016) defines equitable distribution of HRH as having the right quantity and quality of frontline and other Health Workers (HCWs), in line with the needs of the population health, at the right time and place (where they are needed).

According to WHO, (2016), most Low and Middle Income Countries (LMICs) have focused on periodic recruitment to fill vacancies, but less on achieving the most efficient and equitable distribution of the existing HCWs, with non-corresponding HRH skills sets and competence against the actual population needs in various geographical and demographic settings (World Health Organization, 2016).

These non-responsive HRH decisions have disproportionately affected the LMICs including in Africa; where HCWs are more scarce and disease burden is also high(World Health Organization, 2010, 2016, 2021).

Dependence on tabularization of secondary than up-to-date HRH data, due to lack of scientific HRH tools or models' use in countries' health systems, has contributed to non-responsive HRH decisions and poor utilization of the already insufficient HCWs (Mziray et al., 2017) in such countries.

For this reason, global HRH density remains low (1.7 for Doctors and 3.9 for nurses and midwives per 1,000), below the WHO minimum recommendation of 4.5 per 1,000 for skilled HCWs, despite implementation of various HRH interventions to address HRH shortage

("Measuring the availability of human resources for health and its relationship to universal health coverage for 204 countries and territories from 1990 to 2019: a systematic analysis for the Global Burden of Disease Study 2019," 2022; World Health Organization, 2021).

Similarly in Africa, a survey by Ahmat et al., (2022), found out that the average density for Physicians, Nurse and Midwives was at only 1.55 per 1,000 population, except for four countries whose densities were found to be more than 4.45 per 1,000 population, in the region (Ahmat A, 2022).

Human resources for Health (HRH) or Health workforce refers to all the people who are engaged in actions that have a primary intent to improve and protect the health of the population. These include paid and unpaid service providers, management and support workers; working in both public and non-public health sectors (World Health Organization, 2020).

Improved HRH planning and distribution has been made possible in other countries with the use of various HRH tools and models, which countries have adapted according to their capacity, applicability and perceived benefits and impact (World Health Organization, 2010).

One of these tools is the Human Resource Information System (HRIS), which Human managers in the health system use for managing HRH, as a general Human Resource (HR) tool for determining compensation, wages and other benefits and other support (World Health Organization, 2015); (VrabcovÁ et al., 2021).

In 2015, WHO recommended the need for countries to develop electronic national HRH registries to specifically monitor HRH. WHO also called for further adaptation and improved software development and application designing, to further improve the national HRH registries and enable the HRH information to be inter-operable with the broader Health Information System (HIS) (World Health Organization, 2015)

In this regard, the integrated Human Resources for Health Information System (iHRIS) tool was developed by organizations such as Intra-Health International Global Capacity Project funded by USAID, around the year 2005, under which all HRH data modules were linked, ranging from training to retirement, through management, licensure as well as in-service training and development (IntraHealth International, 2020). The tool has been adopted and used in improving overall HRH management in more than 20 African countries (IntraHealth International, 2020; Tursunbayeva et al., 2017).

However, a study by Bhattacharyya et al., (2021), found that adopting and using such systems would not turn out to be as easy as perceived in settings where health systems are partially decentralized and not adequately funded, which is a similar case in Malawi (Bhattacharyya et al., 2021).

Furthermore, learning from how the tool was rolled in Tanzania, iHRIS adoption would be a longer process than expected, in settings which data management skills and capacity is low (Ishijima et al., 2015).

In addition, iHRIS use in Senegal was shown not to spontaneously lead to improved HRH decisions due to various underlying factors which organizations identified and supported the health systems to address before iHRIS worked out (Human Resources for Health in 2030, 2021).

1.2 Problem statement

According to WHO (2016), equitable distribution of competent HRH is a key prerequisite for achievement of UHC and SDGs.

HRH tools and models such as iHRIS, have been recommended by WHO to help health systems achieve responsive planning and distribution of the health work force(World Health Organization, 2010). iHRIS tool mainly improves availability, quality and inter-operability of HRH information, which in turn provides accurate evidence on which decision makers can base HRH decisions (Driessen et al., 2015; Human Resources for Health in 2030, 2021).

Like in many LMICs, inequitable distribution of the already few HCWs is a weighty challenge in Malawi (Government of the Republic of Malawi, 2017). The country has a low overall skilled HRH density of 1.48 per 1,000, which is worse in rural areas (Berman et al., 2022) despite all the HRH interventions since 2005.

This has been attributed to lack of HRH Information system tools' use, particularly at district level, to provide comprehensive and timely HRH information, to inform responsive strategic HRH decisions by MOH (Government of the Republic of Malawi, 2017).

Over the years, HRH production has increased with over 50% in Malawi following the Emergency Human Resources Program (EHRP) since 2005 (Berman et al., 2021). Retention has also improved in rural areas following introduction of incentives such as top up allowances and housing programs (Berman et al., 2021). Additionally, HCW migration was found to have had significantly decreased beyond 2008 according to (Adhikari et al., 2013); with a reduced overall number of HCWs (291) migrated to Organization for Economic Co-operation and Development (OECD) countries in 2021 as compared to 573 in 2002 (Dia, 2022).

However, there has been less of corresponding efforts to the above interventions, to ensure that the existing HCWs are distributed equitably across the country (Government of the Republic of Malawi, 2017). The World Bank group (2017), also described Malawi's HRH distribution as inequitable and that there is misaligned allocation of HRH in line with population health demands and needs (Mziray et al., 2017) .

As a result, rural areas, where more than 80% of the population live, have shown to suffer consequences of the mal-distribution than urban areas. A study done by Chimwaza, et al (2014), found that access to sexual and reproductive health and rights services was poor among rural women and girls as compared to urban due to shortage of HCWs. The 2016 Demographic and Health Survey also showed that general access to timely health care

services was poor among rural populations than urban (Chimwaza et al., 2014; National Statistical Office Malawi et al., 2016).

On the other hand, urban areas also have varying facility level densities, where some urban facilities are over-burdened with work due to low HCW to patient ratio, while some have HRH over-concentration (Chimwaza et al., 2014; Mziray et al., 2017) . This is contributing to inequalities in access to healthcare, particularly in rural areas where health facilities are far apart than in urban areas (Berman et al., 2021; Chimwaza et al., 2014; Mziray et al., 2017).

To address this, Malawi Ministry of health (MOH) planned to roll out iHRIS within the HSSP II period, thus 2018 to 2022. The decision was made on the documented benefits that the iHRIS tool has brought in other African countries (Government of the Republic of Malawi, 2017).

However, though use of iHRIS tool has shown to improve evidence based HRH decisions in other African countries (Tursunbayeva et al., 2017), its adoption and use requires mutual commitment and accountability from both national and sub-national governance systems in countries where health systems are partially decentralized (Bhattacharyya et al., 2021).

Additionally, adoption and/or use of iHRIS in other countries such as Senegal, did not obviously lead to the improved HRH decisions until non-governmental organizations had helped the government to re-strategize its implementation of the iHRIS tool (Human Resources for Health in 2030, 2021).

1.3 Justification of the study

This study discussed the importance that adoption of iHRIS as an HRH tool, has shown in improving HRH decisions in other countries. through the availability of comprehensive HRH data for decision making.

The study examined the applicability of adopting and using iHRIS in Malawi health system, providing an in-depth analysis on whether HRH information through the use of iHRIS would help to address the inequitable distribution of HRH, which Malawi is currently facing, based on the experiences that other countries have had with iHRIS use.

This review also analyzed some of the strategic issues relating to the current modalities that Malawi health system is using for HRH planning and distribution, comparing them with the best practices in HRH planning and distribution. Proposals and policy recommendations on any areas worthy considering to improve HRH distribution along iHRIS have also been suggested.

This information in this review is useful for policy makers; national and district governance structures in Malawi health system to understand whether the benefits of the adoption and use of iHRIS are exaggerated; and whether they can be applicable in Malawi's partially decentralized health system. This paper will also help the decision makers to understand

factors that would be useful in designing and implementing associated interventions for equitable HRH planning and distribution, along iHRIS use.

CHAPTER 2

This chapter presents a review from local and international literatures on the status, planning and management approaches for HRH, at global level and in Malawi. The chapter also presents the purpose and objectives of the study, as well as the conceptual framework.

Literature review

Existing studies, reports and policies on HRH status and interventions done to improve HRH globally, in African region and Malawi were reviewed for this study, to find the information presented under this chapter.

2.1 HRH Management approaches and systems

Largely, actual deployment and distribution of HRH has been progressively more acknowledged as a key hitch in efficient utilization of the existing HRH towards attainment of UHC globally, predominantly in LMICs (World Health Organization, 2020).

Ineffective HRH monitoring due to unavailability of comprehensive HRH data and lack of HRH models' use has contributed to this challenge (World Health Organization, 2016)

As stated above, health workforce models have been recommended globally to support strategic evidence- based HRH policies, projections and decisions that would enhance a balance between HRH supply and demand. The models, either deterministic or stochastic, essentially aim to guide HRH decision makers and stakeholders in achieving efficient HRH planning and distributions based on available and pending HRH supply, their development and movement; health services workload; and population demands and choices (Murphy et al., 2016). These include the following:

Workload indicators of staffing needs (WISN):

WISN tool was developed by WHO to help setting rational HRH staffing levels in health facilities by setting activity time standards for HRH and translating them into workload (Mziray et al., 2017). The tool incorporates professional judgement and work activity measurement (service utilization), to determine staffing norms based on workload, and not just facility type or capacity (Namaganda et al., 2022). WISN has been used in a number of countries such as Uganda, Delphi, Indonesia, Bangladesh and Turkey to improve HRH planning (Namaganda et al., 2022) (Bhattacharyya et al., 2021).

Trend analysis:

This methodology is used to predict future HRH needs using trends observed in the economic status and healthcare expectations of the population, attributed to the likely growth trends in the private sector. However, the limitation with this methodology is that most countries have limited data on private health facilities and may not be certain of the actual numbers, size and staffing norms for the private health facilities (World Health Organization, 2010) .

Workforce optimization Model (WOM)

Workforce optimization model was proposed and used to inform the current HRH Strategic Plan (HSSP 2018-2022) for Malawi. The model is used to calculate HRH projects by 2030, to evaluate countries' progress towards achievement of HRH goals in the SDG3, based on present HRH staffing and training (Berman et al., 2022)

Simple models for consideration of other health aspects:

Projections by this model aims to address demographic and epidemiological impacts on HRH, such as loss of skilled HRH and associated costs for educating and training HRH due to AIDS related mortality. This model was used by Guinea to construct three different scenarios of the future evolution of HIV and AIDS in HRH. The model requires sound multi-sectoral collaboration with other ministries beyond health sector such as ministries of education, finance and other development stakeholders, to access administrative data on number of active HCWs, those in training and estimated costs for the education and training requirements (World Health Organization, 2010) .

Human Resource Information System (HRIS)

HR information system (HRIS) is an electronic general HR tool that governments, institutions and organizations use to manage information about their employees (VrabcovÁ et al., 2021), and can be used in any sector including the health system.

HRIS has been recommended by WHO, which provided minimum requirements and guidelines for its use, to maximize the benefits of its use. Essentially, HRIS (health workforce registry), has been recommended to be a central component under the larger Health Information systems (HIS), whose information would be linked with health services, financial and logistical provisions and other components of the HIS, to enable monitoring of HRH needs and supply versus the demand and resources available (Szabo et al., 2020; World Health Organization, 2015).

HRH information is available and managed by specific bodies in countries where it has not been integrated yet, such as Malawi. The HRH bodies include training institutions, regulatory bodies, public health facilities, non-public health facilities; and other stakeholders and donors (Government of the Republic of Malawi, 2017).

As shown in figure 6 below, HRH information is a central sub-set of HIS that forms an integral part of the rest of the health systems sub-sets for information. From this complex system then an HRH information system is derived, to form a specific intra-operable HRH information framework, which enables exchange of HRH data across all structures related to health work force (World Health Organization, 2015).

Integrated Human Resources Information System (IHRIS)

IHRIS is one of the internet-based Information and Communication Technology (ICT) tools, for managing Human Resource (HR) data in the health sector. It is a computerized integrated system for managing HR information that links all HR data from the time professionals enter pre-service training to the time they leave the workforce. The system consists of electronic databases for storing HR data, software for entering and updating data, and tools for HR data analysis and reporting.

The system was developed by Intra-Health to help countries improve health information system, and is currently being used in about 20 countries many of which are in the Sub-Saharan Africa, with support from various donors such as the United States Agency for International Development (USAID), Centers for Disease prevention and Control (CDC), Canada, Department for International Development (DfID), World Health Organization (WHO), and World Bank (Intra-health International, 2020).

2.2 Status of HRH globally, in Africa and Malawi

Average HRH density is below the WHO recommendation of 4.45 skilled HCWs per 1,000 globally. Doctors density is at 1.7 while Nurses and midwives is 3.9 per 1,000 ("Measuring the availability of human resources for health and its relationship to universal health coverage for 204 countries and territories from 1990 to 2019: a systematic analysis for the Global Burden of Disease Study 2019," 2022; World Health Organization, 2021). Though low HRH density is a global problem, the density is worse in developing regions. South- east Asia and Africa, have been the worst hit regions by the largest needs- based HRH shortage, at 6.9 million and 4.2 million respectively in 2013 (World Health Organization, 2016). These regions also bear high rates of population growth and high disease burden.

For instance, in 2019, the African region (Malawi inclusive), had an average density for Physicians, Nurse and Midwives was 1.55 per 1,000 population, (except in four countries whose densities were found to be more than 4.45 per 1,000 population), far below the WHO HRH density recommendation on 4.45 per 1,000 (Ahmat A, 2022).

From moments back in time, the Africa region has hardly achieved globally recommended HRH density despite implementation of various interventions to improve HRH numbers and retention(World Health Organization, 2021). Figure 1 below shows the HRH density for the region between 2005 and 2018:

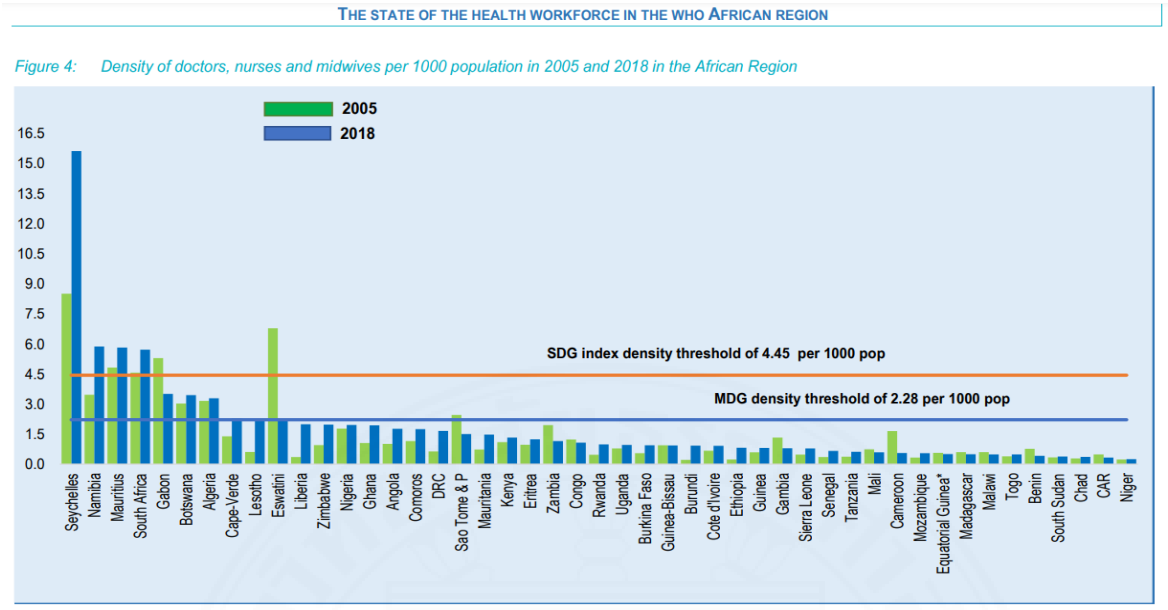


Figure 1: Health workforce status in African region in 2005 and 2018
Source: WHO, 2021

Studies have shown that HRH density is poor in these regions as compared to high income regions due to the upsurge of globalization, which has influenced rapid population growth, urbanization; changing demands, preferences and needs for the population; growing economies which have affected behavioral and feeding patterns; and effects of the rise in pandemics including Covid-19, Non Communicable Diseases (NCDs) and HIV and AIDS (World Health Organization, 2016) ; (WEMOS foundation, 2018).

Increase in labor markets, technology has also increased opportunities for HCWs migration within and outside countries in search of better living conditions, investment opportunities and career development opportunities. This has been fueled by unfavorable working conditions and lack of employment for new HRH graduates (Chimwaza et al., 2014; Government of the Republic of Malawi, 2017) .

Malawi has been equally affected with HCW shortage and the effects of globalization on the health system. The country's shortage of Health Care Workers (HCWs) is one of the worst, with a density of only 1.48 for skilled HCWs per 1,000 population, only 55% of frontline positions (Berman et al., 2021), and about 3,000 Nurses and Midwives graduated but not employed (National Organization for Nurses and Midwives, 2022). This has likely contributed to the reduction in HRH density in 2018 as compared to 2005, as shown in figure 1 above.

Another possible contributing factor to HRH shortage is high morbidity and mortality of HCWs due to HIV and AIDs. Though actual figures are not known, a study conducted in 2006 by Bemelmans et al. (2011), found that HIV prevalence was high (63% of HCWs and their families who were tested) at one of the districts (Bemelmans et al., 2016).

Migration of HCWs from Malawi

Migration of HCWs from Malawi to Organisation for Economic Co-operation and Development (OECD) countries, fueled by unfavorable working conditions and absorption of HCWs into the health system after graduating, has also affected HRH availability. However,

Considering the significant drop in HCWs migration as explained above, migration could not be considered as a major concern causing HRH shortage in Malawi after 2008 (Adhikari et al., 2013). Additionally, though migration recurred in 2015, overall average of HCWs who travelled to other countries was estimated to be less than 300 in 2021 for all cadres of HCWs. Though HCW migration recurred in 2015, Malawi is not among the top 20 countries on the OECD HCW migration list, with only 291 overall HCWs (all cadres) migrated in 2021 (Vidal, 2021); (Dia, I. A, 2022).

Figure 2 below shows the drop in Nurse- Midwives migration between 2000 and 2008.

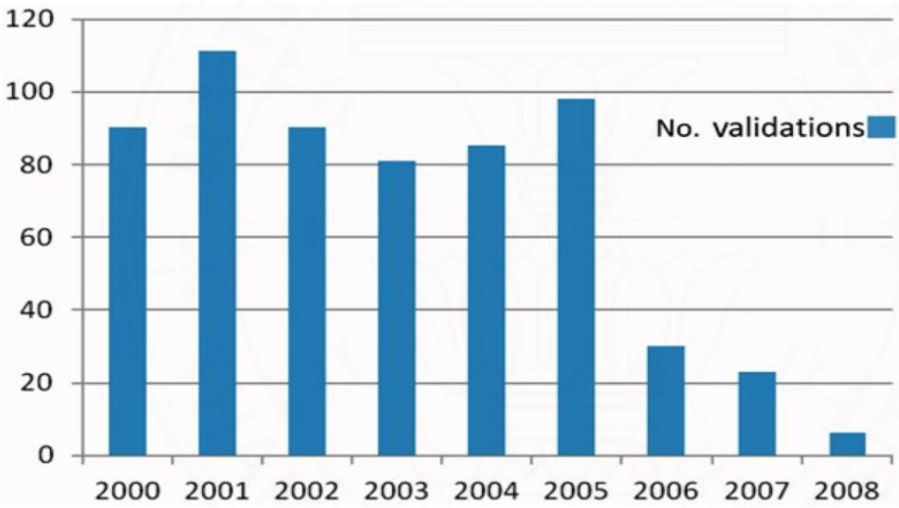


Figure 2:Migration of Nurses- Midwives between 2000 and 2008 in Malawi

Source: Adhikari, 2013

The country is also facing challenges with deficient distribution of the HRH recruited leading to disparities in HRH density between rural and urban areas, and also distribution of HCWs which is not based on individual service or facility's workload(Berman et al., 2021; Mziray et al., 2017) .

HRH distribution in Malawi

As earlier indicated, Malawi has an HRH density of only 1.48 per 1,000 for skilled HRH; and a vacancy rate of 33% of all HCW positions. Less than 70% of the established HCWs positions are filled. The vacancies vary across cadres, districts and regions (Government of the Republic of Malawi, 2017). As shown in Table 1 below, pharmacy personnel have the

highest vacancy rate of 79%, followed by Nursing Officers (66%); Clinical Officers (63%); Laboratory Technicians (62%) then Nurse Midwife Technicians (60%).

Health Surveillance Assistants also known as Disease Surveillance Assistants positions are filled in excess (114%); whereas Medical Assistants have the least vacancy rate of 20% followed by Medical Doctors (29%).

Table 1 below shows frontline positions and the status of vacant and filled positions per each frontline cadre:

Table 2: Established versus filled frontline positions for MOH and CHAM HCWs

Cadre	Established positions	Filled positions	Vacant positions	% vacant
Medical Officer	398	284	114	29%
Clinical Officer	3,135	1,159	1,976	63%
Nursing Officer	3,275	1,098	2,177	66%
Nurse Midwife Technician	8,626	3,475	5,151	60%
Medical Assistant	1,506	1,199	307	20%
Pharmacy Technician	1,063	218	845	795
Laboratory Technician	1,053	397	656	62%
Health Surveillance Assistants	6,699	9,468	(2,769)	-41%
Total	25,755	17,298	8,457	33%

Source: Malawi Government, 2017.

