Opportunities and challenges of integrating eye health and neglected tropical diseases services in primary health care in Sierra Leone: a mixed method study

June 2024

Sightsavers

Report authors and contributors

Sapana Basnet, Emma Jolley, Elena Schmidt, Nancy Smart, Nazaradden Ibrahim, Tiangay Gondoe, Dr Lloyd Harrison-Williams and Jalikatu Mustapha

Acknowledgements

We would like to thank all study respondents who voluntarily agreed to be part of this study and spared their invaluable time to be interviewed. We would also like to thank all the team members of the 32 facilities for facilitating us to conduct the facility-based surveys. Special thanks to Sightsavers Sierra Leone country office for their support and Tiangay Gondoe, Nazaradden Ibrahim and Sumrana Yasmin for their review and feedback on this report.

We would also like to thank Fatu Yumkela, Joseph Kandeh, Dianna Ofori and researchers from Dalan Development Consultants for leading and delivering all the research activities.

We are grateful to Irish Aid for their financial support that made this study possible.

Citation

Basnet S., Jolley E., Schmidt E., Smart N., Ibrahim N., Gondoe T., Harrison-Williams L., and Mustapha J. (2024) Opportunities and challenges of integrating eye health and neglected tropical diseases services in primary health care in Sierra Leone: a mixed method study. Haywards Heath (UK): Sightsavers

Executive summary

Primary health care (PHC) is the backbone of a whole-of-society approach to health. It provides comprehensive care for health needs throughout the lifespan, ranging from promotion and prevention to treatment, rehabilitation and palliative care – as close as feasible to communities and people's day-to-day life. An integrated approach to service delivery through primary care settings is considered an effective and efficient way to deliver essential health services to all.

The World Report on Vision published by the World Health Organization (WHO) in 2019 highlighted significant global challenges in the delivery of eye care services and called for strengthening eye care within national strategic health plans and, specifically, in primary care settings. The report emphasised the role of PHC services in the delivery of integrated, people-centred eye care, which can improve access and respond to rapidly changing population needs.

Furthermore, transitioning of some previously vertical programmes, such as neglected tropical diseases (NTDs) to routine health system-based services is critical for providing integrated health care services to the populations living in the areas, where these programmes have reached their elimination thresholds; and can be achieved through long-term investments in the foundations needed for equitable, accessible and rights-based primary health care.

This report presents findings of a mixed-methods study of PHC services and their role in the delivery of eye care and NTD services in selected districts in Sierra Leone. The eye care component of the study focused on the experiences and capacities of PHC workers trained in eye care using the WHO Primary Eye Care (PEC) Training Manual for Africa region. The manual was published by the WHO Africa region in 2018 with the aim to provide guidance in the design, implementation and evaluation of training courses, which can build and strengthen the capacity of health personnel to manage eye patients at primary level in health care facilities in the Africa region. The training falls within the remit of continuous professional development and its content focuses on simple evidence-based practices that can be easily carried out in primary care facilities in Africa. In Sierra Leone, the WHO PEC manual needed to be adapted to suit the local context. An ophthalmologist working at national level was trained on the manual, as a Master Trainer; and the training for other trainers was organised in October – December 2020, who in turn trained staff working in primary health units (PHUs).

The NTD component focused on the readiness of the primary care facilities and staff to deliver trachoma, onchocerciasis and lymphatic filariasis (LF) management after Sierra Leone reaches its elimination targets for these diseases.

This study was conducted in Kailahun, Bonthe, Pujehun and Falaba districts of Sierra Leone. The districts are located in different provinces, but all are below the Sierra Leone average Human Development Index.

The study deployed several data collection methods, a desk review of key documents and policies, key informant interviews (KIIs) and a survey of 32 PHUs (eight per district) with a review of available infrastructure, equipment and medicines. Data was analysed using the WHO health system framework, structured around six building blocks: governance,

financing, human resources, equipment & technology, health management information system (HMIS) and service delivery.