HRH investments in Malawi

In efforts to improve HRH distribution, Malawi has implemented various interventions, in different result areas as outlined in its HRH strategic Plan 2018- 2022.

Inadequate HRH numbers:

The government of Malawi through the Ministry of Health implemented the EHRP program from 2005 with support from international donors such as USAID, CDC and PEPFAR.

Under this program, intake to HRH training programs was increased, resulting into 53% increase of HCWs between 2012 and 2016. The donors also provided salary support for recruitment of additional HCWs in districts with high HIV burden. In 2017, over 3,000 HCWs were recruited and supported under this initiative, of which 56% were frontline HCWs. (Bernman et. al., 2021; Malawi Government, 2017).

Increased attrition of HCWs especially in rural areas:

The Government of Malawi also introduced incentives to promote retention of HCWs in both rural and urban areas. A top up allowance was introduced for all frontline HCWs to boost their salaries and motivate them to stay in service. For rural HCWs, modern houses were

constructed in rural health facilities. Additional monthly top up allowance was also introduced as a hardship allowance for rural HCWs as a motivation and compensation for their sub-standard working conditions and work load (Bernman et. al., 2021; Adhikari, 2014; Malawi Government, 2017)

Providers and levels of health services in Malawi

The main provider of health services in Malawi is the government (through the Ministry of Health), which provides health services in community; primary; secondary; and tertiary healthcare levels for free of charge, at the point of service delivery (Berman et al., 2022).

Approximately 63% of healthcare services is provided by the government, while Christian Health Association of Malawi (CHAM), a faith based non-governmental not- for profit organization, is the second largest provider of the health services (Malawi Government, 2017). CHAM is a largest non- governmental healthcare provider and trainer; which provides about 29% of Malawi's healthcare (Berman et al., 2022), through its facilities which are mostly (about 75%), located in hard to reach areas; and also trains more than 80% of middle level HRH through its 11 training colleges (http://cham.org.mw/) . Most of CHAM facilities also provide the essential healthcare package for free at point of service delivery, through a service level agreement it has with the Malawi Government. The remaining 8% of healthcare services is provided by other providers which include academic institutions, private for profit healthcare providers and others, including traditional healers (National Statistical Office Malawi et al., 2016).

Figure 3 and 4 below shows the different levels and providers of health services in Malawi:

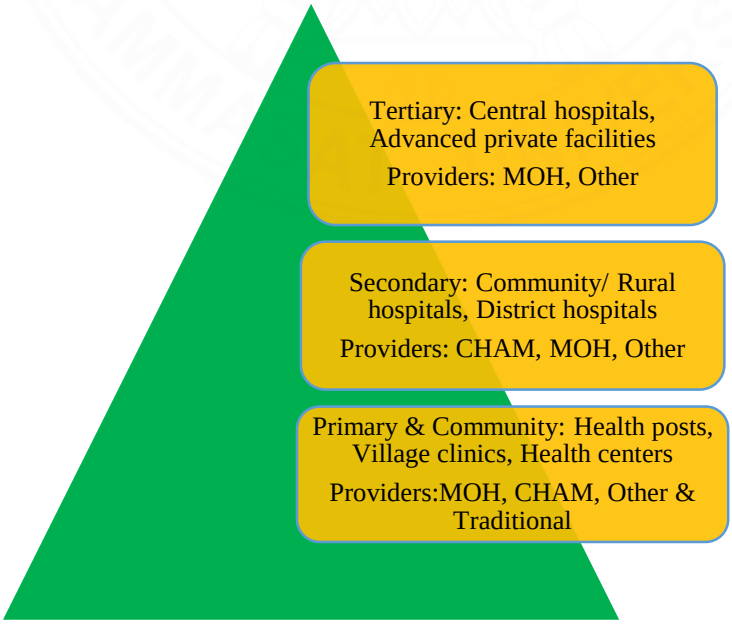


Figure 3:Levels of health services in Malawi

Source: Malawi Government, 2017

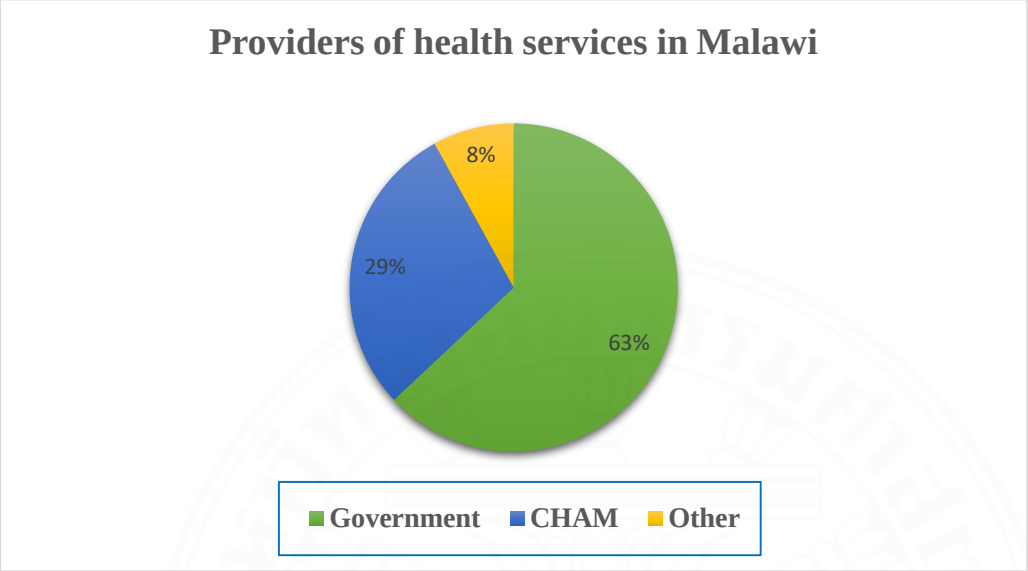


Figure 4:Providers of health care in Malawi

Source: Government of the Republic of Malawi, 2017

Coming in of decentralization in 2016, gave Central Hospitals the autonomy to manage their own HCWs and service delivery, while governance of district and community health facilities was left with the District Councils, under the Ministry of local Government (MoLG) (Institute of Public Opinion and Research et al., 2016).

With this development, planning; recruitment and distribution of workers up to grade M falls under responsibility of the district councils, while higher grades (from L upwards- which includes the frontline HCWs), is determined and controlled centrally by the MoLG in collaboration with MOH (CHAM Secretariat Human Resources department, 2022).

Structure of the health system in Malawi

Malawi is divided into three administrative regions namely Northern, Central and Southern regions. At national level, the Ministry of Health headquarters is responsible for strategic functions which include setting standards and policies, strategic planning, resource mobilization, monitoring and evaluation, and provision of technical support. (Institute of Public Opinion and Research et al., 2016)

Malawi has 28 districts administratively governed by District Councils which fall under Ministry of Local Government. District Commissioners are the controlling officers for all the district councils. The councils are made up of technocrats which include the District Health Management Team (DHMT); and a political arm, which comprises elected councilors and members of parliament. District councils are also supported by various sub-district structures which include Area and Village Development Committees (ADCs and VDCs), which

represent communities and facilitate grassroots participation in local decisions (Institute of Public Opinion and Research et al., 2016).

The health system is one of the departments under district councils and directly reports to the Ministry of Health (MOH), with parallel reporting lines to the District Commissioner through the District Executive Committee (DEC). Every district has District Health Offices (DHOs) which oversees all health services operations. Manned by the DHMT, DHOs are responsible for managing and coordination of all primary and secondary level health services in both public and non-public health facilities. This includes regulation of health services in line with MOH standards; recruitment and distribution of lower health facility cadres (from grade M of the government scale below); and management of HRH recruited by MOH (from grade M upwards); and management of the Health Management Information System (HMIS) for both public and private health service providers (Institute of Public Opinion and Research et al., 2016).

DHOs also cooperate with the other sub committees at the district councils and community structures to improve health service delivery in the districts (Institute of Public Opinion and Research et al., 2016; National Statistical Office Malawi et al., 2016).

Figure 5 below shows the structure of health system in Malawi, from national to grassroots level:

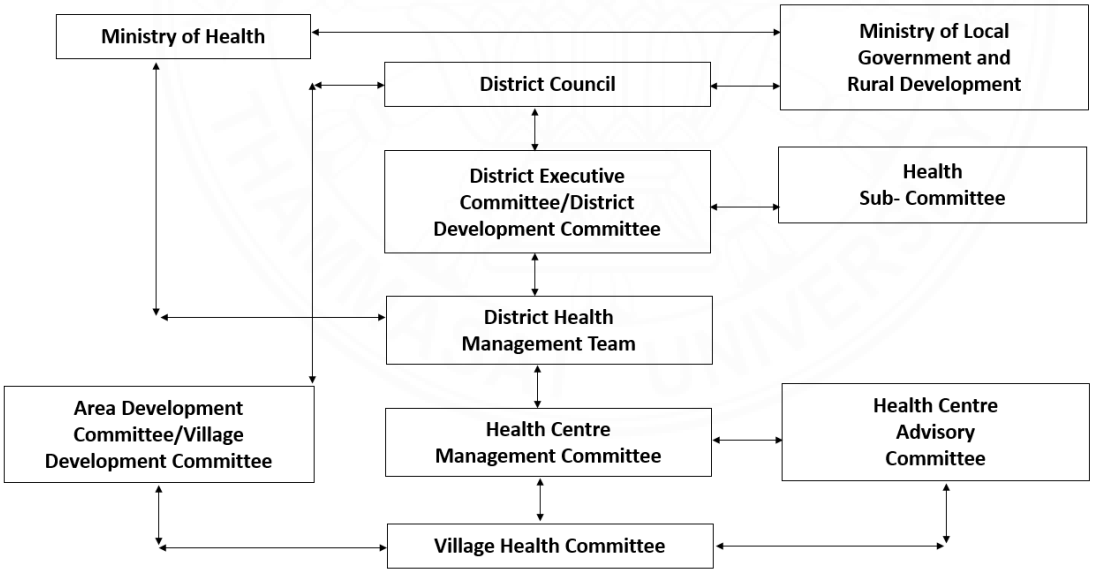


Figure 5: Structure of health system in Malawi, from national to grassroots level

Source: Institute of Public Opinion and Research, 2016

Vacancy rates vary from region to region, for a number of factors such as increased internal migration of HCWs to urban and areas with better living conditions such as weather and geographical terrain, inadequate supervision and poor governance of district authorities, and others (Berman et al., 2022; Chimwaza et al., 2014).

Table 2 below shows the status of filled positions per region in Malawi:

Table 3 Status of filled and vacant positions at region and district level in Malawi

Region	District	Current staff	Establishment	% of posts filled (%)
Central (62% of posts filled)				
	Dedza	782	1234	63
	Dowa	766	1161	66
	Kasungu	767	1317	58
	Lilongwe	2227	2560	87
	Mchinji	681	1103	62
	Nkhotakota	493	1095	45
	Ntcheu	793	1239	64
	Ntchisi	366	859	43
	Salima	669	943	71
North (44% post filled)				
	Chitipa	303	830	37
	Karonga	420	1028	41
	Mzimba	346	2054	66
	Nkhatabay	418	1213	34
	Rumphi	474	1116	42
South (58% post filled)				
	Balaka	596	911	65
	Blantyre	1058	1293	82
	Chikwawa	525	1081	49
	Chiradzulu	606	987	61
	Machinga	617	962	64
	Mangochi	1038	1492	70
	Mulanje	799	1403	57
	Mwanza	210	640	33
	Neno	282	795	35
	Nsanje	391	1068	37
	Phalombe	455	958	47
	Thyolo	803	1159	69
	Zomba	1168	1424	83
Central	Headquarters	174	3536	5
Central	Kamuzu Central Hospital	610	653	93

North	Mzuzu Central Hospital	313	650	48
South West	Queen Central Hospital	676	679	100
South East	Zomba Central Hospital	284	650	44

Source: Berman et al., 2022

According to Table 2 above, the central region has the highest percentage of positions (62%) filled, seconded by the southern region (58%) and with the Northern region least filled (44%) possibly due to increased internal migration of HCWs away from the region to urban and areas with favorable terrain. Two central hospitals (Queen Elizabeth in the south and Kamuzu Central in the Central regions) have the highest percentage of 100 % and 93% respectively, whereas Mzuzu and Zomba central hospitals have the lowest percentages of 48% and 44% respectively.

For individual districts, Lilongwe has the highest percentage (87%) of positions filled, seconded by Zomba (83%) then Blantyre (82%). Mwanza, Neno and Nsanje districts have the lowest percentages of less than 40%. Overall, only 13 districts (48%) have filled positions percentage rate over 60%.

Levels of HRH decisions making and implementation in Malawi health sector

According to (Government of the Republic of Malawi, 2017):

> MOH through DHRMD is the one responsible for strategic HRH decisions in Malawi such as forecasting, planning, recruitment and distribution.
>
> Before decentralization, MOH was responsible for recruitment of all cadres in the health system including payroll management. HRH data was managed through HRIS centrally coordinated and controlled by MOH for all the districts.
>
> After decentralization, some HR functions were deployed to district level where recruitment of lower cadres, grade M and below, of the Malawi government job scale is done. Figure 6 below shows the flow of HRH authority within the public health system of Malawi:

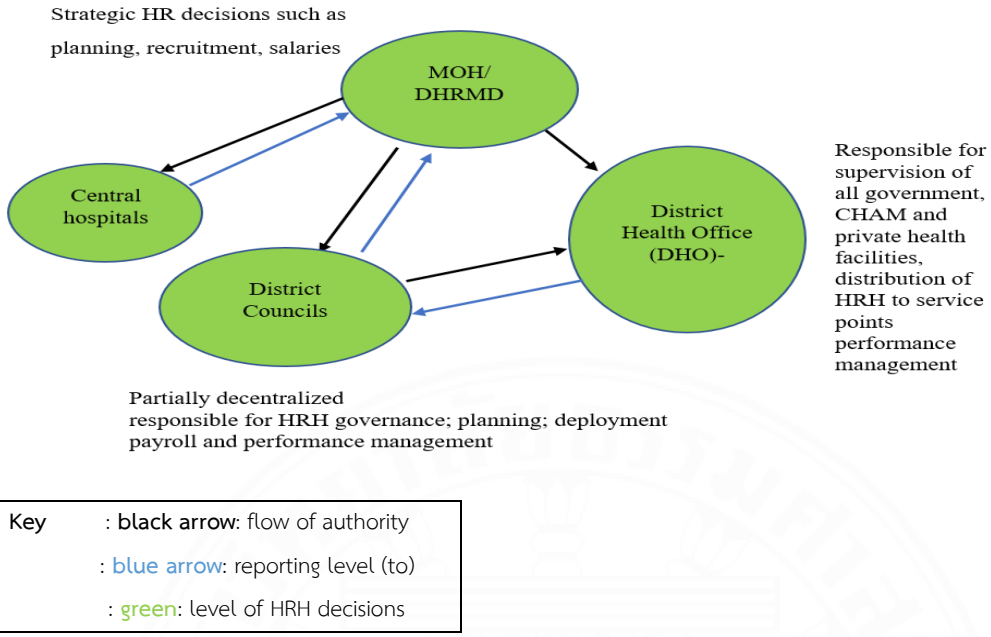


Figure 6: Levels of HRH decisions making and implementation in Malawi public health system

Source: Malawi Government, 2018

Decentralization and Malawi health system

Decentralization is one of the reform measures towards improved inputs, health outcomes and management processes in health system (Panda et al., 2016). One of iHRIS benefits is that it is applicable to decentralized systems and that it can be used at individual district level (Malawi Government, 2017; Intra-health International, 2020).

However, according to Panda et al. (2016), the extent at which decisions at local level influences strategic decisions is key in realization of decentralization goals. In most LMICs decentralization of the health system is associated with various political, administrative and financial implications; and the benefits for the health system is not well established (Abimbola et al., 2019; Dwicaksono et al., 2018).

A study by Bulthuis, et al (2021) found that MOH headquarters and political bodies markedly influence decision making at district level in Malawi. Furthermore, DHMT and District councils have limited empowerment and liberty to exercise their structural power and decisions over the districts. This is because of hierarchical structures and financial resource allocation (Bulthuis et al., 2021).

These complex decentralization processes have systemic effects on the health system decisions (Panda et al., 2016), as it has implications on the commitment and support from top management to get iHRIS rolled out and sustained, and get the data analyzed used for decision making (Bhattacharyya et al., 2021).

Adoption of the Integrated Human Resources Information System (IHRIS)

As earlier indicated, IHRIS is one of the internet-based ICT tools, for managing Human Resource (HR) data in the health sector (IntraHealth International, 2020).

Adoption of IHRS was endorsed because it would leverage on the existing commitment by Malawi Government to the use of digital technologies in the health sector as outlined in its Digital Health Strategy 2021-2025. (Government of the Republic of Malawi, 2017).

The digital health strategy outlines the vision to attain sustainable, harmonized and country led digital health systems, in line with the World Health Assembly (WHA) 58.28. It also aims to improve flow and utilization of information in support of health services delivery and management; and structures at national and district levels for implementation of the strategy were already established (Malawi Government, 2020).

IHRIS has five modules and MOH which have different functionalities as shown in Figure 7 below.

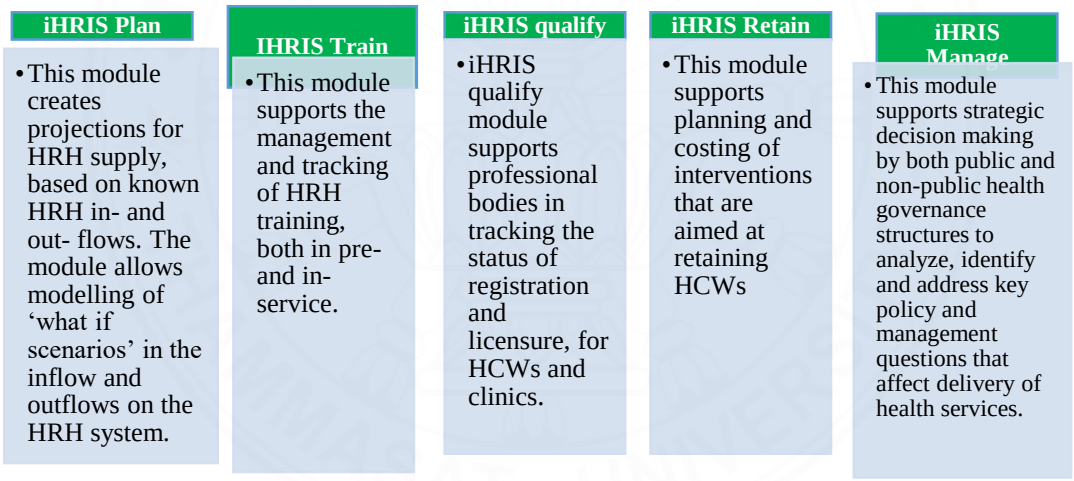


Figure 7: Data management modules in IHRS
Source: Intra-health International, 2020; Malawi Government, 2018

As earlier explained, iHRIS was chosen based on its ability to bring together wide range of inter-linked HRH functions and data (from planning, training, licensure, retention status and management data of HCWs), which gets continuously updated on real time basis. This would ease access of comprehensive data by MOH and significant stakeholders, useful for strategic HRH decisions (Government of the Republic of Malawi, 2017).

According to the Malawi Government, (2017), IHRIS is convenient for use by the partially decentralized health system in Malawi, for it can be used by individual District Councils. It is also inter-operable for it can exchange data with other government supported-standard based

information systems; and scalable because it can be used by professional bodies, among other advantages (IntraHealth International, 2020).

iHRIS would serve as a strategic one-stop reference for documenting and linking all HR interventions, and guide stakeholders on HRH decisions and directions towards achieving equitable distribution of HRH (Malawi Government, 2018).

iHRIS use has shown to improve HRH decisions such as re-deployment of HCWs with the appropriate expertise to where they were needed in Tanzania and Mozambique (Ishijima et al., 2015; Waters et al., 2016), and saved time and costs associated with reporting and prevention of salaries' payment for ghost and inactive workers. (Ishijima et al., 2015; Waters et al., 2016; Waters et al., 2013).

However, HRH2030 (2021) found that iHRIS use in Senegal demonstrated to compromise focus on improving data quality and use but rather made the workers using it to focus more on data entry, contributed by lack of clear roles and ownership between the national and sun-national level. an increased focus on having the system users such as data entry clerks, getting oriented on ICT capacity and skills than mentoring the local managers on how the information entered and analyzed can be applied to improve HRH decisions (Human Resources for Health in 2030, 2021).

2.3 Research Purpose, Question and Objectives

This chapter presents the purpose, objectives, and the question that this study is addressing, in reference to the problem statement outlined in chapter one above.

Study purpose

The main purpose of the study is to examine whether adoption and use of iHRIS at district level can contribute to the strategies to improve inequitable planning and distribution of HRH in Malawi.

Research question and objectives

The main research question for this study is:

How can adoption of IHRIS at district level help address inequitable planning and distribution of HRH in Malawi?

To address the above research question, the following objectives were pursued:

1. To describe international guidelines and purpose of Information Systems for Human Resources for Health
2. To examine the existing methods of managing HRH data and determining HRH needs in Malawi
3. To scrutinize the gaps associated with the current modalities in HRH data management, planning and distribution

4. To explore other interventions for improving HRH distribution along iHRIS and provide recommendations

2.4 Conceptual framework

A country's progress towards UHC is largely influenced by the equitable planning and distribution of its health workforce, in line with the health demands and needs of its population (World Health Organization, 2016).

HRH models and tools such as HRH Information systems, have shown to enhance availability of comprehensive HRH data and responsive health workforce projections (World Health Organization, 2010). Electronic HRH Information Systems (health workforce registries), have since been incorporated into Health Information Systems, to enable recording, monitoring and management of HRH (World Health Organization, 2015).

With the expertise of software and system developers and designers, advanced models of the health workforce registry, such as the iHRIS, have been developed in many countries, where separable information systems for HRH pre- and in-service training, licensure, practicing and exiting HRH, have been integrated into a single repository, accessible and usable by the national and sub-national levels of the health system, including the private health sector (Human Resources for Health in 2030, 2021; IntraHealth International, 2020; World Health Organization, 2015).

The inter-operability and integration of the iHRIS tool, enhances its ability to provide reliable data, which in turn improves the evidence base on which HRH decision makers can base strategic decisions (Driessen et al., 2015; Human Resources for Health in 2030, 2021).

Lack of comprehensive and quality of HRH information has contributed to non-responsive HRH decisions in Malawi, bringing about poor utilization of the existing HCWs and inequitable distribution of workload among HCWs in different geographical and demographic locations (Government of the Republic of Malawi, 2017).

Though HRH interventions have targeted increased HRH production, reduced migration to other countries and improved retention, other factors such as increased labor markets, increasing burden of NCDs and pandemics, rapid population growth; have worsened the effects of the poor HRH density in Malawi, consequently further demotivating the existing HCWs, who resort to exit the health system for better opportunities (Government of the Republic of Malawi, 2017).

According to the experiences shared in other countries on iHRIS use, operability of iHRIS would require substantial commitment and ownership by both national and sub-national

levels of the health system as well as enhanced coordination of both public and private sectors (Bhattacharyya et al., 2021; Ishijima et al., 2015). Districts have limited influence on HRH decisions and data use in Malawi due to partial decentralization (Bulthuis et al., 2021; Institute of Public Opinion and Research et al., 2016). Furthermore, districts and health institutions have varying capacity and methods of data management, ranging to paper to electronic based(Government of the Republic of Malawi, 2017).

Figure 8 below demonstrates the inter-connection between HRH tools, HRH information System s use, responsive and equitable HRH distribution and limiting factors to iHRIS use and HRH density, towards UHC.

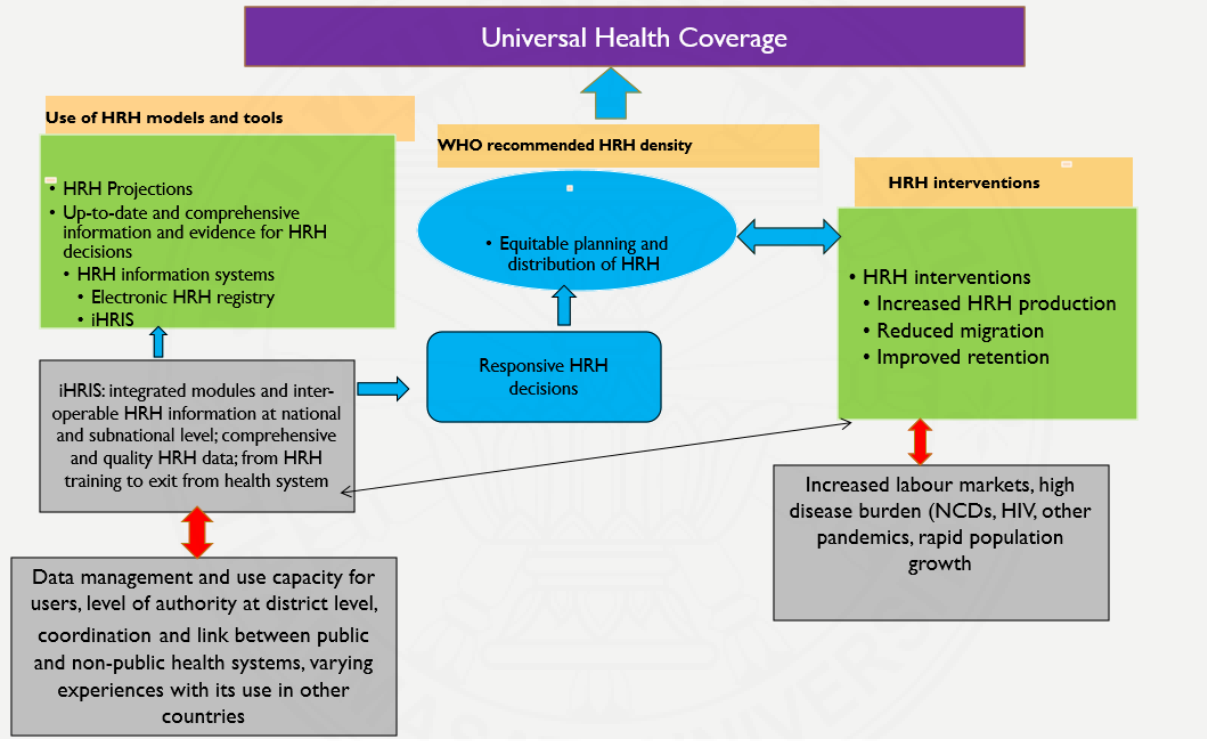


Figure 8: Conceptual framework for causes of inequitable HRH distribution, what iHRIS targets to address; and benefits and shortfalls of iHRIS use

Source: Malawi Government, 2018; Human Resources for Health in 2030, 2021

CHAPTER 3: RESEARCH METHODOLOGY

This section outlines the methodology used search literature, to answer the question and explore the objectives for this research.

3.1 Study design

This study is a documentary review of academic literature and relevant grey literature on human resource for health models, management tools and modalities, for HRH planning and distribution decisions.

In particular, available iHRIS implementation best practices were reviewed, and compared with the Malawi context.

3.2 Study area

This study's focus area is the Malawi health system and its associated structures, where HRH decisions are done and implemented.

3.3 Sampling strategy

Source materials

Table 4 below shows details on the data sources where literature was sourced from, and methods which were used to search for the information per each objective

Table 4: Data collection methods and sources

Objective	Type of documents	Data source
To describe international guidelines and purpose of Information Systems for Human Resources for Health	-WHO framework and guidelines -HRH grey literature	WHO framework and guidelines Human resource for health, equitable distribution, HRH models, iHRIS, health information systems, universal health coverage
To examine the existing methods of managing HRH data and determining HRH needs in Malawi	-Governments reports (Malawi) -Malawi Government strategic documents -Non-governmental organizations reports	Data base: Malawi government websites, World Bank website, USAID website, HRH2030 website, Thammasat university library, WHO website, Google scholar Search words: Human resource for health, Malawi, equitable distribution, HRH models, HRH policies, iHRIS, universal health coverage, decentralization, health information systems
To scrutinize the gaps associated with the current modalities in HRH data	-Documents and reports from the Malawi Government	Data base: Malawi government website, USAID website, Printed documents from Malawi Ministry of health, Google Scholar, PubMed, Medline, Biomed central,

management, planning and distribution	-Non-governmental organizations' reports -Research articles	Thammasat university library, WHO website, World Bank website, CDC website Search words: Human resource for health, Malawi, equitable distribution, HRH models, HRH policies, iHRIS, universal health coverage, decentralization, health information systems
To explore other interventions for improving HRH planning and distribution along iHRIS and provide recommendations	-Documents and reports from the Malawi Government -Non-governmental organizations' reports -Academic articles -International guidelines - Non- Governmental Organizations reports WHO reports World Bank reports	Data base: Malawi government website, USAID website, Printed documents from Malawi Ministry of health, Google Scholar, PubMed, Medline, Biomed central, Thammasat university library, WHO website, World Bank website, USAID website, CDC website Search words: Human resource for health, Malawi, equitable distribution, HRH models, HRH policies, iHRIS, universal health coverage, decentralization, health information systems

Search strategy

A broad range of source documents for the study were retrieved online using Thammasat online library, the Academic ultimate search and others. Boolean and advanced search techniques using 'AND', 'OR' were used. Offline documents and reports especially those from the Government of Malawi were also reviewed.

The following keywords were used to search:

Human resource for health

Malawi

Equitable distribution

HRH models

HRH policies iHRIS

Universal health coverage

Decentralization

Global health

Health information systems

Selection criteria

The criteria below were used to determine inclusion or exclusion of the literature searched, for the study's analysis.

Inclusion criteria

a. Documents published in English between 2010 and 2022

b. Malawi Ministry of Health and Christian Health Association of Malawi reports and strategic documents on Human resources for health (HRH) and HRH models

c. Documents such as journals, reports and working papers on HRH data management, models, barriers, and mitigating factors.

d. Peer reviewed articles from government of Malawi, international organizations, and other non- governmental organizations with qualitative and/ or quantitative data on use of human resource models in Malawi, Low- and Middle Income countries and globally.

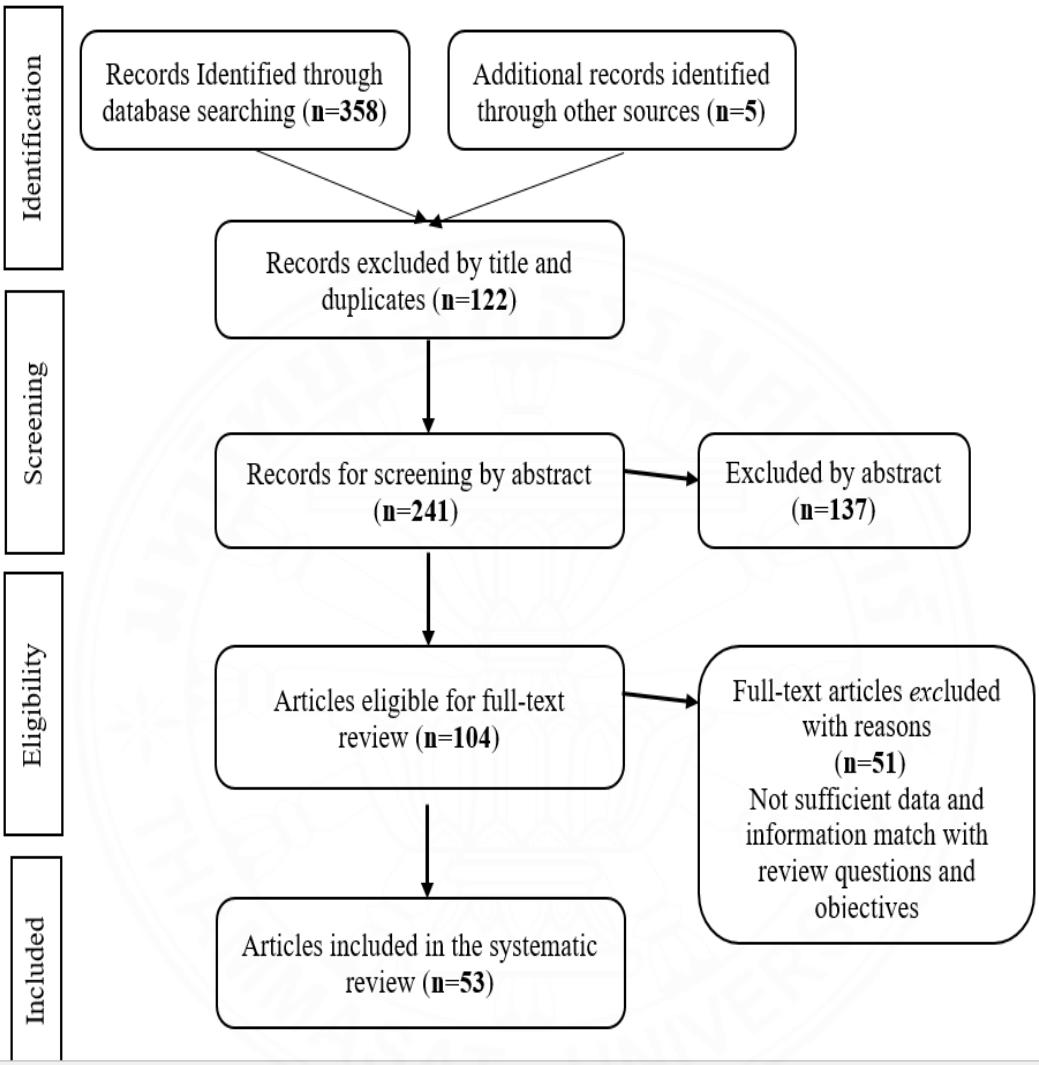
Exclusion criteria

Documents for which only abstract was available.

3.4 Data management

EndNote referencing was used for managing citations, referencing and data management, using APA 7th Thammasat format. Preferred Reporting Items for Systematic Review (PRISMA) flow chart and checklist were also used to show selection and management of data. See PRISMA flow chart below:

PRISMA FOR ADOPTION OF IHRIS IN MALAWI TO ADDRESS INEQUITABLE HRH DISTRIBUTION



3.5 Data Analysis

Table 4 below illustrates how data analysis was conducted for the study, to obtain relevant literature for analysis, per each objective under the review.

Table 5: Data analysis plan

Objectives	**How the data was used**
To describe international standards and purpose of Information Systems for Human Resources for Health	Documents from HRH and general health International organizations, policies and reports were reviewed to describe the best practices, standards and requirement for HRH information systems.
To examine the existing methods of managing HRH data and determining HRH needs in Malawi	Documents from the government and non-governmental organizations were reviewed to explore various methods and models of how HRH data is generated, reported and used at district and national level, and by who. Furthermore, the documents were reviewed to understand how HRH needs are determined in the Malawi health system
To scrutinize the gaps associated with the current modalities in HRH data management, planning and distribution	Government policy documents and strategic documents, and program reports from Malawi, local and international organizations were explored to understand how efficient the current modalities for HRH information management and HRH forecasting and distribution in Malawi are, compared with the international standards and other countries
To explore other interventions for improving HRH planning and distribution along iHRIS, and provide recommendations	Experiences from other countries which are using iHRIS and results gotten from the first three objectives were used to assess whether adoption of iHRIS at district level would be applicable in Malawi context, and suggesting ways on how objectives for iHRIS adoption would better be achieved in addressing inequitable HRH planning and distribution in Malawi

CHAPTER 4
RESULTS

This chapter contains the findings that the study found for each of the objectives that this paper seek to address. The information contained in this chapter was gotten through literature review of policy and strategic documents; academic studies, relevant grey literature on HRH, program reports from Malawi, local and international organizations, international guidelines and standards; studies on HRH and other documents from the government and non-governmental organizations.

4.1 International standards and purpose of Information Systems for Human Resources for Health

HRH information systems are meant to stem from the larger Health Information systems, which comprises of all the main sub-components of the health system (WHO, 2015).

Figure 9 below illustrates how HRH registry relates health workforce registry to health information systems specific HRH framework:

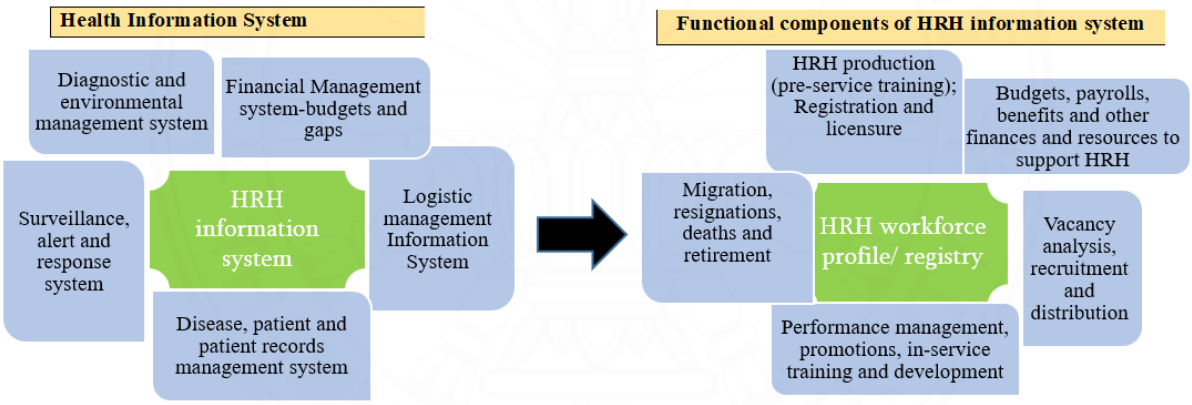


Figure 9:Relationship between HRH registry and health information systems specific HRH framework

Source: WHO, 2015

As shown in the figure 9 above, HRH information is an essential component that affects the functioning of the other HIS. This implies that linking HRH information system to be disease trends, available budgetary allocations, supply chain and potential and actual health risks in the environment, would provide better evidence for HRH projections and planning (World Health Organization, 2015).

The electronic functional HRH information system (the health workforce registry), contains a ‘count’ of HRH specific sets, those in training, registered, in-service-trained, and exited; and where they are located.

iHRIS was designed to have all these functional components into one integrated and inter-operable system, and allows generation of reports and analyses from them all. HRH information is an essential component that affects the functioning of the other HIS.

A. Standards for HRH Information Systems- the health workforce registry:

WHO (2015) described Health workforce data as all records about personal, demographic, academic and professional information for health workers. Usually, this information is contained in a country's health work force profile or health workforce registry, which acts as a repository for essential information about all pending, serving and exited health workers in a country (World Health Organization, 2015).

Health workforce registry covers four main functional domains through the health workforce life-cycle which are pre-entry, Entry, Exist and Exit categories, as follows:

The pre-entry domain: This category mainly covers the workforce needs for planning and budgeting purposes for ministry of health. The source for this information includes the staffing projection, planning and distribution models and modalities for the country's health system, as informed by HRH supply, trends in population growth and health needs and demands as well as financial capacity of the health systems.

Entry domain: This category contains information for all students pursuing various health training courses in HRH training institutions, by cadre. It also includes the information about HCWs graduated, registered and licensed by all professional and regulatory bodies. This information is generated and reported by the academic institutions and the professional regulatory bodies.

Exist domain: This category is a count of all health workers who are currently employed in (both public and non-public) health facilities and training institutions, at the country's national and sub-national level in the health system. This information includes details for the existing HCWs by cadre, location deployed, type of facility where they are working, thus either public or private and whether it is a primary, secondary or tertiary level health facility.

Payrolls, information on resources or finances (expenditure, budgeted and gaps); records from in-service training reports and datasets; and performance management and promotion records are some of the main sources for the information under this domain. Additionally, vacancy analyses to determine available HRH versus the needed HCWs also fall under this domain.

The information included in this domain is useful for determination of HRH needs, budgetary requirements and gaps as well as identification of inefficient HRH distributions across different geographical locations.

WHO also proposed inclusion and formalization of Community Health Workers (CHWs) CHWs training, deployment and remuneration; and their integration into the formal health workforce information system.

As the (World Health Organization, 2017) highlighted in its report by the Regional Office for Africa, improved primary health care outcomes require a formal integration and strengthening of Community Health Workers' (CHWs) programs.

Learning from the Ebola outbreak in Liberia, Guinea and Sierra Leone from 2014 to 2015, the CHWs programs integration with the larger health system would help health systems to prioritize and consider their development as an established and not standalone nor short time intervention amidst HRH shortages in Low and Middle Income countries (LMICs) (The World Health Organization (World Health Organization, 2017).

Exit domain: All HCWs who ever worked in both government and private health institutions and are no longer serving due to various reasons such as resignations, retirement and death, are included in this category of the health workforce data. Sources of this data include pension and retirement records; resignation notifications and reports, supervision reports, migration data at professional bodies (where the HCWs get references to work abroad); and surveys (World Health Organization, 2015).

Figure 10 below shows the four main domains in the context of the health workforce registry:

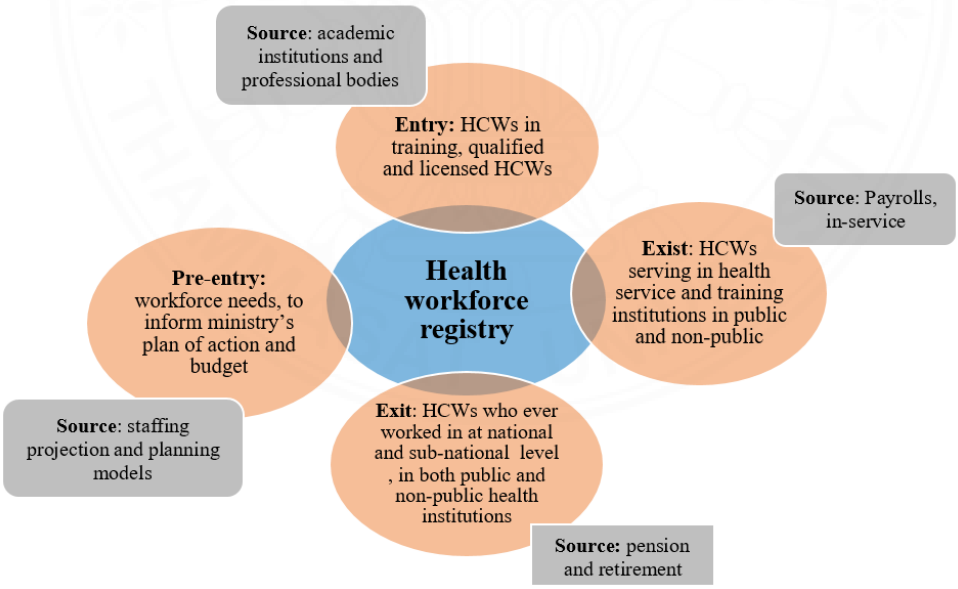


Figure 10: Four main domains in the context of the health workforce registry

Source: WHO, (2015)

The figure above shows that HRH information systems should contain data from all stakeholders in the health system, ranging from training institutions, public and non-public service providers as well as professional bodies. Human resource, health services (Nursing

and clinical departments); finance and administration departments have a responsibility to record, report and share information into the HRH information system.