Key findings

A number of policies govern primary care services, eye health and NTDs in Sierra Leone. However, operational detail on how eye health and NTD services can be delivered at the primary care level are often missing. The NTD Master Plan focuses primarily on reaching elimination targets through vertical NTD-specific support. The integration of NTD services into the general health system post elimination is stated as a priority but there are uncertainties about how it can be achieved and resourced in practice.

Financial resources available within the government health system are not sufficient to cover all population needs. Therefore, partners including development donors, international and national NGOs, and the private sector have to contribute to health care financing and delivery. This funding, however, is often irregular and limited to certain population groups, such as pregnant and lactating women or children under five. As a result, out of pocket payments for health care services and medicines are common, affecting access and demand for care.

The WHO PEC manual provides guidelines and structure using algorithms for primary health workers on eye examination, treatment and referrals. Both the PEC trainees and other eye care stakeholders were very positive about the training programme and the new knowledge and skills they acquired. The training manual and content appear to be pitched at the right level and delivered in a clear simple way focusing on the competencies required at the primary level. Findings suggest that the newly trained PHC workers manged to establish good relationships with the local communities and engaged them in the conversation about their eye care needs. They could raise awareness about eye care services and deliver simple clinical assessments and treatments, where the required equipment and supplies were available. Ophthalmic specialists at the secondary level felt that the PHC workers were now making better-informed referrals, which has reduced the workload of the specialist secondary facilities staff.

Blinding NTD diagnosis and treatment is mentioned in the manual and was covered during the training but only in general terms without any specific detail. Even though NTDs did not form part of the WHO PEC training as such, the links between NTDs and eye care were discussed, where appropriate. It was also noted that the personnel who went for the PEC training were the same people who were in charge of the annual NTD mass drug administration (MDA), which was thought to be a good way of integrating NTDs and eye care and making efficient use of the scarce workforce.

One of the key issues highlighted in this study was poor infrastructure and insufficient resources available to the health system, including primary care settings. The facilities included in the study were extremely under resourced, the majority lacked basic amenities, such as stable electricity and safe water sources, accessible toilets, consumables and medical supplies. Many facilities lacked well-lit premises required for eye examinations. Furthermore, while the National Essential Medicines List and the Basic Package of Essential Health Services specified a list of key medicines that should be available for eye care, the majority of these medicines were not available in the primary care facilities surveyed on a regular and sustained basis. As a result, the PEC trainees reported that although they had been trained to treat simple eye conditions, there were no medicines in their facilities, and

they had to refer patients to the district hospital, which was very frustrating. It defeated the purpose of task shifting and increased patient time and travel costs.

The system of referral from primary and secondary level was generally well defined. PEC trainees were given five colour-coded algorithms to guide them on the eye conditions they could treat and those they had to refer. The algorithms were simple but robust and most trainees understood them well. Staff also showed their commitment to follow up on referrals made. For example, they tried to call or message district hospitals using the WhatsApp platform. Yet, the uptake of referrals was reported to be an issue for many patients, largely due to high costs of transport and hospital user fees. Long distances to referral centres, poor road infrastructure and high costs of treatment and medication were reported to be the main barriers impeding the uptake of referrals, particularly in rural communities.

Our findings on the HMIS show that the eye care and NTD data reporting currently uses a bottom-up approach, where data is collected at the health facility level and passed through the district health management teams (DHMTs) to the national level in a standardised format. At the time of the study, health data was mostly collected on paper, summarised and reported electronically using the DHIS 2 platform. The captured facility level data is processed to report a number of indicators for planning and health service management purposes. If the government moves to electronic data collection as intended, if delivered at scale, it can significantly improve data collection processes, including procurement of medicines and resource allocation. However, the questions of poor infrastructure (limited number or no computers at the facility level, poor internet connectivity) continues to be a major barrier to this intention and needs to be addressed.

In conclusion, the study shows that, overall, the PEC training of primary care workers has been well received and has the potential to improve access to eye care and post-elimination NTD services for all people and particularly those in remote locations. However, the weaknesses of the broader health system, such as poor infrastructure, the lack of consumables, poor motivation of staff and high patient costs need to be addressed to maximise the effectiveness of this new task shifting initiative.