As mentioned above, iHRIS was designed to have all these functional components into one integrated and inter-operable system, and allows generation of reports and analyses from them all. iHRIS enables for instance HRH managers to access training data for example, or professional bodies' records data, health services data), for a particular district and compare with its HR exist data, versus what was planned for that particular district.

B. Purpose of Information Systems for Human Resources for Health

HR information systems act as a repository and a one-stop reference for countries' health systems and stakeholders, for all essential statistics about the country's HCWs (both public and non-public) (World Health Organization, 2015).

According to WHO, (2015), HRH information system provides a readily available aggregate; and enables analysis of the existing quantity and quality; expenditure; pending supply; retention status for HCWs and compare them with the established or expected norms.

HRH information systems are an important aspect of HRH planning and distribution as it also helps in making decisions on how the gaps will be filled as well as how the pending supply will be absorbed in the system (Szabo et al., 2020).

This analysis provides evidence base for projecting and planning for present and future HRH needs, resources required to support them and informing distribution needs to meet current demands of population health needs, as informed by the disease management and patient records information system. HRH models adopted by health systems are largely informed by such analyses among other methods such as surveys and international guidelines (Szabo et al., 2020; World Health Organization, 2021).

4.2 Existing methods of managing HRH data and determining HRH needs in Malawi

Management of HRH Information systems in Malawi

Management of health information, including HRH information is governed by the Malawi National Health Information System (NHIS) policy (Government of the Republic of Malawi, 2017).

Developed in 2015 by MOH, the NHIS policy aims to improve reliability and accuracy of evidence base for enhanced health services, through improved data management and reporting for health indicators, taking into consideration the shifting health priorities, ICT advances and coming in of new policies (Malawi Government: Ministry of Health, 2015)

As indicated in the NHIS policy, fragmented and parallel data collection, vertical programs and lack of alignment to HSSP indicators contributed to poor management and reporting for the country's health indicators.

To curb this, a National Data Standards Sub-Technical Working Group under Central Monitoring and Evaluation Division (CMED) in collaboration with the MOH ICT unit develops, standardizes and monitors all hardware and software standards and specifications for the Health Information systems (Malawi Government: Ministry of Health, 2015).

Data sources for the NHIS mainly include Logistics Management Information System (LMIS) and Financial Management System (FMS), Human Resource Information System (HRIS), and District Health Information System II (DHIS 2) (Malawi Government: Ministry of Health, 2015).

DHIS II is the system which is used to monitor performance of specific health indicators and disease trends for all districts and all levels of health facilities in the country, which submit monthly reports to MOH (Chikumba, 2017).

HRIS is the one that covers the HRH information. As explained in chapter one, this is a general human resources tool that is also used by the MOH's DHRMD to manage public health workforce information (Malawi Government: Ministry of Health, 2015). However, how HRH information is linked or inter-operated with the DHIS 2, LMIS and FMS is not clearly explained in the NHIS policy.

Additionally, handling of e-information is guided by the Malawi Digital Health Strategy (2022-2025) which was established to improve timeliness, accuracy, flow and use of information in the health sector, for improved health services' delivery strategic decisions (Government of Malawi Ministry of Health, 2020). Guided by the strategy, the ministry of Information supports the health system at central and district level by secondment of ICT personnel and technical guidance. This support is provided to entire district councils and not just to the health departments and non-public institutions are not included (Government of the Republic of Malawi, 2017).

Before decentralization, DHRMD was responsible of managing HRIS for both national and sub-national public health workers. HRIS was used to record, aggregate, analyse and produce reports for HRH, for all public HCWs in the country (Government of the Republic of Malawi, 2017).

After decentralization was adopted, the system is not directly linked nor devolved to district level yet, and it is still centralized. So far, Central hospitals are the only ones empowered to manage their own HRH, and uses the HRIS to manage their own recruitment, payrolls, training and performance management for their health workforce, in collaboration with the Ministry of Local Government (Government of the Republic of Malawi, 2017).

Health workforce information at district level is recorded and stored at the districts by the DHOs' HR departments. This information is shared with DHRMD during processing of payrolls and staff returns when processing monthly salaries which are coordinated by DHRMD. Besides, districts also submit information on HRH when they are sending requests to have HCWs replaced after they exit through resignations or deaths. Similarly, performance

management reports for the HCWs are also shared with DHRMD when there are career progression training requests and other requests from district and community HCWs (DHRMD, 2022).

Non-public health facilities such as Christian Health Association of Malawi (CHAM) and private health facilities, manage their own HRH data using modalities which vary depending on the capacity of the individual health facilities. Advanced private and CHAM facilities have electronic data bases in excel and word formats which are used to record and store information about their workforce. HRH information from CHAM facilities is submitted to CHAM headquarters (CHAM Secretariat). This is in form of monthly payrolls and staff returns that are submitted monthly when processing salaries for the HCWs. CHAM Secretariat then sends this information to MOH because salaries for all established positions for CHAM HCWs are paid by MOH (CHAM Secretariat HR department, 2022; National Health Accounts, 2017).

Facilities who report to districts record HRH information using various tools according to their status. Less advanced facilities use paper-based formats, while advanced one use electronic (Malawi Government, 2017).

HRH training institutions and professional bodies individually manage their own data sets and report to Ministry of Education, and DHRMD when required (Government of the Republic of Malawi, 2017). This information is not reported through DHOs and there are no prescribed schedules for the HRH reports from training institutions nor professional bodies to DHRMD (Malawi Government, 2017).

According to the HSSP II, whenever MOH wants additional HRH information beyond what it gets from the districts' monthly payrolls and other related information, the facilities are visited to collect the data. Alternatively, the facilities are asked to send the specific dataset as required by the MOH at particular time. Same applies when the ministry wants some HRH information from the non-public health facilities and training institutions (Government of the Republic of Malawi, 2017).

Figure 11 below summarizes the flow and management of HRH data in Malawi health system:

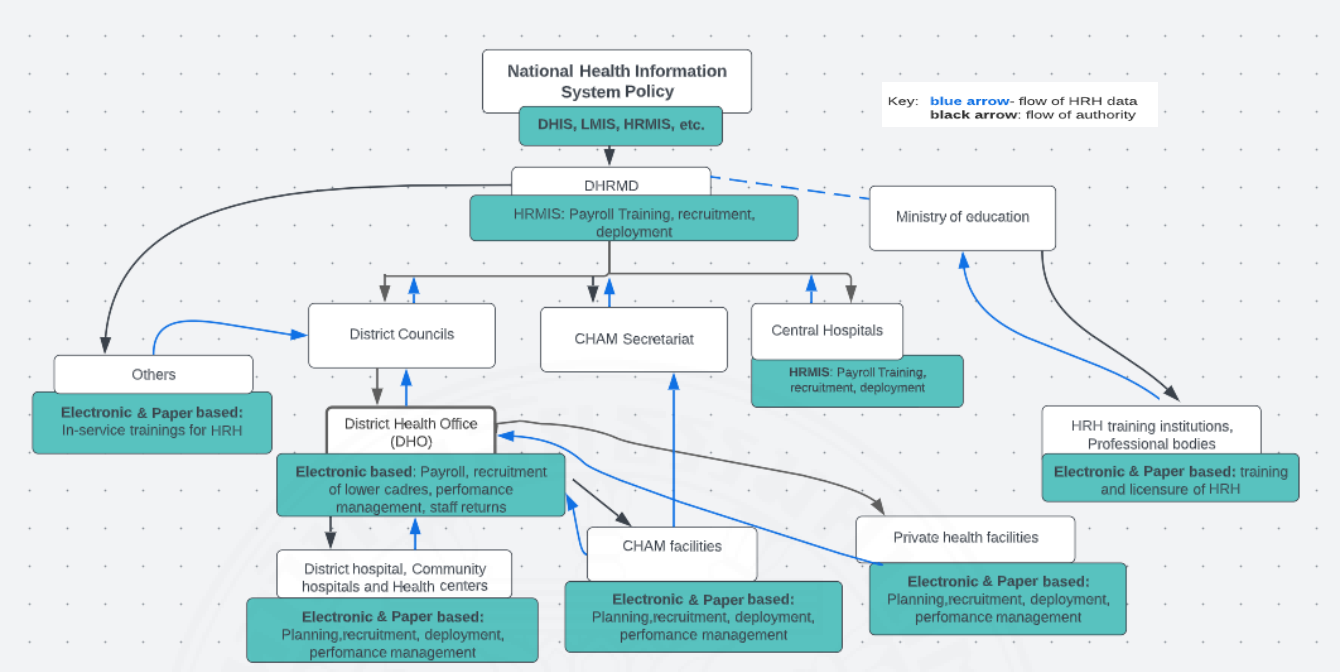


Figure 11: Flow of HRH authority, information, tools used and HR functions at different levels of HRH governance structures in Malawi health system

Source: Adapted from Malawi National Health Information System Policy; HSSP II; and Institute of Public Opinion, 2016.

Which models and methods are used for determining HRH planning and distribution needs at national level in Malawi?

From 2004, the annual Program of Work (PoW) through Sector Wide Approach (SWAp) package was the one which had been guiding all decisions and programs in Malawi's health sector, with focus on access to the Essential Health Package (EHP) for all; before development of the HSSP I (Kawale et al., 2019).

EHP is the minimum package of health services that the Malawi government provides or intends to provide to all its citizens regardless of socio-demographic and economic status (Government of Malawi Ministry of Health, 2011).

Guided by the Millennium Development Goals (MDGs); and Malawi's Vision 2020, HSSP I was developed as a framework and reference point for designing, delivery and financing of EHP for the period 2011- 2016 (Kawale et al., 2019).

Currently, the HSSP II (2017-2022) is the one which shapes the objectives, strategies, and directs resource allocation to support UHC (including HRH priorities), towards attainment of SDGs, following the expiry of the HSSP I (Government of the Republic of Malawi, 2017). The EHP also provides basis for estimation of the numbers and type of HCWs needed in the Malawi Health system (Mziray et al., 2017).

The current HSSP (2017-2022) has the following strategies and priorities which directly concerns HRH, shown in figure 12 below:

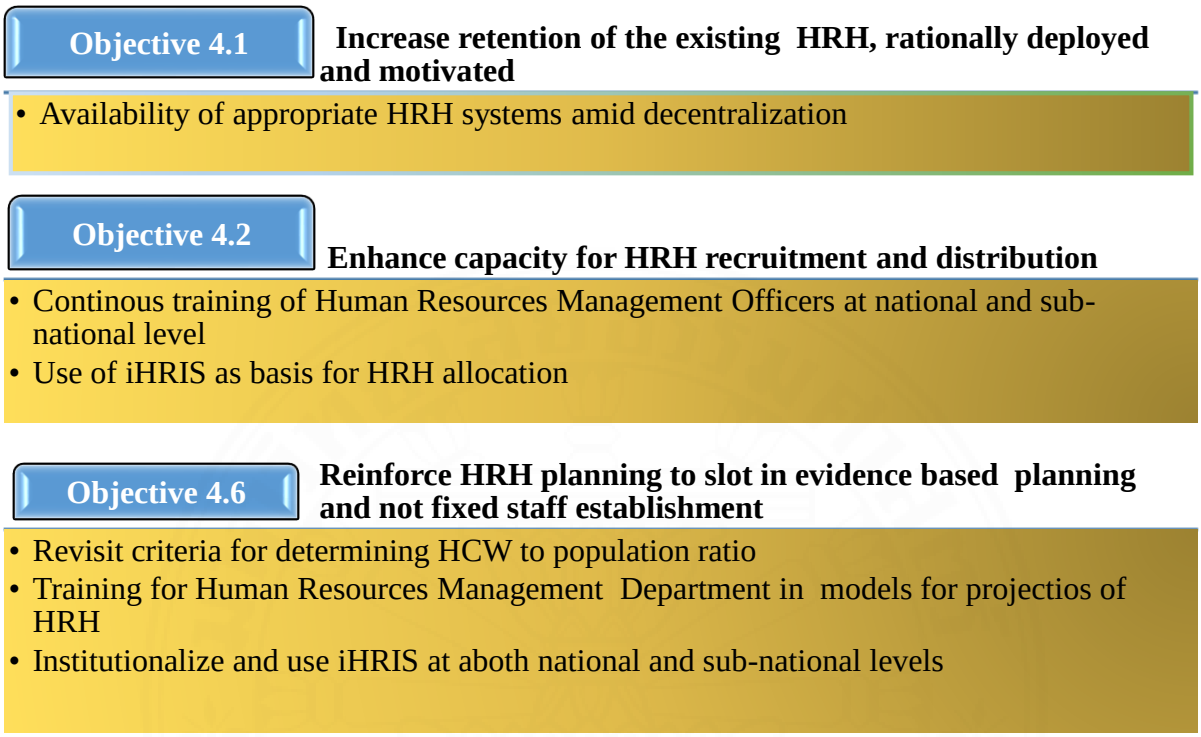


Figure 12:HSSP II HRH strategies and priorities

Besides the HSSP, Malawi has a National Human Resources for Health Strategic Plan (HRH SP), which provides guidance for HRH planning, education, recruitment, distribution and management (Government of the Republic of Malawi, 2017). During the time of this study, the HRHSP was reportedly being reviewed.

In spite the above strategic documents and aspirations, actual number and type of frontline HCWs distributed in health facilities in Malawi is guided by staff establishment (Berman et al., 2022).

Staff establishment is a method or standard that provides requirements for the number and type of staffing (established posts), to be deployed per each health facility in Malawi, on the basis of the level of the health services expected to be provided at the facility as well as the population in different geographical areas of the country (Government of Malawi Ministry of Health, 2011). The model has designated standards on how many HCWs, of which cadres, should be deployed in which health facilities, on the basis on them being either Health centers, community hospitals, District hospitals or Central Hospitals. The establishment provides staffing guidance for curative, preventive, Administrative, Nutrition and Social health services for all pubic and CHAM health facilities. These positions for CHAM facilities are the ones whose salaries are supported by MOH (Government of Malawi Ministry of Health, 2011).

The establishment currently in use was last reviewed and updated in 2016, during the development of the HSSP II (Berman et al., 2022; Mziray et al., 2017).

Table below shows some examples of staff establishment for frontline HCWs for one of the community hospitals in Lilongwe DHO, Kabudula community hospital. The facility has a catchment population of 350,000 (Access health Africa, 2019).

Table 6: Staff establishment for Kabudula community hospital, for frontline and community cadres

Frontline cadre	No. on establishment
Clinical department	
Senior medical Officer	1
Clinical Officer	2
Chief Clinical Technician	1
Senior Clinical Technician	3
Clinical Technician	8
Nutrition	
Senior Home Craft Worker	1
Home Craft Worker	3
Dental	
Senior Dental Therapy Technician	1
Dental Therapy Technician	2
Hospital Attendant	1
Pharmacy personnel	
Pharmacist	1
Senior Pharmacy Technician	1
Pharmacy Technician	2
Pharmacy Assistant	3
Hospital Attendant	1
Laboratory Personnel	
Laboratory Technologist	1
Laboratory Technician	1
Laboratory Assistant	3
Hospital Attendant	1

Frontline Cadre	No. on establishment
Nursing department	
Nursing Administration	
Senior Nursing Officer	1
Senior Nursing Officer (Night supervision)	1
Nursing Officer (Night Supervision)	3
Nursing Officer	1
Nursing Care Services	
Nursing Officer	4
Mental Health Nursing Officer	1
Community Health Nursing Officer	2
Chief Nurse Midwife Technician	3
Community Health Nurse Midwife Technician	6
Senior Nurse Midwife Technician	6
Senior Psychiatric Nurse Technician	2
Nurse Midwife Technician	12
Hospital Attendants	11
Preventive and promotive health services	
Health Promotion Officer	1
Environmental Health Officer	1
Senior Assistant Health Promotion Office	1
Senior Assistant Environmental Health Officer	1
Senior Disease Control and Surveillance Assistant	4
Disease Control & Surveillance Assistant	46
Radiology	
Senior Radiography Technician	1

Radiography Technician	1
Hospital Attendant	1

Source: Ministry of Health and Population, (2016)

The establishment shows a total of 15 positions under the clinical services; and 46 Nursing and Midwifery personnel, among which 36 are responsible for service provision while six are for administration. Radiology has a total of three established positions, while Dental, Nutrition and Pharmacy departments have total of four positions each. Laboratory has five positions and preventive and promotive services has the highest establishment, 54.

In every department, there is also a provision of the lay cadres or support staff, which are the hospital attendants. In the establishment for a community hospital above, there are total 15 positions established for this cadre with the highest allocation (73%) under the Nursing department. There are no hospital attendant positions established for clinical, nutrition and the preventive and promotive health services departments.

Table 5 below, shows an example of staff establishment for two health centers in Lilongwe (urban) and Zomba (rural) districts respectively. The facility in Lilongwe district, Lumbadzi health center is a government facility while the one in Zomba, Matiya health center, is a CHAM facility, with catchment populations of 74,980 and 49,777 respectively:

Table 7:staff establishment for Lumbadzi and Matiya health centers

Urban Health center-Lumbadzi (Government facility)	**No. on establishment**	**Rural Health center-Matiya (CHAM facility)**	**No. on establishment**
Primary curative health services			
Clinical Officer	1	Senior Clinical Officer	1
		Clinical Officer	1
Medical Technician	3	Medical Technician	1
Medical Assistant	4	Medical Assistant	1
Nutrition			
Senior Home Craft Worker	1	Community Health Nurse	1
Home Craft Worker	2	Senior Home Craft Worker	1
		Home Craft Worker	2
Dental			
Senior Dental Therapy Technician	1	Dental Therapy Technician	1
Dental Therapy Technician	2		
Pharmacy			
Senior Pharmacy Technician	1	Pharmacy Assistant	1
Pharmacy Technician	1	Pharmacy Technician	1
Pharmacy Assistant	3		
Hospital Attendant	1		
Laboratory			
Laboratory Technician	1	Laboratory Technician	1
Laboratory Assistant	2	Laboratory Assistant	1
Hospital Attendant	1		

Nursing			
Senior Nursing Officer	1	Senior Nursing Sister	1
Nursing Officer	2		
Community Health Nursing Officer	1	Nurse Midwife Technician	4
Chief Nurse Midwife Technician	2	Community Midwife Assistant	2
Community Health Nurse Midwife Technician	3	Hospital Attendant- all departments	9
Senior Psychiatric Nurse Technician	1		
Senior Nurse Midwife Technician	4		
Nurse Midwife Technician	6		
Community Midwife Assistant	4		
Senior Head Hospital Attendant	1		
Head Hospital Attendant	1		
Hospital Attendant	2		
Preventive and promotive health services			
Assistant Health Promotion Officer	1	CHAM hospitals do not have any establishment for this cadre. All positions under this fall under government (DHO) facilities, and covers even CHAM catchment areas.	
Assistant Environmental Health Officer	1		
Senior Disease Control and Surveillance Assistant	10		
Disease Control & Surveillance Assistant	101		

Source: Ministry of Health and Population, (2016)

As shown in Table 6 above, both facilities have same scope, thus primary health care, including basic maternal and Child healthcare and HIV services. According to the examples above, Lumbadzi health center has a large catchment population compared to the rural health center, Matiya.

There are more positions under each department in urban health center than the one in rural, (twice as many in every department), except for Nursing and preventive and promotive health services, where the ratio is four times higher in urban compared to rural (20 Nurses in urban versus five at CHAM). Similar trends also exist for Community based cadres such as Community Midwife Assistants. For preventive and promotive services, CHAM hospitals do not have any establishment as all positions under this cadre are held at government (DHO) facilities, but their scope also cover CHAM catchment areas.

(Note: In this study, Clinical positions include Medical Officers, Clinical Officers and Medical Technicians and Medical Assistants; and Nursing positions include all cadres on Nursing except Community Midwife Assistants).

The position of Community health nurse falls under nutrition department in CHAM and for the government facilities, it is under nursing services. In CHAM establishment, there is a

position “Senior Nursing sister’ which is not available in government facilities. It is not indicated whether this position is equivalent to the ‘Senior Nursing Officer” for the government facilities. In addition, urban health center has a position for specialized Nurse, Psychiatric nurse, which is not available in rural health centers.

Models and methods used to determine HRH planning and distribution needs at district level

As illustrated earlier in chapter one, the health system in Malawi is partially decentralized. Planning, recruitment and distribution decisions for all frontline and all other cadres at the hospital from grade M above, is done at national level, by the DHRMD in the MOH, which coordinates the recruitment process in collaboration with the Ministry of Local Government (MoLG) and districts are informed of the plans. Some community health workers’ positions such as HSAs, are also done centrally though they are a lower cadre below grade M (Bulthuis et al., 2021; Institute of Public Opinion and Research et al., 2016).

HRH planning for CHAM facilities is also controlled by DHRMD, based on staff establishment. From time to time, districts and CHAM submit the vacancy analyses to DHRMD, along the staff returns and payrolls. These analyses show the vacancies that the districts and CHAM facilities have according to their established posts in the staff establishments (National health Accounts, 2017).

Planning and determination on when, where to fill what number of which type of positions, is based on the staff establishment. The actual recruitment of the HCWs to be deployed in the districts and CHAM facilities depends on availability of funding. MOH then releases the communication to districts, MoLG and CHAM Secretariat when the funding is available (Government of the Republic of Malawi, 2017) .

District authorities in the concerned districts participate in the interview process and preparation of employment offers to the successful candidates, who are then deployed to various health facilities in the districts. For CHAM, the Secretariat is the one which conducts the recruitment process and distributes to its facilities based on the establishment.

For positions below grade M including community health workers except HSAs, both CHAM and districts seek permission from MOH to fill the vacant positions according to the established posts. The positions are then distributed in the facilities. In either case, plans and distribution for HRH in both CHAM and public facilities emanate from the staff establishments (Bulthuis et al., 2021).

There have been complaints on delayed replacement of vacant positions by MOH, particularly for CHAM facilities, which MOH attributes to lack of readily available information on this from the districts (Government of the Republic of Malawi, 2017).

4.3 Gaps associated with the current modalities in HRH data management, planning and distribution in Malawi

Following expiry of the 2012-2016 HRH strategic plan, the government of Malawi and its development partners such as Clinton Health Access Initiative (CHAI) conducted an evaluation of the SP to inform the current HRH SP (Berman et al., 2022; Mziray et al., 2017) .

The analysis revealed an overall 45% percent vacancy rate for the established posts in Malawi, and average of 1.49 professional HCWs to 1,000 population (Berman et al., 2022), which is below the recommended proportion of 4.45 / 1,000 ratio by WHO.

This evaluation by Berman et al. (2022), also showed significant disparities in staffing levels across cadres, and also across zones, districts and facilities. The analysis showed that overall, largest gaps exist in Nursing Midwifery Officers and Pharmacist cadres.

During the exercise, a demand-based modelling was used to calculate whether the staff establishment projections will be able to achieve HRH needs by 2030. The modelling, projected that though the HRH gaps according to the staff establishments are likely to be met in 2030, the HCW to population ratio will still be far from meeting the WHO set standard of 4.45 professional HCWs, till in 2040 (Berman et al., 2022).

Secondly, the demand-based model, showed that with the current health service utilization rates, Malawi needs 7,374 HCWs immediately, to catch up with the current population health service needs and demand (Berman et al., 2022; Government of the Republic of Malawi, 2017).

Figure 13 below shows the immediate gap that Malawi has in its HRH and established positions to reach WHO SDG HRH 2030 goals:

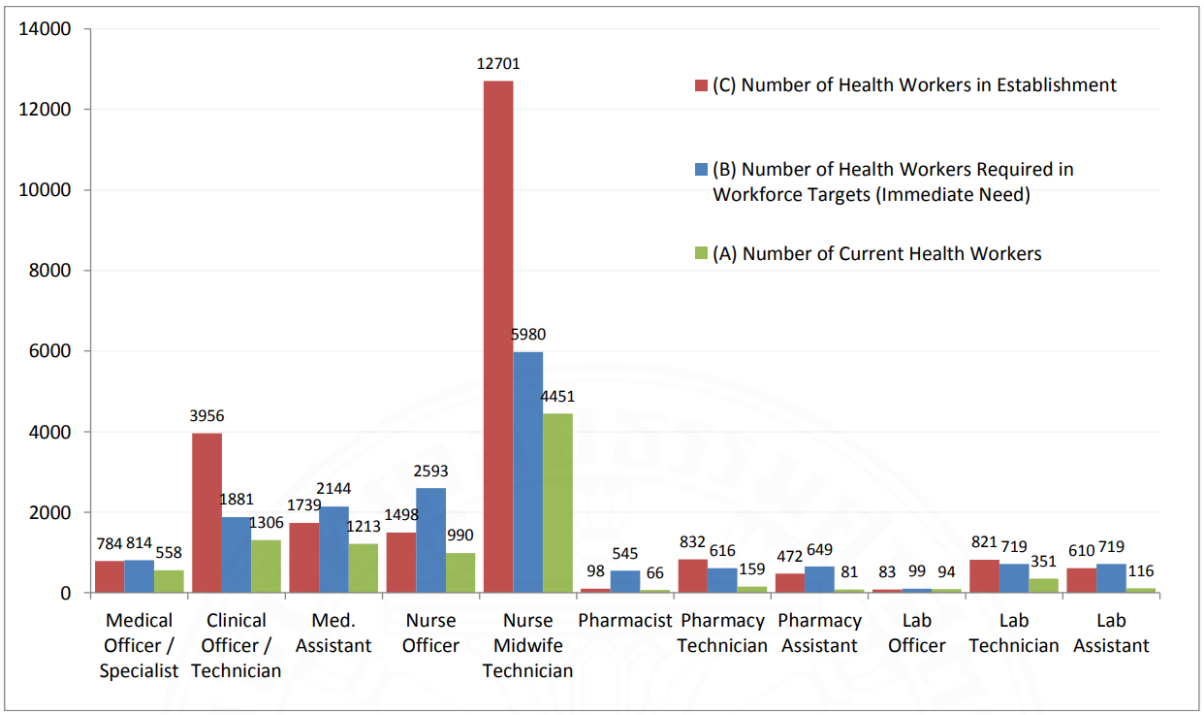


Figure 13:gaps between existing HCWs, compared to calculated instant need for HCWs in government and CHAM stablished positions

Source: Berman et al., (2022).

Mziray et al. (2017) also found out that the models being used for HRH projections in Malawi are not efficient and were found to worsen mal-distribution of the already insufficient HCWs and inequitable work load among facilities.

With the above analysis and insights, the two studies recommended that Malawi need to consider adopting models that would be able to distribute HCWs based on demand and workload. This entails taking consideration of the demographic, geographic and service use variations across the country's facilities, as well as differing scope, skills mix and expertise among the HCWs (Berman et al., 2022) .

Recommendations by Berman et al. (2022b) also included making staffing projections based on the current filling rate of the established posts, approximation of immediate need for added HCWs based on facilities' current services' demand; and projecting the HCWs who will likely be available in future under different scenarios.

The results from this analyses and modelling, were presented to Malawi Government, to guide the HRH-SP prioritized interventions.

The current HSSP admits the inappropriateness of basing HRH planning and distribution on the staff establishment. The current HSPP acknowledged and recommended that Malawi HRH planning, recruitment and distribution, needs to be based on service utilization and not just the facility type and a snapshot of catchment population (Government of the Republic of Malawi, 2017).

The HSSP II mentioned of the instance, where the recent vacancy analyses (2017) show overstaffing of HSAs (9,468 HSAs available), beyond the establishment (6,698 positions). In line with WHO recommendation of one per 1,000 population, Malawi needs a total of not less than16,000 (Government of the Republic of Malawi, 2017). The cadre is also unevenly distributed (more in urban than rural areas) (National Statistical Office Malawi et al., 2016).

Malawi is also experiencing a rapid population growth, further straining the inadequate HRH. The staff establishment does not consider this growth rate as evidenced by infrequent review of the staff establishment. The establishment's last review was in 2016 (Government of the Republic of Malawi, 2017) .

Figure 14 below shows the growth rate for Malawi population between 1987 and 2018:

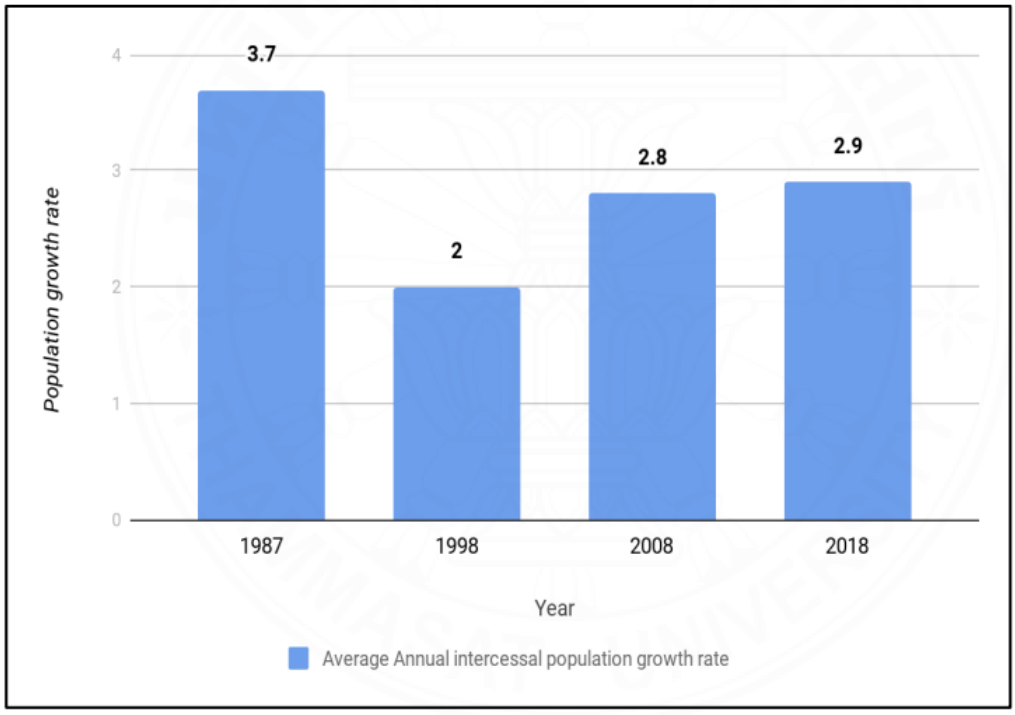


Figure 14:Average annual population growth rate for Malawi, between 1987 and 2018

Source: (Malawi investment case for maternal health care, 2020).

4.4 Other interventions for improving HRH distribution along iHRIS

The long-term goal for iHRIS has been to contribute to increased quantity and quality of HRH; through availability of comprehensive evidence to inform HRH policies and strategies. iHRIS has shown to bring these perceived benefits in other LMICs such as Tanzania, Kenya and Uganda and Senegal among others. However, achievement of its objectives

Such is the also the expectation on iHRIS for MOH, which has the perception that once iHRIS gets adopted and used at district level, HRH data will be timely available and accessed

by MOH for responsive, timely and accurate HRH planning and distribution decisions. (Malawi Government, 2018).

According to WHO (2021), comprehensive HRH information are meant to improve evidence for HRH decisions. This would imply HRH information System models compliment other existing models for forecasting and establishing HRH needs. Use of the comprehensive information along the models would help health systems achieve responsive and equitable distribution of HRH and UHC (WHO, 2021).

HRH models aims at forecasting and establishing HR positions according to trending of morbidity prevalence and shifting demands for services for population health. Countries need to set these provisions depending on the health priorities and service delivery targets. This can be continuously updated and adapted using statistical models, basing on the existing HCWs establishments, disease trends and service utilization data (World Health Organization, 2010).

Lack of adaptive and responsive HRH planning and distribution would worsen health outcomes and further slow progress towards SDGs, in countries with poor health outcomes (World Health Organization, 2016) . In effort towards the responsive HRH planning and distribution, in 2016, WHO developed a methodology of defining numbers of HCWs needed to achieve SDG 3 tracer indicators (WHO, 2021). This methodology recommends a minimum skilled HCW to population ratio of 4.45 per 1,000 population (World Health Organization, 2016).

Preparation for iHRIS implementation Roadmap (2022, draft-unpublished)

As part of its readiness and commitment to have iHRIS adopted and used, in 2022, MOH has developed a draft roadmap (implementation plan), to guide iHRIS adoption and use. This roadmap was developed by the Ministry of Health, in collaboration with key HRH stakeholders such as CHAM, HRH training institutions, NGOs and professional regulatory bodies (Draft iHRIS Roadmap, 2022. Unpublished). The plan was presented to MOH and is yet to be approved and endorsed.

According to the implementation plan, the following are the areas of focus:

Target audience for iHRIS: the tool is meant to be used by MOH, non-public health institutions, implementing partners and funding agencies; at national and subnational level.

Objectives of iHRIS: The plan highlights the specific objectives for the iHRIS, as an HRH tool. The roadmap mentions that iHRIS aims to enhance HR data management in the health sector, for timely and evidence based strategic HRH decisions.

In pursuit of this, the plan highlights strategic objectives such as conservation of political will and continued support for iHRIS through a defined structure, resources and technical support. In addition, the objectives focus on enhancing capacity of the institutions and individuals who

will be using the tool, through training and mentorship on iHRIS use by central and zonal teams.

Integration of iHRIS in existing information systems is another objective in the implementation plan, which highlights that the available guidance and practice on information systems, data exchange and use will also be applied to iHRIS.

Coordination of IHRS implementation

The roadmap provides for specific roles and responsibilities for various stakeholders, for iHRIS adoption and use.

Task team

The team will be established, with membership from all key HRH stakeholders, and will be responsible for capacity building, resource mobilization, provision of technical support, and setting standards of iHRIS data. The task team will also develop standard operating procedures (SOPs) for data quality, flow and reporting.

Responsibilities of MOH

The central level will be responsible for improving quality of the data bases such as de-bugging and troubleshooting; use the iHRIS to develop a national registry for all the health workforce in training, those qualified and exited.

e-Government has been assigned the responsibility to support with ICT guidance and maintenance of servers, as well as expanding access to the information systems to district structures.

Responsibilities of District governance structures

The districts have been assigned a responsibility to mobilize resources for iHRIS implementation and sustainability; generate and utilize the data to inform district level HRH decisions; and send HRH data and reports to MO and stakeholders for development of HRH policies and plans.

Responsibilities of CHAM

CHAM, the second largest provider of health services in Malawi health system, has been assigned a role to continuously update its HRH data in iHRIS, to enable MOH access it for decision making. CHAM is also stated to be part of those who will be trained on use of iHRIS by MOH (two people per CHAM hospital).

Resources

According to the roadmap, MOH has planned to start with the iHRIS Manage module (which was already adapted and hosted on the Malawi government server), followed by iHRIS Train. This will be concurrently done along assessments of institutions' capacity on ICT skills and infrastructure.

The iHRIS implementation plan mentions that during the pilot phase, ICT equipment such as servers and computers were procured and distributed in 34 government cost centers.

The draft roadmap estimated total cost of adoption and implementation of iHRIS for the first three years to be about US$678,000, whose main sources are government health budget allocation and donors.

These resources are meant to be part of the provisions for HRH interventions in the HSSP, which guides funding allocation priorities. The current HSSP has the following priority areas for funding.

Table 7 below shows the cost of HRH interventions out of the total HSSP II implementation cost:

Table 8: Cost of HRH interventions out of the total HSSP II implementation cost:

Cost for HSSP implementation per year (in USD)							
Objective	2017/2018	2018/2019	2019/2020	2020/2021	2021/2022	Cumulative total cost (USD)	% Total of total HSSP II cost
Increase equitable access to and improve quality of health services	294,352,308	297,448,601	305,397,705	308,073,133	306,074,548	1,511,346,295	58%
Reduce environmental and social risk factors that have a direct impact on health	13,513,103	14,913,209	16,344,148	17,864,933	19,391,192	82,026,585	3%
Improve the availability and quality of health infrastructure and medical equipment	58,028,263	62,932,476	45,587, 308	44,497,885	50,280,432	261,326,364	10%
Improve the availability, retention, performance and motivation of human resources for health by 2022 for effective, efficient and equitable health service delivery	**115,118,437**	**124,189,837**	**131,690,679**	**139,674,718**	**148,298,405**	**658,972,076**	**25%**
Improve the availability, quality and utilization of medicines and medical supplies	5,667,4 15	5,305,1 78	5,108,4 67	2,995,23 7	646,396	19,722,6 93	1%
Increase health sector financial resources and	44,822	18,198	10,198	10,198	10,198	93,614	0%

improve efficiency in resource allocation and utilization							
Total	504,305,794	521,062,492	519,497,755	528,334,386	539,935,372	2,613,608,334	100%

Source: Government of the Republic of Malawi, 2017

Table 7 above shows that HRH interventions have been allocated up to a quarter of all HSSP II costs (USD 658,972, 076), with the highest allocation in the final year of the HSSP, 2021/2022 financial year.

CHAPTER 5
DISCUSSION AND POTENTIAL IMPLICATIONS OF FINDINGS

This chapter discusses and presents the in-depth analysis of the findings above, that the study found under each of the objectives.

5.1 Underlying causes of inequitable HRH distribution: HRH shortage and non-responsive HRH planning and distribution modalities

The review has found that inequitable planning and distribution of frontline HCWs in Malawi is contributed by factors beyond lack of information. Lack of comprehensive HRH information is among (but not the only one), the causes for the inefficient planning and distribution. The study has found two main contributing factors to inequitable HRH planning and distribution which are insufficient HCWs and inefficient modalities used for determining the HRH needs.

A. Overall shortage of HRH

As explained in chapter one, Malawi has a severe shortage of HCWs, with a density of only 1.48 for skilled HCWs per 1,000 population, less than 70% of frontline positions filled (Government of the Republic of Malawi, 2017), while about 3,000 Nurses and Midwives graduated but not employed (Malawi National Organization of Nurses and Midwives, 2022), of which a significant percentage have been trained through donor support (WEMOS foundation, 2018).

Government pre-service training has also significantly declined since 2014, due to a drop in international aid for pre-service training (Government of the Republic of Malawi, 2017).

Furthermore, there has been a general reduction in recruitment by the government which is the major employer of HRH, with funding challenges cited as the major limitation.

Though about 2,000 HCWs were deployed through the PEPFAR supported HRH project and all have been transitioned and successfully absorbed into the health system (WEMOS foundation, 2018); and 2,000 HCWs have been temporarily recruited through Covid-19 funding (Malawi Government, 2021), Malawi is still far behind the requires density set by WHO, let alone its establishment.

Furthermore, the unemployed HCWs may end up diverting away from the profession and join other non-heath related jobs, just for employment sake. Others may also resort to migrating to other countries in search of jobs. This will consequently lead to under-utilization and drain of the HCWs that the government and donors supported with training, and further worsening the inequitable distribution of HCWs.

There is need therefore for the Malawi government and its funding partners to increase and prioritize funding to the health sector, to increase support for HRH interventions such as pre-service trainings and recruitment.

Malawi has improved health expenditure percentage of GDP between 2010-2018 up to 11.58% in 2013 (11.58%), from 11% in 2016 and 2017 (The World bank, 2019). Furthermore, allocation of the national budget for the health sector has also increased to 10% of the entire budget in the current budget (2022/2023) financial year (Malawi Government, 2022), from 9.4% in the 2021/22. This is slightly above the average provision in the previous five years (UNICEF, 2022).

Additionally, as shown in table 6 above, resource allocation for HRH has improved in the HSSP from $115 in 2017/2018 financial year to $148 in 2021/2022, translating to a quarter of total HSSP II costs); and salaries (64% of HRH costs), and pre-service training (7%) are the areas prioritized (Government of the Republic of Malawi, 2017) .

However, the funding is still inadequate to support HRH interventions as required, for it is also below the Abuja Declaration of 15%. This would mean the HR shortage would still be there until resources to support their production and absorption into the health system are secured.

In this view, getting timely information on the quantity and quality of pending and existing HCWs would indeed be useful to timely inform DHRMD and MOLG on the potential sources and type of HCWs to be distributed in areas in need.

Nevertheless, this timely information would not be useful if there are no corresponding efforts to increase and sustain continuous training and absorption (to increase their numbers), hence not solve the problem of inequitable planning and distribution.

Lack of formalization of Community Health Worker cadres

Looking at the staff establishment, support staff (hospital attendants) and Community based cadres (Community Midwife assistants), are part of the establishment, alongside the frontline HCWs. In establishment for government facilities, there are also HSAs as part of the formal establishment.

This is a good development as compared to findings in the WHO, 2016 report, that many LMICs focus on frontline cadres only.

However, Malawi's health system has not yet incorporated other cadres such as lay HIV counsellors who also help with other technical services such as Tuberculosis (TB) and HIV services.

With increased workload, the non-formal cadres have ended up being delegated tasks, complimenting the frontline cadres' role in the health facilities and communities in Malawi. The tasks include blood collection of viral load samples, dispatching ARVs, TB and other medicines and treatment; despite not being accorded a formalized training, nor being recognized as part of formal health workforce (Smith et al., 2014).

Furthermore, a study done by Pindani et al., (2020) also found that HSAs were providing maternal and child services such as postnatal care (Pindani et al., 2020).

In its 2015 Africa Region Report, WHO proposed formalization of CHW programs trainings and develop them into more formal part in the health workforce, following the crucial role they played during Ebola pandemic (World Health Organization, 2017)

The lay cadres have been assigned technical tasks without any formal training, because there are no formalized trainings for them. The HSA cadre for instance, is not recognized by regulatory bodies (technically) in Malawi but this cadre is highly entrusted by communities, and provide health services at both communities and facility level (beyond their scope) (Pindani et al., 2020).

For the above reasons, iHRIS could also be an opportunity to get these CHW cadres incorporated and linked to be part of the pending (but undeveloped) formal HCWs, according to geographical and demographic areas, linked to epidemiological trends.

This would then help to inform MOH decisions on how these cadres can be equitably distributed and, most importantly develop a formal training program for their upgrading and continuous development, to beef up the frontline cadres after the training.

Strengthening the existing CHWs whose contributions to PHC and UHC cannot be underrated, hence it is another crucial area that Malawi health system can consider with the shortage the country has.

As WHO commends, incorporating such cadres would be helpful to inform considerations for formalizing the CHW trainings and development programs, leveraging on them as a readily existing source of HRH.