The study also highlights areas for future research. First, as this was a qualitative study, we cannot quantify the impact of the training in terms of the number of people presenting at the primary care level or referred to the upper-level facility. A study, which examines the number and flow of patients at the primary and secondary level will be highly desirable. Second, there is a need to better understand the financing of the health care system at the primary and secondary levels and to examine the pricing structure and the costs to the system and to the patient, as well as the exemption groups and their benefits.

List of acronyms

Acronym	Definition
BPEHS	Basic Package for Essential Health Services
CDD	Community directed distributor
CHA	Community health assistant
CHC	Community health centre
CHO	Community health officers
CHW	Community health workers
CSO	Civil society organisation
CSR	Cataract surgical rate
DHMT	District health management team
EHSA	Eye health system assessment
FHCI	Free health care initiative
GoSL	Government of Sierra Leone
HIS	Health information system
HMIS	Health management information systems
HRH	Human resources for health
INGO	International non-governmental organisation
IPC	Infection prevention and control
LF	Lymphatic filariasis
MCH aide	Maternal and child health aide
MCHP	Maternal and child health post
MoHS	Ministry of Health and Sanitation
NEHP	National Eye Health Programme
NGO	Non-governmental organisations
NHSSP	National Health Sector Strategic Plan
OCHO	Ophthalmic community health officer
OCHOs	Ophthalmic community health officers
PEC	Primary eye care
PHU	Peripheral health unit
RAAB	Rapid assessment of avoidable blindness
SECHN	State enrolled community health nurse
TT	Trachoma trichiasis
UHC	Universal health coverage
WASH	Water, sanitation and hygiene

Introduction

This report presents findings of a mixed-methods study of primary health care services and their role in the delivery of eye care and neglected tropical diseases (NTD) services in selected districts in Sierra Leone. The eye care component of the study focused on the experiences and capacities of primary health care workers trained in eye care using the World Health Organization (WHO) Primary Eye Care Training Manual for Africa region[1]. The NTD component focused on the readiness of the primary care facilities and staff to deliver management for trachoma, onchocerciasis and lymphatic filariasis (LF) after Sierra Leone reaches its elimination targets for these diseases.

The role of primary health care in eye care and NTDs

Primary health care (PHC) is the backbone of a whole-of-society approach to health. It provides comprehensive care for health needs throughout the lifespan, ranging from promotion and prevention to treatment, rehabilitation and palliative care – as close as feasible to communities and people's day-to-day life. An integrated approach to service delivery through primary care settings is considered an effective and efficient way to deliver essential health services to all.

The World Report on Vision published by the WHO in 2019[2] highlighted significant global challenges in the delivery of eye care services and called for strengthening eye care within national health strategic plans and, specifically, in primary care settings. The report emphasised the role of PHC services in the delivery of integrated, people-centred eye care, which can "improve access and adapt and respond to rapidly changing population needs"[3].

Furthermore, transitioning of some previously vertical programmes, such as NTDs to routine health system-based services is critical for providing integrated health care services to the populations living in the areas, where these programmes have reached their elimination thresholds; and can be achieved through long-term investments in the foundations needed for equitable, accessible and rights-based primary health care.

Evidence suggests that with the right levels of investments and capacity building, there are significant benefits to providing basic eye care and NTD services at the primary level[4,5]. Firstly, primary care workers are well placed to integrate eye care and NTD services into their (health) education work, increasing community awareness of these health conditions and services available for treatment. This is thought to improve healthy behaviours, increase the service uptake and minimise potentially dangerous practices, such as treatment from traditional healers. Secondly, if appropriately trained, primary care workers can effectively diagnose and treat simple health conditions and refer only more complex cases to the secondary and tertiary levels. This can minimise patient costs related to expensive travel to hospitals and reduce the number of individuals presenting at often overstretched specialist ophthalmic units.