B. Non-responsive HRH distribution

Non-responsive HRH planning and distribution modalities

The current modalities which Malawi health system uses to determine HRH distribution needs (the staff establishment), has been found to be non-responsive to work-load as revealed by the HSSP I evaluation and the WISN study (Berman et al., 2022; Mziray et al., 2017).

This model is also contributing to worsening inequitable distribution of the already insufficient HCWs, between health facilities and also across CHAM and public health facilities.

Referring to the examples of the staff establishment in Table 5 above, there is a huge gap in terms of how the establishments translate to HCW/ population ratio between the public (Lumbadzi health center) and the CHAM (Matiya health center), despite being both primary level facilities.

For instance, in Nursing department, the 20 Nurse positions for Lumbadzi translates to 1: 3,749 population and for the clinical department, it is 1: 9,373. On the contrary for Matiya, the five positions in Nursing translates to 1: 9,956; and clinical department, the ratio is 1: 12,443 population.

As earlier highlighted, this is not the case just for CHAM facilities, but also applies to other government facilities.

For instance, as shown in table 4 above for Kabudula community hospital, the facility has a total of 36 Nursing care service positions on its establishment against a population of 350,000; and M'bang'ombe II rural health center which has a population of 26,268, has seven nursing positions on establishment. This translates to nurse to population ratios of 1.02 per 9,722 (0.1 per 1,000); and 1 per 3,753 (0.3 per 1,000) respectively. These facilities are both public and located in Lilongwe district which is also a PEPFAR HIV burden priority district.

Figure 15 below shows the disparities in the ratio for HCW per population, according to the positions on staff establishment, for the four facilities mentioned above:

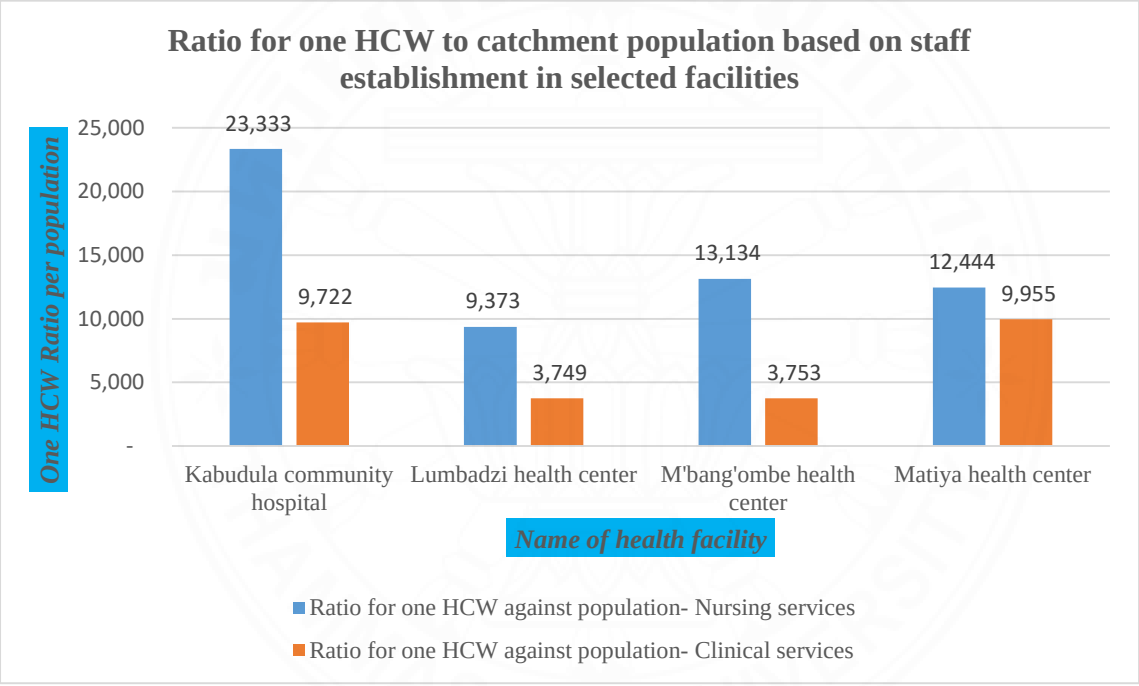


Figure 15: HCW- population ratio for four facilities in Malawi, based on established positions

Source: Ministry of Health and Population, (2016), unpublished

Figure 15 above shows that despite having staff establishment as the standard for basing HRH planning and distribution needs for all the facilities, the model is not fair enough and is contributing to inequitable distribution of HRH. The examples above, show that the biggest HCW per population is at Matiya CHAM health center, for both Nursing and clinical cadres, compared to government facilities. Though CHAM facilities have the liberty to recruit additional HCWs with their own resources, there is need for a uniform guide on the standard minimum HCW to population ratio, to ensure both public and non-public facilities abide by the HRH requirements for EHP delivery. The government should also ensure that the commitment to support CHAM HRH is upheld and fair, to ensure equitable access to UHC to all populations regardless of being in either public or non-public institution catchment areas.

Additionally, according to the analysis done by (Berman et al., 2022; Mziray et al., 2017), the staff establishment has shown not to be responsive nor linked to work burden and service utilization data, such as HIV and maternal and child health services. For instance, HIV program data trends have shown there is an increased burden of HIV services in each passing year, while the establishment is static since 2016 when it was last reviewed.

Figure 16 below is an example of the Matiya CHAM rural health center in Zomba district, one of the PEPFAR HIV 5 burden priority districts; showing changing trends of ART clinic registrations, for a period of seven years. Data for Quarter two of each year was compared from 2015 to 2021(CHAM facilities HIV data, 2021).

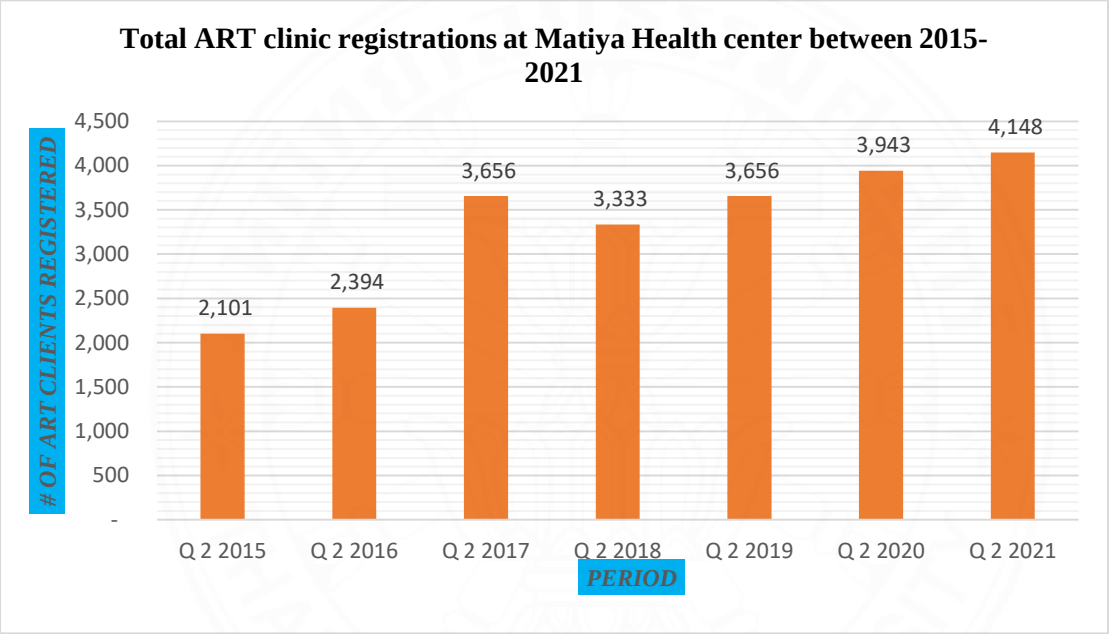


Figure 16:Total ART clinic registrations at Matiya Health center between 2015-2025

Source: CHAM facilities HIV data (2021)

The figure 16 above, shows that ART clinical registrations increased with 51% between 2015 and 2017. The current establishment has been static since the last review (in 2016) while the service needs for the population keep rising along the years.

Besides, Malawi population increase rate is too high. The fact that the staff establishment is not continuously updated in line with population growth, is another shortfall. There is a mismatch between the establishment projections with the rate at which the population is growing.

In 2015 for instance, Malawi population was at 16,745,305 and in 2021 it had increased to 19,647,681 (The World Bank, 2021), whereas the staff establishment was last reviewed in 2016/17 when the current HSSP was being developed.

It is likely that the basis for distribution is no longer relevant now since the population has increased. This would imply that the number of frontline cadres are fixed compared to the

population health service needs which keep on increasing, leading to increased workload (The government of Malawi's investment case for reproductive, maternal, newborn, 2020).

Adoption and use of iHRIS would be very useful to timely identify the existing HRH, the facilities and positions which have vacancies according to the staff establishment and contribute to timely decisions on where to distribute HRH.

Nevertheless, focusing on improving quality and timeliness of HRH information for identifying vacant positions based on the staff establishment, would not completely resolve the unfair allocation of positions across facilities; nor will it solve the unfair workload burden brought about by the inequitable distribution.

In this case, Malawi would not be able to achieve UHC for all populations due to lack of appropriate models to be used along iHRIS for responsive planning. Furthermore, HCWs in facilities with high workload may continue resign for NGOs or 1other countries due to burn out.

To achieve UHC, there is need for health systems to be flexible enough and adapt the SDG HRH threshold guide to its planning and projections for HRH, to its own set-up and local trends in availing needs for different demographic and epidemiological population demands for health (World Health Organization, 2016).

Implementing the proposed work load (WISN) and demand based models alongside iHRIS model would be paramount, for responsive strategic HRH decisions and maximum utilization of the available workforce, compared to the traditional, fixed staff establishments. MOH would need to start using some of the proposed modalities for HRP planning and distribution such as the WISN and demand based model.

A number of African countries such as Mozambique, Uganda, Kenya, and Tanzania have appreciated the role of HR information systems, as having contributed to improved HRH decisions like deployment of HCWs where they are needed most.

However, these countries still have low HRH density. According to (Muzyamba et al., 2021; Okoroafor et al., 2022), HRH density for skilled HCWs in Uganda is at 0.71 and Kenya is at 3.01 per 1,000.

The study considers that lack of corresponding responsive HRH models to iHRIS use, could be one of the reasons contributing to this as the literature review was not able to find which HRH models these countries use to determine HRH planning and distribution needs in addition to iHRIS.

5.2 Barriers to achieving comprehensive and quality data

The study has identified the following factors would limit the achievement of efficient use of iHRIS and data quality:

Lack of uniformity in Human Resources for Health Information across established positions

Quality of information entered and generated from iHRIS is an important factor to achieve accurate evidence base reliable for HRH decisions.

According to findings in 4.1 and 4.2 above, HRH information in Malawi health system lags behind the standard recommended in the WHO HRH data set guidelines.

For instance, looking at the positions in the staff establishment, there are varying composition and scope of positions and departments between government and non-public facilities. For example, the position of Community Health Nurse is placed under nutrition department for CHAM facilities while in government facilities, it falls under Nursing service department. Furthermore, CHAM establishment has Senior Nursing Sister while public health facility establishment has Senior Nursing Officer.

If these differences are not clarified nor standardized to those who will be responsible for entering the information, there is a possibility of having inaccurate data as was the case with Senegal experience, before HRH2030 helped the health system with further training on data iHRIS use and data quality (Human Resources for Health in 2030, 2021; Reda, 2017).

Lack of capacity to manage HRH data in some health institutions

The findings in 4.1 above also show that HRH information in Malawi is available in different formats (both electronic and paper based), at subnational level and in all non-public health institutions; except at MOH level (DHMRD) where the HRIS is used. Districts and health facilities have different capacity as regards to data tools (such as computers), and also ICT technical skills and knowledge

Furthermore, the NHIS policy does not clearly explain computerization of data at levels below secondary level health facilities. This would work for public and CHAM facilities, but may not work for other health institutions which manage own HRH data despite being a primary level facility. Examples are health facilities belonging to Estates, academic institutions and other private facilities. "*HIS data shall be computerized at secondary hospitals, tertiary hospitals and at national levels*" (Malawi Government: Ministry of Health, 2015).

This lack of computerization would compromise accuracy and timeliness of the information at local levels, especially for CHAM and other non-public institutions who might have to use their HRH records to feed into the iHRIS. Though districts and CHAM hospitals have been assigned responsibility to verify and validate the HRH information entered before reporting to MOH, the institutions may lack resources, time and commitment to do so all the time.

This is contrary to the digital health strategy, which calls for integration of digital technology; and NHIS policy which calls for application of ICT advances at every level of the health sector to improve flow of information and its use in the health sector, as key means towards attaining UHC (Malawi Digital Health Strategy, 2020).

Additionally, there is need for MOH to critically consider the different training needs for various levels of the governance levels and institutions, and incorporate mentorship specifically for data quality in addition to what will be monitored during iHRIS implementation.

Furthermore, all levels of staff from management to support staff (such as the clerks will be entering the information into iHRIS), need to be trained to ensure increased understanding, ownership and mutual accountability on iHRIS.

This approach was also seen to be beneficial in Senegal, where not only top managers and programs coordinators were targeted, but also and local iHRIS focal points(Human Resources for Health in 2030, 2021).

Leaving out local staff would compromise accountability and ownership and hence reduce their commitment to ensure quality and timeliness of the data, and consequently limiting accuracy and reliability of the evidence.

Additionally, iHRIS roll out should also be accompanied by a plan on how the trained technical and support staff for iHRIS data entry, analysis and use will be sustained, considering the undeniable possibility of staff turn-over (Ishijima et al., 2015). This would help to ensure sustainable HRH data quality and availability.

To address this, in Tanzania, a course module of operating the HRH systems was integrated into university training to mitigate this risk (Ishijima et al., 2015).

ICT support only targeting public costing centers: The MOH plans to distribute ICT equipment will be distributed to MOH facilities only, at central and district level, according to Ministry of Health, (2017). There is no mention of any considerations for the non-public sector other than the training, mentorship and supervision.

Non-public structures such as CHAM and other institutions which are based in communities such as health facilities run by other agencies like Malawi Defense force; Estates and schools, might be experiencing financial challenges which would lead to lack of prioritization of procurement of ICT equipment to support iHRIS.

In this regard, it is important that all structures responsible for recording and managing the HRH information should be capacitated and encouraged to use electronic ways of managing HRH data.

If the above gaps are not addressed, iHRIS data may end up being inaccurate and incomplete due to the use of sub-standard tools. MOH would need to consider and address individual needs that districts and non-public health institutions have as regards to ICT infrastructure and skills, also taking into consideration the power and internet connectivity challenges across different geographical areas.

5.3 Decentralization and decision making in health systems

The finding by Bulthuis et al, (2021) above is also similar to the findings by Conteh, (2016), which found that performance of primary healthcare (which falls more under the local or district health governance authority), is highly determined by the extent to which power and resources can be controlled at that level, as assigned by the central level. This is because inconsistent and partially devolved political and structural command was found to cause unclear authority demarcations between central government and sub national authority, hence limiting the ability of the local structures to make significant decisions.

Unclear devolvement of authority and lack of empowerment of sub national governance structure were also found to be limiting factors to efficient HRIS use in other African countries (Tursunbayeva et al., 2017).

According to Tursunbayeva et al., (2017), in both high and LMICs, HR information systems use considered decision makers, HR and Administration heads as the main beneficiaries or users; and less focused on lower and primary level managers, those responsible for generating and entering the data, non-public health institutions; and funding partners. This would likely also be a similar case in Malawi due to the partially decentralized health systems. As earlier discussed, HR strategic decisions in Malawi are done at central level by the DHRMD in the partially decentralized health system.

Health system decisions including for HRH in Malawi leaves the district governance structures with insignificant influence over what would work best for them (Bulthuis et al., 2021).

With this structure, it is likely that the central level would still to a greater extent control or coordinate iHRIS implementation. This would also limit the extent to which districts would be able to use the analyzed data for HRH decisions, which is one of the main objectives of iHRIS.

Though the HSSP II mentioned promoting the culture of data use at district level, the districts would only analyze the data but translating it to HRH planning and distribution would be limited to the cadres below grade M, (mainly support staff and some community based cadres).

Learning from Tanzania experience, HRH information systems improved HCWs distribution even at district level because it enabled the Health Management Teams at Council level to make decisions about their district's HRH needs. As informed by the information provided by HRH information systems and DHIS2, these structures were also empowered to make decisions on HRH (after validation of the reports at central level) which would work best for their district's population health needs. The districts were able to deploy and re-distribute HRH in-line with the actual demand and skills needed at individual health facilities (Ishijima et al., 2015).

This was also a similar case in Mozambique, where local structures and decision makers were rather part of the users on HRHIS information and reports , than just entering and reporting to central government (Waters et al., 2016). Furthermore, the country had high level of commitment from top leadership and this helped Mozambican health system to achieve HRIS goals (Waters et al., 2016).

Additionally, in Senegal a focal person at each district was appointed, with clear task description. This in turn helped to instill ownership, responsibility and mutual accountability for iHRIS at district level (Human Resources for Health in 2030, 2021).

Essentially, the district structures would better coordinate (and be accountable for) decisions such as HRH distribution, for they are the ones who understand the population health needs and demands, than it would be at the central level.

iHRIS adoption would be more efficient if the districts were empowered with resources and power to use the HRH data and make decisions at their level, which is not the case in Malawi health system.

This is contrary to one of the strategies in HSSP II, which is to get HR management functions decentralized to district councils (Government of the Republic of Malawi, 2017). 2022 is the final year of the HSSP II (2022), but this commitment is yet to be effected.

This de-concentration rather than devolution of authority and power, would be a limiting factor to the institutionalization and successful use of iHRIS due to lack of responsibility and ownership by the district authorities, leading to poor coordination of iHRIS interventions at local level, affecting the districts' ability to achieve equitable HRH distribution even after iHRIS is adopted.

These restrictions would bring demotivation among the district structures to own iHRIS and improve data quality, since it will be to a larger extent just for reporting purposes.

Furthermore, the HCWs would be frustrated with lack of, or delayed promotions despite their performance leading to burn out and increased resignations, further straining the few and inequitably distributed health workforce. This would result from the fact that all HRH planning and distribution decisions can only be done by DHRMD. Even for the support staff, the districts still do not have a complete liberty to do as they would wish but ask for permission from DHRMD. The same applies to the performance –based management, where authority to promote still has to be sought from (and is coordinated by) MOH (Bulthuis et al., 2021).

5.4 Health Systems policies and structural support for iHRIS

The Malawi government has shown its commitment and support for iHRIS adoption and use in various ways.

As earlier illustrated in this paper, iHRIS was endorsed by the Malawi government in 2012, and is also incorporated as one of HSSP II priorities. In Annex 1 of the HSSP, which further

illustrates each HSSP objectives, iHRIS institutionalization is also mentioned as one of the prioritized activities (Government of the Republic of Malawi, 2017).

MOH has also developed the draft roadmap (implementation plan), to guide iHRIS adoption and use in 2022, though it is yet to be approved. The road map also contains a detailed budget and costing for iHRIS, for the next three years.

This is a sign of commitment and willingness that the Malawi health system has, on improving evidence based HRH planning and distribution towards UHC.

Furthermore, in the current HSSP, HRH interventions have also been allocated up to 25% of the total HSSP II costs. Malawi has improved its expenditure on public health between 2010-2019 (The World Bank, 2019). The National budget for 2022/2023 has also increased budgetary allocation to health (10% of total national budget (Ministry of Finance and Economic Affairs, 2022) from 9% in 2021/2022), as compared to previous years. These are remarkable efforts that the Malawi government are doing for improved HRH interventions in the country.

However, though the budgetary allocation has increased as compared to 2021 financial year (9%), it is still below the recommended 15% as per the Abuja Declaration (WHO, 2020).

Achieving equitable HRH distribution is dependent on commitment from top governance structure, funding commitments and modalities; and exchange of information across all the key areas such as preservice training, DHIS 2 and LMIS (Ahmat, et al., 2022); Zurn, P., et. al., 2021)

This being the case, there is need for a careful prioritization of interventions amidst multiple and equally pressing health challenges, including reduced donor aid; to get the required support for iHRIS.

Furthermore, Malawi may learn from Tanzania health system, where HRHIS and Training Institution Information System (TIIS) were introduced in phases, over a period of six years even after successful piloting in ten districts (Ishijima et al., 2015).

Rolling out iHRIS in all districts at once would not be feasible considering the limited health sector budget, training needs for data entry and use for all public and non-public health facilities and training institutions.

iHRIS requires robust ICT infrastructure, uninterrupted internet to be in full use, and financial resources for trainings and monitoring and supervisions (Government of the Republic of Malawi, 2017), which would need a significant funding that would not be available at once.

With such insufficient budgetary allocation to health and less clear funding allocation priorities, there is need for strong commitment from central government to equally prioritize iHRIS or lobby for resources from other sources than the government, to support iHRIS implementation. iHRIS has not been explicitly mentioned as an area for which resources have

been prioritized in the HSSP II, as only salaries have been mentioned (64% of HRH costs), and pre-service training (7%) (Government of the Republic of Malawi, 2017).

Incorporation of iHRIS in the national policies would therefore need clearly defined and documented guidance and strategies to guide its implementation and administration. In addition, these mechanisms should be made available and communicated to all government and non-governmental health structures at both national and sub-national levels.

5.5 HRH Information Systems framework is a sub-set and intra-operable information source for inter-connected decisions for UHC

According the WHO (2015) HRH information framework, HRH information needs to be incorporated in each of the health systems' sub-sets for information, and be able to exchange with the health information systems ranging from disease trends, financial information, supply chain and potential and actual health risks in the environment (World Health Organization, 2015).

IHRIS would be less beneficial if there is no inter-operability with the other information sub-systems, accessible and usable by all levels of service provision, training institutions and program coordinators including donors; for responsive HRH actions.

In other words, iHRIS need to be at the center of all health information systems and not just mere combination of the iHRIS modules.

Additionally, iHRIS use would be an important tool for the health system if all players in the health system are targeted to learn, apply and benefit from its use, not just top decision makers.

A study by Tursunbayeva et al. (2017), found that though more than one modules were integrated (which is the same case with Malawi iHRIS), most iHRIS implementation plans mainly supported general HR operations and less of being linked to health services, nor being used to assess quality of patient care (Tursunbayeva et al., 2017).

As highlighted by WHO, (2016), responsive and equitable HRH planning and distribution implies that HCWs are distributed equally according to population health needs (UHC goal), and not just filling vacant positions (general HR goal). To achieve this, there is need for a vibrant inter-operability between DHIS 2 and iHRIS, to enable determination of HRH needs in relation to the health services and disease trends' needs and demands reported by the DHIS2.

According to Ishijima, et al. (2015), strengthened inter-operability between HRH information systems and DHIS2 helped the health systems to improve calculation of HRH needed for different health in Tanzania (Ishijima et al., 2015).

Similarly, HRH information system use in Mozambique helped the health system to track HCWs who were trained in ART and align them to ART service provision sites and facilities (Waters et al., 2016).

In Kenya also, iHRIS helped in tracking of trained intensive care nurses, who then got relocated to serve at the points with greatest need for their expertise (Waters et al., 2013).

In addition to improving quality of health services, ensuring inter-operability also maximizes utilization of the skills sets among the HCWs (Driessen et al., 2015); which in turn increases their motivation once they know that their competence is being valued and monitored (Driessen et al., 2015; Kawale et al., 2019).

This would therefore require MOH to enforce the need for recording in-service trainings by all professional bodies and both public and non-public in-service trainers.

Driessen et al. (2015) further echoed to say a well inter-operable iHRIS improves not only alignment of the appropriate skills mix to population health demands, but also guides training institutions on the quantity and quality of HCWs that should be prioritized for training.

iHRIS can also be used to mitigate economic losses in the health system through detection and limiting of fraudulent HCW payments such as salaries and benefits for ghost and inactive HCWs (Tursunbayeva et al., 2017), which is also a problem in Malawi (Pondani, The Times Group, June 2022). This benefit was realized in Tanzania (Ishijima, et al., 2015), and Mozambique (Waters et al., 2016).

This can be achieved through ensuring that uniform and standardized information is entered into iHRIS for each HCW according to WHO HRH information dataset guidelines, and through close monitoring and supervisions (World Health Organization, 2015).

In Kenya, savings in terms of time were also noticed, as it was found out that use of the country's HR information system (known as regulatory HRHIS (rHRIS)); significantly reduced the time that was spent on developing, tracing and compiling HRH reports as well as HCWs time for travelling to the professional bodies, to update licensure and registration details (Waters et al., 2013).

Furthermore, in Uganda, HRIS economic benefits were also calculated based on the savings made from use of the electronic- based iHRIS compared to printing and photocopying of HRH reports which were done manually before iHRIS (Driessen et al., 2015).

rHRIS was also used to inform and modify some HRH policies in Kenya. More than 10,000 HCWs were deployed when rHRIS report showed a huge gap in rural areas, at a time when infrastructure building was the one prioritized in local development funding instead of recruiting HCWs. Furthermore, retirement age was adjusted from 55 to 60 when rHRIS reports revealed a gap that was created when HCWs retired early (Waters, et al., 2013).

In this way, iHRIS use would be an opportunity for continuous linkage, learning and adaptation of HR distribution needs to population health outcomes, through comprehensive and forecasted analyses of the integrated information systems.

CHAPTER 6
CONCLUSIONS AND POTENTIAL IMPLICATIONS AND APPLICATIONS OF FINDINGS

6.1 Conclusions

Electronic and integrated HRH information systems such as iHRIS, are an integral sub-set of the entire health information systems (HIS), which serve as one-stop intra-operable framework for monitoring and management of pending and actual supply of HRH, their training and development, and exits. The ability of iHRIS to intersect with the other HIS subsets, makes it an important tool in contributing to evidence for improving HRH planning and distribution, compared to traditional approaches of HRH data management. Learning through the mixed experiences with iHRIS use in other countries during iHRIS roll out, would be an opportunity for developing countries and decentralized health systems like Malawi to iron out possible limitations to its success such as partially decentralized authority for districts, fragmentation between public and non-public health sector, deficient data management and use capacity, and ineffective inter-operability of health information systems. iHRIS tool however, would not be the single needed solution for inequitable HRH distribution in Malawi. Use of the tool along other updated and responsive modalities for planning and distributing of HRH would also be key in determining realistic and responsive HRH needs based on population health needs and demands. Malawi may need to revise the current basis for HRH planning and distribution, also referring to the recommendations from the WISN and other studies.

Table 8 below summarizes the study conclusions with reference to the WHO standard HRH registry framework in table 6 above.

Table 9: Summary of conclusions related to the "Pre-entry, Entry, Exist, Exit" framework

POLICY ASPIRATIONS AND INITIATIVES	**ASSESSMENT OF CURRENT ACHIEVEMENTS AND NEEDS IN MALAWI CONTEXT**
Pre-entry: workforce needs to inform Ministry's plan of action and budget	
Interoperable information exchange between HRHIS and other sub-sets of health system information	- Training institutions have now been incorporated in HIS (iHRIS Train), and health system managers included as iHRIS users. However still no clear reporting lines (to Ministry of Education or MOH). Additionally, HRH training intakes and programs are less aligned to the actual needs and gaps in the number, type and expertise of HRH needed. - MOH would need to consider addressing the inefficient and unclear coordination between HRH training, health services and budgetary data. Furthermore, revising the staff establishment model to use of responsive projection models to guide both public and private health sectors, would be useful.

POLICY ASPIRATIONS AND INITIATIVES	ASSESSMENT OF CURRENT ACHIEVEMENTS AND NEEDS IN MALAWI CONTEXT
	- Though there has been an increase in government budgetary allocation to health sector as percentage of total national budget, it still below Abuja declaration of 15% hence would not be enough to support substantial HRH interventions.
Entry: HCWs in training. Qualified and licensed	
Professional and licensing bodies to enter data and generate reports in iHRIS. Community health Workers need to be formalized and developed, to add to the formal frontline workforce	- There has been a commitment to support the regulatory bodies as well with ICT support ad iHRIS use training. However, only public institutions have been mentioned for the support, and this would affect data quality. - Additional support s needed for the Malawi government to ensure pending HRH supply are absorbed in the health system. - Accommodating HCWs who are upgrading their skills in other technical areas such as nutrition, for equal recognition as frontline courses' HRH by regulatory bodies, would help in reducing migration and resignations, which would result from lack of promotion and opportunity to practice in their area of expertise.
Exist: HCWs serving in health service and training institutions in public and non-public	
Inter-operable information exchange between HRIS and health services and all the other HIS aspects	- Steering multi-sectoral task force to coordinate iHRIS from central level proposed. There would be more advantages in ensuring data quality and iHRIS ownership if non-public facilities are equally targeted for ICT support; if districts are empowered to coordinate iHRIS implementation, use data and make HRH decisions. - Formalization of Community health workers training and development into formal workforce, is another important aspect that Malawi would need to consider. Responsible structures for digital and ICT programs would also need to be strengthened to improve interoperability of HRHIS and health services
Exit: HCWs who have ever worked at national or sub-national level, in both public and non-public health institutions	
Commitment to adopt iHRIS, for recording and updating all HCWs exiting through either resignations, migration, retirement or death for both public and private, national and subnational	- Professional bodies need to be encouraged to incorporate information for HCWs who migrate in their reports, since they are the ones who provide references - Incorporation of exits from non-public institutions in national HRH exits data would help to understand the actual HRH gap at district and national level - Disaggregating exits per geographical location and reason for resignations would be useful in informing tailored HRH decisions

6.2 Potential implications and applications of findings

The UN SDG 3 aims entails that all nations globally should ensure healthy lives and promote the population well-being to achieve sustainable development (United Nations, 2016). All the SDGs targets which include reduction of maternal, newborn, under-five and premature mortality for all; as well as deaths from communicable and Non-communicable disease; requires that health systems ensure equitable HRH distribution, who will deliver the right services to the right people at the right time (World Health Organization, 2016).

Having discussed the analysis above, the following are some possible implications and useful strategies for consideration along use of iHRIS in developing and decentralized health systems like Malawi:

A. Additional useful strategies that could be implemented with iHRIS to address HRH inequitable distribution

It is a fact that HCWs in Malawi are not enough, due to various factors such as lack of the government to absorb HRH graduates. This has contributed to inability of DHRMD to distribute the HCWs to all areas as needed. The following are some of the measures that iHRIS would also be used to achieve equitable planning and distribution of HCWs and UHC

B. Using iHRIS as a tool to formally develop CHW development programs and to enhance retention of HCWs in rural and hard to reach areas:

Acknowledging the complimentary role that CHWs have on health systems, it would be useful also for the districts to leverage on iHRIS as a tool to build on the existing CHWs and mitigate inequitable distribution of frontline HCWs, since distribution of this cadre is within the district's jurisdiction. The information of the CHWs in the HRH database would be used to identify gaps and inform the development of the CHWs through in-service trainings such as Nursing and clinical trainings for instance.

Malawi can also borrow a leaf from Myanmar, where the country implemented an incentive where rural areas' residents were prioritized for recruitment into Nursing and Midwifery training programs, to enhance likelihood of having them retained in their own communities' health facilities (World Health Organization, 2016) .

C. Best practice to improve iHRIS implementation-tone from above

Implementation of iHRIS which will act as the HRH registry, requires consideration of inter-linked factors and devising an approach that would enable its successful implementation. These include the following:

Incorporation of iHRIS in the national policies, with clearly defined and documented guidance and strategies to guide its implementation and administration. In addition, these mechanisms should be made available and communicated to all government and non-governmental health structures at both national and sub-national levels. The policy provisions should be accompanied by a mandate from the government, to both public and non-public

stake holders and district health governance structures to collect and upload HRH data to the registry, within defined time schedules, as was the case in Senegal.

Consideration and adoption of the above strategies would be useful to contribute to equitable HRH distribution, in line with WHO HRH density recommendation of 4.5 per 1,000 population, in both rural and urban populations.

References

Abimbola, S., Baatiema, L., & Bigdeli, M. (2019). The impacts of decentralization on health system equity, efficiency and resilience: a realist synthesis of the evidence. *Health Policy Plan*, *34*(8), 605-617. https://doi.org/10.1093/heapol/czz055

Adhikari, R., & Grigulis, A. (2013). Through the back door: nurse migration to the UK from Malawi and Nepal, a policy critique. *Health Policy and Planning*, *29*(2), 237-245. https://doi.org/10.1093/heapol/czt010

Ahmat A, O. S., Kazanga I, Asamani AJ, Millogo SJJ, Illou AMM, Mwinga K, Nyoni J,. (2022). The health workforce status in the WHO AFrican Region: Findings of a cross-sectional study. *BMJ Global Health*, *7*(Suppl 1). https://doi.org/0.1136/bmjgh-2021-008317

Bemelmans, M., Goux, D., Baert, S., van Cutsem, G., Motsamai, M., Philips, M., et al. (2016). The uncertain future of lay counsellors: continuation of HIV services in Lesotho under pressure. *Health Policy and Planning*, *31*(5), 592-599. https://doi.org/10.1093/heapol/czv106

Berman, L., Nkhoma, L., Prust, M., McKay, C., Teshome, M., Banda, D., et al. (2021). Analysis of policy interventions to attract and retain nurse midwives in rural areas of Malawi: A discrete choice experiment. *PLoS ONE*, *16*(6), e0253518. https://doi.org/10.1371/journal.pone.0253518

Berman, L., Prust, M. L., Maungena Mononga, A., Boko, P., Magombo, M., Teshome, M., et al. (2022). Using modeling and scenario analysis to support evidence-based health workforce strategic planning in Malawi [Journal article]. *Human Resources for Health*, *20*(1), 1-14. https://doi.org/10.1186/s12960-022-00730-3

Bhattacharyya, D. S., Dutta, G. K., Nowrin, I., Shafique, S., Islam, M. Z., Riazul Islam, B. M., et al. (2021). Implementing a digital human resources management tool in the government health sector in Bangladesh: a policy content analysis [Journal article]. *BMC Health Services Research*, *21*(1), 1-10. https://doi.org/10.1186/s12913-021-07304-4

Bulthuis, E., Kok, C., Amon, S., Agyemang, S., N, A., S, X., et al. (2021). How district health decision-making is shaped within decentralised contexts: A qualitative research in Malawi, Uganda and Ghana. *Global Public Health*, *16*(1), 120-135. https://doi.org/10.1080/17441692.2020.1791213

Chikumba, P. (2017). Management of Health Information in Malawi: Role of Technology. *Advances in Science, Technology and Engineering Systems Journal*, *2*, 157-166. https://doi.org/10.25046/aj020118

Chimwaza, W., Chipeta, E., Ngwira, A., Kamwendo, F., Taulo, F., Bradley, S., et al. (2014). What makes staff consider leaving the health service in Malawi? [Journal article]. *Human Resources for Health*, *12*(1), 17-17. https://doi.org/10.1186/1478-4491-12-17

Dia, I. A. (2022). *African health practitioner migration and mobility study* (, Issue. https://au.int/sites/default/files/documents/41858-doc-2262_ILO_AU_Health_Practitioner_Migration_and_Mobility_Study_FINAL_HIRES.pdf

Driessen, J., Settle, D., Potenziani, D., Tulenko, K., Kabocho, T., & Wadembere, I. (2015). Understanding and valuing the broader health system benefits of Uganda's national Human Resources for Health Information System investment. *Human Resources for Health*, *13*(1), 49. https://doi.org/10.1186/s12960-015-0036-0

Dwicaksono, A., & Fox, A. M. (2018). Does Decentralization Improve Health System Performance and Outcomes in Low- and Middle-Income Countries? A Systematic Review of Evidence From Quantitative Studies. *Milbank Q*, *96*(2), 323-368. https://doi.org/10.1111/1468-0009.12327

Government of Malawi Ministry of Health. (2011). *Malawi Health Sector Strategic Plan 2011 - 2016 Moving towards equity and quality*.

Government of Malawi Ministry of Health. (2020). *Digital Health Strategy 2020 - 2025*. Retrieved from https://lukeinternational.no/wp-content/uploads/2021/12/DIGITAL-HEALTH-STRATEGY.pdf

Government of the Republic of Malawi. (2017). *Malawi Health Sector Strategic Plan II (2017-2022). Towards Universal Health Coverag*. Lilongwe, Malawi Retrieved from https://www.csogffhub.org/wp-content/uploads/2019/10/Malawi-health_sector_strategic_plan_ii_030417_smt_dps.pdf

Human Resources for Health in 2030. (2021). *iHRIS in Senegal; Technical Brief*. https://pdf.usaid.gov/pdf_docs/PA00XR84.pdf

Institute of Public Opinion and Research, & University of Gothenburg. (2016). *The Local Governance Performance Index (LGPI) in Malawi: Selected findings on health* (2016:7, Issue. https://gld.gu.se/media/1170/health-report-malawi.pdf

IntraHealth International. (2020). *Kenya Now Uses iHRIS Software to Manage PEPFAR Health Workforce*. I. International. https://www.intrahealth.org/news/kenya-now-uses-ihris-software-manage-pepfar-health-workforce

Ishijima, H., Mapunda, M., Mndeme, M., Sukums, F., & Mlay, V. S. (2015). Challenges and opportunities for effective adoption of HRH information systems in developing countries: national rollout of HRHIS and TIIS in Tanzania. *Human Resources for Health*, *13*(1), 48. https://doi.org/10.1186/s12960-015-0043-1

Kawale, P., Pagliari, C., & Grant, L. (2019). What does the Malawi Demographic and Health Survey say about the country's first Health Sector Strategic Plan? *Journal of Global Health*, *9*(1).

Malawi Government. (2020). *Malawi Digital Health Strategy: 2020 - 2025*. Lilongwe: Ministry of Health Retrieved from https://lukeinternational.no/wp-content/uploads/2021/12/DIGITAL-HEALTH-STRATEGY.pdf

Malawi Government: Ministry of Health. (2015). *Malawi National Health Information System Policy*. Lilongwe, Malawi: Malawi Government

Measuring the availability of human resources for health and its relationship to universal health coverage for 204 countries and territories from 1990 to 2019: a systematic analysis for the Global Burden of Disease Study 2019. (2022). *Lancet*, *399*(10341), 2129-2154. https://doi.org/10.1016/s0140-6736(22)00532-3

Murphy, G. T., Birch, S., MacKenzie, A., & Rigby, J. (2016). Simulating future supply of and requirements for human resources for health in high-income OECD countries [Article]. *Human Resources for Health*, *14*, 1-18. https://doi.org/10.1186/s12960-016-0168-x

Muzyamba, C., Makova, O., & Mushibi, G. S. (2021). Exploring health workers' experiences of mental health challenges during care of patients with COVID-19 in Uganda: a qualitative study. *BMC Research Notes*, *14*(1), 286. https://doi.org/10.1186/s13104-021-05707-4

Mziray, E., & Gorgens, M. M., P. (2017). *Analysis of human resources for health in Malawi through implementation of a WISN study in 75 facilities*. https://openknowledge.worldbank.org/handle/10986/33307

Namaganda, G. N., Whitright, A., & Maniple, E. B. (2022). Lessons learned from implementation of the Workload Indicator of Staffing Need (WISN) methodology: an international Delphi study of expert users [Journal article]. *Human Resources for Health*, *19*, 1-9. https://doi.org/10.1186/s12960-021-00675-z

National Statistical Office Malawi, & ICF. (2016). *Malawi Demographic and Health Survey 2015-2016*.

Okoroafor, S. C., Kwesiga, B., Ogato, J., Gura, Z., Gondi, J., Jumba, N., et al. (2022). Investing in the health workforce in Kenya: trends in size, composition and distribution from a descriptive health labour market analysis. *BMJ Global Health*, *7*(Suppl 1), e009748. https://doi.org/10.1136/bmjgh-2022-009748

Panda, B., & Thakur, H. P. (2016). Decentralization and health system performance – a focused review of dimensions, difficulties, and derivatives in India. *BMC Health Services Research*, *16*(6), 561. https://doi.org/10.1186/s12913-016-1784-9

Pindani, M., Phiri, C., Chilinda, I., Chikazinga, W., Botha, J., & Chorwe-Sungani, G. (2020). Health Surveillance Assistants' Practices of Postnatal Care in Lilongwe District, Malawi. *Africa Journal of Nursing and Midwifery*, *22*. https://doi.org/10.25159/2520-5293/6963

Reda, M. (2017). HRH2030 Supports Health Worker Data Training in Senegal. *Senegal News*. https://hrh2030program.org/hrh2030-supports-health-worker-data-training-in-senegal/

Smith, S., Deveridge, A., Berman, J., Negin, J., Mwambene, N., Chingaipe, E., et al. (2014). Task-shifting and prioritization: a situational analysis examining the role and experiences of community health workers in Malawi [Article]. *Human Resources for Health*, *12*(1), 1-23. https://doi.org/10.1186/1478-4491-12-24

Szabo, S., Nove, A., Matthews, Z., Bajracharya, A., Dhillon, I., Singh, D. R., et al. (2020). Health workforce demography: a framework to improve understanding of the health workforce and support achievement of the Sustainable Development Goals. *Human Resources for Health*, *18*(1), 1-10.

Tursunbayeva, A., Bunduchi, R., Franco, M., & Pagliari, C. (2017). Human resource information systems in health care: a systematic evidence review. *J Am Med Inform Assoc*, *24*(3), 633-654. https://doi.org/10.1093/jamia/ocw141

VrabcovÁ, P., & UrbancovÁ, H. (2021). Use of human resources information system in agricultural companies in the Czech Republic [Article]. *Agricultural Economics / Zemedelska Ekonomika*, *67*(5), 173-180. https://doi.org/10.17221/452/2020-AGRICECON

Waters, K. P., Mazivila, M. E., Dgedge, M., Necochea, E., Manharlal, D., Zuber, A., et al. (2016). eSIP-Saúde: Mozambique's novel approach for a sustainable human resources for health information system. *Human Resources for Health*, *14*(1), 66. https://doi.org/10.1186/s12960-016-0159-y

Waters, K. P., Zuber, A., Willy, R. M., Kiriinya, R. N., Waudo, A. N., Oluoch, T., et al. (2013). Kenya's health workforce information system: a model of impact on strategic human resources policy, planning and management. *Int J Med Inform*, *82*(9), 895-902. https://doi.org/10.1016/j.ijmedinf.2013.06.004

WEMOS foundation. (2018). *Mind the funding gap: Who is paying the health workers?ACHIEVING AN ADEQUATE, FAIR FUNDING LEVEL FOR A STRONG HEALTH WORKFORCE IN MALAWI; Malawi Country Report*. https://www.wemos.nl/wp-content/uploads/2018/11/Wemos_Country-report-Malawi-2018.pdf

World Health Organization. (2010). Models and tools for health workforce planning and projections.