Eye health in Sierra Leone

In Sierra Leone, visual impairment remains a public health concern and a driver of poverty[6]. According to the rapid assessment of avoidable blindness (RAAB) conducted in 2021, the prevalence of blindness among people aged 50 years and over (adjusted for age and sex)

was 5.4% (95%CI 4.3-6.7%)[7]. Over 60% of blindness was due to causes that are treatable (unoperated cataract, unaddressed refractive error and uncorrected aphakia), and a further 33.3% were due to causes that were preventable (corneal opacities and phthisis). Cataract was the major cause of blindness (59.4%), followed by glaucoma (21.7%) and non-trachomatous corneal opacities (8.4%). Cataract surgical coverage was relatively low (45.0%), and significantly lower among women (31.1%) than men (62.5%). The country is still far from attaining the International Agency for the Prevention of Blindness's (IAPB) recommended cataract surgical rate (CSR) for Africa of 2,000 surgeries per million population per year, reporting only 409 surgeries per million in 2015, the last year for which this data is available [8].

In spite of this heavy burden of visual impairment, Sierra Leone has only 90 eye health workers. Health care access in rural areas, where nearly two thirds of 7.4 million Sierra Leoneans live, is particularly challenging as few medical graduates choose to work in rural facilities due to poor infrastructure, long working hours and emotional and financial hardship[9].

In order to make eye care more accessible to Sierra Leoneans across most remote locations, the government decided to train primary health unit (PHU) staff to provide eye care at the primary level. This is in line with the WHO task shifting strategy[1] which makes use of available human resources by delegating specific tasks from higher level to lower-level cadres in the event of staff shortages[10].The WHO Primary Eye Care (PEC) training manual is a tool developed specifically for these purposes. The WHO Africa region published the manual in 2018 with the aim to provide guidance in the design, implementation and evaluation of training courses, which can build and strengthen the capacity of health personnel to manage eye patients at primary level in health care facilities in the Africa region. The training falls within the remit of continuous professional development and its content focuses on simple evidence-based practices that can be easily carried out in primary care facilities in Africa.

In Sierra Leone, the WHO PEC manual needed to be adapted to suit the local context, so the national eye health programme (NEHP) organised a consultative meeting where all stakeholders, including representatives from the directorate of primary health care (DPHC), regional eye care staff, district health management teams (DHMTs) and PHUs were present[11]. An ophthalmologist working at the national level was trained on the manual, as a Master Trainer; and the training for other trainers was organised in October – December 2020. They in turn trained 559 staff from 289 PHUs in Bonthe, Pujehun, Kailahun and Falaba districts. This study aimed to assess the experiences and capacities of the trained primary health care staff to deliver eye care services in their facilities post-training.

Neglected tropical diseases in Sierra Leone

Onchocerciasis and LF are endemic throughout most of Sierra Leone, and the government coordinates mass treatment of at-risk populations through its Master Plan for NTD Control[12], which characterises both diseases as being at the 'pre-elimination' stage. Morbidity control

[1] This is not the first time the task-shifting strategy is being used in Sierra Leone. Training of community health officers (CHOs) in ophthalmology was started in 2012 to help provide basic eye care services in the PHUs.

and disease management are important components of the strategy, and specialist skills, including surgical skills, are being developed at the district level.

Although trachoma infection is now below the level indicating MDA, blinding trachomatous trichiasis (TT) is still evident in many communities.

As the diseases get increasingly controlled, and prevalence of active infections dips below the thresholds for elimination, Sierra Leone, like many other African countries, must prepare to transition from vertical, disease-specific programmes, to integrated approaches led by the PHC system. This study is the first attempt to assess to what extent the PHC system in Sierra Leone is prepared to take on the activities related to ongoing identification, treatment and management of these three NTDs post-elimination.

Study objectives

General objective

This study sought to draw on the WHO health system building blocks framework[13] to explore how PHC services in Sierra Leone are organised and supported to provide eye care and post-elimination NTD services to communities, and to identify the factors that support or inhibit the service delivery.