World Health Organization. (2015). *Human resources for health information system: minimum data set for health workforce registry*. (924154922X). World Health Organization

World Health Organization. (2016). *Health workforce requirements for universal health coverage and the sustainable development goals*. Retrieved from https://www.who.int/publications/i/item/9789241511407

World Health Organization. (2017). Community health worker programmes in the WHO African region: Evidence and options—Policy brief.

World Health Organization. (2020). *Improving retention of health workers in rural and remote areas: Case studies from WHO South-East Asia Region*. Retrieved from https://apps.who.int/iris/rest/bitstreams/1302417/retrieve

World Health Organization. (2021). Health Workforce Thresholds For Supporting Attainment of Universal Health Coverage in the African Region. https://apps.who.int/iris/bitstream/handle/10665/348854/9789290234579-eng.pdf?sequence=1&isAllowed=y

Annexes:

Annex 1: Detailed information for standard HRH registry

Minimum data set	Data elements
Identification Number	Unique identification number assigned to the HCW
Full Name	HCW's full name- thus first, last and maiden name as required
Birth history	Date and place of Birth, Sex, names and relationship for next of kin
Address and contact information	Physical address, telephone numbers and email addresses for the HCW and next of kin,
Education and professional information	Education and academic qualifications, year of qualification, registration and licensure status with relevant regulatory bodies, institution trained from
Employment history	Details about employment after qualifying, employer and ownership, type of facility or department (health center/hospital/ administration) position, years of experience and occupational category
Current employer details	Name and address of current employer, date employed, date of recording the information

Source: WHO, 2015

Annex 2: Data Matrix

Data extraction Matrix: Adoption of iHRIS at district level to address inequitable HRH distribution in Malawi

#	**Author/s, Title,** **Year of Publication,** **Source (Journal,** **Name of Organization, Other)**	**Focus area**	**Objective/ Purpose**	**Findings relevant to review question: whether and how can adoption of iHRIS tool at district level improve health care workers' planning and distribution in Malawi**	Findings relevant to objective 1: **To describe international guidelines and purpose of Information Systems for Human Resources for Health**	Findings relevant to objective 2: **To examine the existing methods of managing HRH data and determining HRH needs in Malawi**	Findings relevant to objective 3: **To scrutinize the gaps associated with the current modalities in HRH data management, planning and distribution**	Findings relevant to objective 4: **To explore other interventions for improving HRH distribution along iHRIS and provide recommendations**	Recommended for inclusion for analysis (Yes/No). Short explanation of why.
1	Human Resources for Health Information System Minimum Data Set for Health Workforce Registry. 2015	Policy	This is a standard tool which was developed by WHO, to provides HRH decision makers with standardized and minimum requirements for a functional electronic HRH information system data set. This tool is a standard for both national and sub-national levels, for private and public institutions as well.	The article provides definition of HRH registry, as well as minimum standards for an efficient HRH data set, which also sets the basis and reference point when national health systems are developing their own. Health workforce data or health workforce registry is defined as country profile which acts as a repository for essential information about all health workers in a country. This	This article provided a minimum standard on which HRH information need to be adapted from. This will help in comparing Malawi iHRIS with the international recommendations. Implementation of iHRIS which will act as the HRH registry, requires consideration of inter-linked factors and devising an approach that would enable its successful implementation	The existing methods and modalities in Malawi will be assessed using this standard to identify whether the modalities are in line with the WHO requirement s	The existing methods and modalities in Malawi will be assessed using this standard to identify whether the modalities are in line with the WHO requirement s	The existing methods and modalities in Malawi will be assessed using this standard to identify whether the modalities are in line with the WHO requirement s	Yes, this is a standard on which all national HRH information systems have to be adapted from

				includes a count of all health workers who have ever worked or are currently serving in (both public and non-public), at the country's national and sub-national level in the health system.					
	Mercy Pindani et al: 2019. Health surveillance assistants' practices of postnatal care in Lilongwe District Malawi: African journal of nursing and midwifery	Community Health Workers	The purpose of this journal article was to document how poor postnatal services who were provided by a community health cadre, Health surveillance assistants (HSAs), were in Lilongwe district rural areas. This was being done due to shortage of health Care Workers (HCWs), despite the service being beyond their scope.	The findings in this study contribute to the evidence that HRH shortage is more in rural areas and that the situation is making CHWs working outside of their scope. The article also mentions that HSA cadre is not recognized by regulatory bodies (technically) in Malawi nevertheless, they are reliable by communities and provide health services at both communities and facility level	iHRIS can be used to identify where and what the exiting CHWs are, and inform decisions for their development programs and their distribution according to surveillance date which is interoperable with iHRIS			The findings shared will add evidence for MOH on how CHWs are important and chow formalizing and developing them would improve HRH density	
2	The promise and reality of decentralization: A critical appraisal of Sierra Leone's	Policy/ Structure of the health system	The article examined the systemic failures which have contributed to decentralization of the health system to be more of de-concentration rather than	The article focuses on the effects of partial decentralization on the health system			The article discusses that partial devolvement of power, authority and	This article is also relevant to objective 4. Effects of partial	Yes. Because health system in Malawi is also partially

	primary health care system		devolution in the health system in Sierra Leone. The paper points out that inconsistent political and legal frameworks is the major factor that has distorted delineations of authority between central government institutions and subnational or local governance structures; leading to resistance to devolve power; poor coordination of interventions at local level; and limited accountability for health workers. This contributes to unmet health needs for the population. The article proposes that establishment of mutual accountability at central and subnational governance	including HRH governance. The paper does not particularly mention about HRH data and distribution. However, the article discusses limits in exercising authority at subnational governance, as a limiting factor to on HRH governance which this includes planning and distribution decisions			resources has affected effectiveness of public health sector performance particularly at primary healthcare level. The article mentions that partially devolved governance structures result to poor coordination and accountability of interventions including HRH governance. The modalities used in Malawi for frontline HRH planning and distribution leaves out the	decentralizati on such as lack of accountability and poor coordination of HRH governance, would also affect districts ability to achieve equitable HRH distribution even after iHRIS is adopted. iHRIS adoption would also require empowerment of the districts to use the HRH data and make decisions at their level This would also increase accountability	decentralized and facing similar challenges.

							district governance structures who would better coordinate and be accountable for HRH distribution, to meet the health needs of the district's population.	on HRH decisions	
3	Community Health Worker Programmes in the WHO African Region: Evidence and Options — Policy brief. Geneva: World Health Organization; 2017	Structure of the health system Policy vs reality- what else is needed	This report reviews and highlights the need to formalize community health workers' (CHWs) training, deployment and remuneration, and their integration as part of the formal health workforce. The report, from the WHO Regional Office for Africa, aims to advise countries on the huge potential which strengthening of CHWs programs can bring in efforts to increase access to primary health care (PHC)for their populations.	The focus of the report is on having the community health workers and programs integrated with the larger health system rather than short term or standalone intervention. The report acknowledges the complimentary role that CHWs have on health systems, but does not mention of incorporating them into formal HRH				CHWs fall under district governance structures 'authority. As such, the districts can consider incorporating the CHWs in iHRIS data base and use the advice in this report to develop the CHWs and compliment the inadequate	The report will be included. This is because in Malawi there are no clear pathways for developing community health workers

			This policy brief was written following the role portrayed by CHWs during Ebola outbreak in Liberia, Guinea and Sierra Leone from 2014 to 2015. The report brings about the foundational elements that countries can implement for successful CHWs programs and use such as proportional trainings, supervisions, incentives and career development	database. However, this report could be used to suggest other means of how the impact of inequitable HRH distribution would be minimized, i.e. by strengthening CHWs.				frontline health care workers (HCWs). This can be done along other interventions such as recruitment of more frontline HCWs.	
4	Paul Kawale, Claudia Pagliari, Liz Grant, 2017: What does the Malawi Demographic and Health Survey say about the country's first Health Sector Strategic Plan?	Policy	This journal article examines how health and socio-economic indicators have improved following the development and implementation of the first Health Sector Strategic Plan (HSSP) for Malawi in 2011. This was noted during the 2015-2016 Malawi demographic Health Survey (MDHS). The article highlights how Malawi's health system has evolved since 90s, in the provision of strategic visualization of an	The focus of the paper is to appraise the contributions made by HSSP as a strategic vision and guidance for planning and implementation of health services, in improving health of Malawi populations. HSSP as a guiding policy document, includes collective interventions that contribute to improved population		The article also highlights that HRH strategic decisions and interventions are guided by the HSSP (which is the		iHRIS use on its own may not improve HCWs distribution. There is need to incorporate the significance of using than just capturing HRH data at district level in Malawi health system policy documents	Yes. Malawi health system is guided by its policy objectives and documents

			improved health system; thus from National constitution; Essential health package (EHP), Sector Wide Approach (SWAp), Vision 2020, annual Programme of Work (PoW), up to when HSSP when introduced. The article also discusses the benefits of HRH decisions in the HSSP, which included training and deployment of Medical Assistants (MAs) and CHWs (health surveillance assistants -HSAs). These interventions according to the article, contributed to improved access to health services, both preventive and curative, at community level.	health and socio-economic outcomes. Furthermore, it discusses the role of CHWs in improving access to health services. This knowledge is relevant to the study question because it adds an evidence base, for the district governance structures to build on the existing CHWs and mitigate inequitable distribution of frontline HCWs.				since they are the ones that guide interventions and resource allocation. Secondly, CHWs need to be developed, as also highlighted in above report by WHO.	
5	The government of Malawi's investment case for reproductive, maternal, newborn, child and adolescent health and	Policy vs reality- what else is needed	This report highlights factors contributing to inability of the Malawi Government to realize objectives in the HSSP. One of the strategies in HSSP II is to improve availability, retention,				The paper discusses that Malawi population increase rate is too high. This paper was written in		

	nutrition ministry of health and population government of Malawi 2020 – 2022		performance and motivation of human resources for health for effective, efficient and equitable health service delivery. However, this is not happening due to increased population growth and poverty which is contributing to increased demand for health services and inadequate resources to support health investments such as recruitment of more HCWs and infrastructure to support health service delivery. The report particularly highlight the increased rate at which Malawi's population is growing, and the need to				2020, and staff establishment was last reviewed in 2016. There is a mismatch between the establishment projections with the rate at which the population is growing. It is likely that the basis for distribution is no longer relevant now since the population has increased.		
6	Human Resources for Health in 2030 Year 5 Annual Report (OCTOBER 1, 2019 – SEPTEMBER 30, 2020)	What else is needed	This annual report summarized achievement by HRH2030 in countries it worked. Major focus of HRH2030 is health systems strengthening through HRH recruitment, deployment and development.	The focus of this report is on HRH2030 program contribution in Malawi and other countries. The report's relevance to the study focus is on the HOT4ART tool				The report discusses how other tools can help in optimal use of HRH deployed at facilities amidst high	

			The report highlights how the project helped transitioning and absorption of HCWs from the program to the health system mainstream, in HIV high burden districts of Zomba and Lilongwe. The report also discusses the HRH Optimization tool for Anti-Retroviral Treatment (HOT4ART) which the project developed to help health facilities optimize use of the existing HCWs, amidst high HIV services workload and new client needs in public health emergencies such as COVID-19. The tool helps managers at the facilities to identify gaps in HRH staffing due to re-organizing of service delivery	which was used to help in managing workload at HIV service delivery points in health facilities. As much as the report acknowledges that Malawi has HRH shortage and mal-distribution (not in line with population needs), different tolls can be used to mitigate the effects of the workload burden on HCWs. This can be applied in the study to say iHRIS adoption also needs to work hand in hand with other tools and models for the efficient performance of the HRH distributed				workload brought about by HIV and other pandemics. For the objectives for adopting iHRIS to be achieved, there is need to also consider other tools and models of improving efficiency of the HRH distributed. Thus iHRIS should not be implemented in isolation, as it may not be all that the district needs	
7	Mziray, et al., 2021. Final Report of the Analysis of Human	Policy vs reality-what else is needed	The purpose of this report is to communicate the findings of a Workload Indicators Staffing Needs (WISN) study that The	The WISN study reveals that there are varying workload pressure across the different health zones			This report mentions that different health zones and facilities have		

	Resources for Health in Malawi through Implementation of a WISN Study in 75 Facilities.		World Bank conducted in 75 facilities in Malawi in 2017. The study analyses the staffing needs for the differing cadres .in a given facility, based on their workload. The study also highlights how District health governance structures and health facilities cope with the work burden by task shifting and assigning other direct health related activities to community cadres and volunteers, despite having no proper training. The study was done to inform the 2017-2022 National Health Sector Strategic Plan (HSSP II), learning on the shortfalls identified during HSSP I evaluation, particularly focusing on efficient distribution of Health Care Workers (HCWs).	in Malawi. HCWs in the Northern zone are working under the highest workload pressure, followed by Central west and South west zones. Workload pressure is least in South east zone than the other zones, with over staffing in four frontline cadres. The study also mentions that Malawi Ministry of Health did not have Human Resource Policy as of 2017, except the HSSP. The strategies in this policy document for supporting essential health package (EHP) implementation focused more on production of HCWs than their equitable distribution. Lastly, the report also shows variations in			different work load pressures and staffing gaps. While the northern and other zones have critical shortages of frontline HCWs and work load, others (South East zone) were overstaffed. This shows how the current modalities that guide HRH distribution are being inefficient to meet equitable distribution of HRH towards universal health coverage. This information is useful for this		

				use of community health workers and volunteers across zones. This report is relevant to the study as it shows the inconsistencies in distribution of HCWs due to (among other factors) inefficient modalities of HCWs distribution.			objective (objective 3).		
8	HRH2030 Ihris ins Senegal: TECHNICAL BRIEF | June 2021 iHRIS in Senegal	Best practices and lessons learnt	The article highlights why and how iHRIS was introduced in Senegal, in 2014; and discusses the major glitches that were identified during iHRIS implementation leading to inability of the implementation of the tool to achieve improved and evidence based HRH decisions. The debrief further discusses how HRH2030 project in the country worked with the Senegal health system to improve efficiency of iHRIS.	The focus of the report is to highlight inefficiencies in iHRIS implementation in Senegal. The tool was introduced to improve data completeness, accuracy, and timeliness; for increasing and maintenance of number, production and budget allocation for HRH; which would contribute to HRH increased				The report discusses important aspects that can hinder effective utilization of iHRIS to achieve equitable HRH distribution. The review in this report can be used to understand whether similar	

				availability, accessibility, acceptability and quality; and evidence for HRH policies and strategies. However, HRH data was of poor quality, not current and was being ineffectively used by central and regional health governance structures despite having iHRIS in place. Reasons for this included lack of roadmap to guide iHRIS implementation, no culture of data use and lack of commitment by the top management in the MASA. This prompted MASA and HRH2030 project in the country to devise and institutionalize policies and strategies to increase usefulness of the iHRIS tool, to				technical and structural lapses in central and district health governance structures (such as inadequate training and supervision of the data entry and data quality, lack of data use culture, low commitment from top management, and inadequate resources); are expected, and how the lessons learnt can be used to increase efficiency of iHRIS use in Malawi health system.	

				achieve the purposes for its implementation. The gaps and solutions discussed in this report will provide information on how iHRIS use can be maximized to bring the intended results in HRH. However the report mentions that though local focal persons were identified and trained, there was limited access and authority to the data entry and quality control					
9	HRH2030 Supports Health Worker Data Training in Senegal Posted at 11 Sep 2017 in Senegal News by Mariam Reda	Best practices and lessons learnt	This newspaper article covers how HRH2030 project supported Senegal Ministry of Health to improve iHRIS utilization through data training. This is because various challenges had been identified in iHRIS implementation such as varied use across regions	Similar to the above report, this article focuses on how HRH2030 project helped the Senegal system with the right capacity, skills and knowledge on iHRIS use. The article's relevance to the study				The article is relevant to objective four of the study. Malawi can learn from how and why such trainings are important in iHRIS implementatio	

			due to lack of skills to enter, analyze and use the HRH data among HR staff; lack of the system to capture other HR data other than public sector; and weak infrastructure to support iHRIS implementation	is that it provides insight on how lack of iHRIS training for all levels affected data quality and use				n; and who should be targeted with the trainings to achieve the goal of iHRIS use. Furthermore, there are insights on what needs to be monitored during iHRIS implementation, such as consistent use of the tool and data quality	
10	Celebrating HRH2030 Senegal: Key Achievements in Strengthening Human Resources for Health Posted at 03 Sep 2021 in Senegal, News by HRH2030	Best practices and lessons learnt	This report was written by HRH2030 in Senegal, to highlight achievements that the project achieved in strengthening HRH in Senegal during its project implementation period (2016-2021). The report particularly highlights how HRH2030 project improved HRH strategic decisions by use of iHRIS tool. The project conducted	The report focuses on how iHRIS use and HRH decision making improved at national and local levels with the support of HRH2030 project's interventions. Most importantly, the report discusses how HRH strategies were incorporated in the				Malawi can learn from the report on which on policy and technical factors can favour or deter effective availability and use of HRH data beyond just	

			evaluation of the country's previous (2011-2018) health strategic plan and used the findings to improve the identified inefficiencies in HRH data collection, quality, use and reporting. These improvements were also incorporated in the 2021-2028 strategic plan. The report also highlights how the situation was before its intervention and how it improved after the project interventions	new national plan for development of HRH, based on the findings from evaluation of preceding plan. The report is relevant to the study as it highlights the areas that are key in achieving HRH equitable distribution including policy guidance in line with the use of iHRIS, which would also would be applicable to Malawi health system				having the tool adopted.	
11	The World Bank, 2019. Public health spending in Malawi.	Support for iHRIS-political will and commit ment	This is a World bank country brief on public health spending for Malawi in the year 2019. This debrief shows the trends for Malawi health expenditure of GDP between 2010 and 2019. The report has shown some improvements in the government expenditure on	According to the debrief, Malawi has improved its expenditure on public health between 2010-2019, with 2013 having the highest (11.58). Though it also fell to 7.39 in 2019, from 11 in 2016/2017 financial year, Malawi's health				This debrief is useful under this objective. Though the Malawi government has such expenditure on health, prioritization of interventions	Yes. The debrief will be included in analysis

			health , ranging between 7.4% to 11.58% of GDP.	expenditure has remained above the minimum required GDP expenditure percentage by WHO (5%). This information is useful for the study as it shows the commitment that the government of Malawi on health including HRH .				amidst multiple and equally pressing health challenges, including reduced donor aid over would affect the support that iHRIS would need. iHRIS requires Information Communicati on and Technology (ICT) infrastructure, uninterrupted internet to be in full use. Furthermore, financial resources are also needed for trainings and monitoring	

								and supervisions.	
12	MALAWI GOVERNMENT THE 2022/2023 BUDGET STATEMENT, 8 February, 2022. Minister of finance and economic affairs	Support for iHRIS-political will and commitment	Every year, the government of Malawi through the Ministry of Finance and economic affairs, develops a national budget. The budget shows how much resources have been allocated to different ministries including health. This is the current budget for the year 2022/2023	In this budget statement, the government allocated 10% of its total budget, to health. Though this allocation has increased as compared to 2021 financial year (9%), it is still below the recommended 15% as per the Abuja Declaration. As the above debrief by the World Bank, This information is useful for the study because iHRIS adoption and use requires resources				With such budgetary allocation to health, there is need for strong commitment from central government to equally prioritize iHRIS or lobby for resources from other sources than the government, to support iHRIS implementation	
13	Human Resources for Health Information System Minimum Data Set for Health	HRH minimum data set	The article defines Health workforce data or health workforce registry as a country profile which acts as a repository for essential information about all health workers in a country. This		Implementation of iHRIS which will act as the HRH registry, requires consideration of inter-linked factors and devising an				

	Workforce **Registry. 2015.**		includes a count of all health workers who have ever worked or are currently serving in (both public and non-public), at the country's national and sub-national level in the health system.		approach that would enable its successful implementation. These include the following: -Establishment of a technical working group (TWG) for HRH at national level, controlled and coordinated by MOH. - Commitment and mandate by the MOH to establish or integrate the HCWs registry in the national digital or electronic information systems. This would help the iHRIS to be established as an integral component in the web-based heath structures, such as Health Management Information Systems (HIMS) and web-enabled				

					national health workforce registry. -Incorporation of iHRIS in the national policies, with clearly defined and documented guidance and strategies to guide its implementation and administration. In addition, these mechanisms should be made available and communicated to all government and non-governmental health structures at both national and sub-national levels. The policy provisions should be accompanied by a mandate from the government, to both public and non-public stake holders and district health governance structures to collect and upload HRH				

					data to the registry, within defined time schedules.				
14	Global strategy on human resources for health: Workforce 2030			HRH information system is exclusively focused on the frontline cadres (clinicians (and physicians), and Nurses and midwives); and there is no consideration for the other cadres such as community health workers, specialized health workers such as nutrition, environmental health, and others				To achieve UHC, countries need to be flexible enough and adapt the SDG HRH threshold guide to its planning and projections for HRH, to their own set-up and local trends in availing needs in different demographic and epidemiological population demands for health; Strengthening the existing CHWs whose contributions to PHC and UHC cannot	

								be underrated, is also another crucial area for consideration	
15	Ahmat A, Asamani JA, Abdou Illou MM, et al. Estimating the threshold of health workforce densities towards universal health coverage in Africa. BMJ Global Health 2022;7:e008310. doi:10.1136/ bmjgh-2021-008310				These must also be underpinned by strong governance and efficient health financing mechanisms. Achieving iHRIS for equitable HRH distribution is also dependent on commitment from top governance structure, funding commitments and modalities; and exchange of information across all the key areas such as preservice training, DHIS 2 and LMIS				