Specific objectives

The specific objectives of the study were:

1. Understand the requirements of the current policies, guidelines and toolkits with regards to eye care and NTD service provision at PHC level, explore the extent to which they are implemented, and identify where gaps exist.
2. Understand the training provided to PHC workers using the PEC manual, their perceptions about it, and how the training has impacted their abilities to provide eye care services.
3. Understand how PHC services are currently set up, financed, equipped and supported to manage patients presenting with eye conditions.
4. Understand how PHC services are currently set up, financed, equipped and supported to manage patients presenting with symptoms of trachoma, onchocerciasis or LF.
5. Explore how the health management information system captures data on eye conditions and NTDs, explore the barriers faced in capturing data, and understand if and how that data is used at different levels of the health system.
6. Explore the current approaches used by PHC services to make referrals to specialist providers, understand where challenges exist, and identify examples of success.

Methods

Study location

Sierra Leone, like other low-income countries, faces challenges in providing quality health care for its population, largely due to insufficient financial resources to cover all health care needs, limited health personnel and heavy disease burden. The consensus among countries now is to take a holistic approach to health care and maximise the use of the limited resources available and the opportunities for health system strengthening, using the WHO health system building blocks framework. Although the WHO framework is a useful tool to analyse the capacity of the health system, it does not always fully reflect all aspects of the health care, particularly those delivered at the PHU level; and it is limited to analyse the eye care delivery in the settings with limited infrastructure. For example, in Sierra Leone, most eye care facilities and personnel are concentrated in the capital and a few larger cities, while in remote and rural areas, the eye care infrastructure is scarce, and patients cannot access the care they need. In addition, patient health seeking behaviour is thought to be different in urban areas, where people tend to be more aware of their needs and eye care opportunities.

This study was conducted in Kailahun, Bonthe, Pujehun and Falaba districts of Sierra Leone. The districts are located in different provinces, but all are below the Sierra Leone average Human Development Index (HDI)[14].

Kailahun District is located in the Eastern province and has a population of 545,947 people[15]. The district is subdivided into fourteen chiefdoms. The total area of the district is 4,859 km^2 (1,876 sq mi). The population is largely from the Mende ethnic group, though there are other ethnic groups with significant populations, including the Kissi, Mandingo and the Fula. The major economic activities in the district are farming, diamond mining and trade. The large majority of the population are Muslims with a significant Christian minority.

Bonthe District is in the Southern province and comprises several islands. There are two councils and eleven chiefdoms in the districts. Bonthe has a population of 297,561 and 80 per cent of the population is made up of the Sherbors and the Mandes ethnic groups[16]. Other minority tribes include the Themnes and Fullahs.

Pujehun District is in the Southern province and the third largest district in the country with a population of 429,571 people. It borders the Atlantic Ocean in the southwest and the Republic of Liberia to the southeast[17]. The district has 12 chiefdoms with one of the lowest population densities in Sierra Leone, with most people living in villages of less than 2,000 residents. The Mande is the largest ethnic group in the district with Fulla, Kissi, Temne and Sherbro being other minority ethnic groups.

Falaba is a district in the Northern province, created in 2016 (it was initially a part of Koinadugu District), with a population of 166,205[18] people. Falaba has 13 chiefdoms, and its population is largely from the Yalunkas ethnic group; other ethnic groups include Kuranko, Fullahs and Mandingos.

Study design

This study deployed a mixed-methods design, including a secondary desk review of key documents and policies, key informant interviews (KIIs)[2], and a facility-based survey with a review of available equipment and medicines.

Desk review

A desk review, using a content analysis approach[19,20], of policies, plans and guidelines was performed before, during and after the fieldwork. It focused on the current set up and processes related to the delivery of PHC services, training of PHC staff in eye care and integration of eye care and NTDs in the PHC services. Findings from the desk review were used to help place the fieldwork into the context and to understand among other things, community eye health and NTD health seeking behaviour, with a view on opportunities and risks for the eye care integration and NTD transition. The desk review also informed the refinement of the research tool and provided evidence to meet the first objective of this study.

Key informant interviews

A total of 57 KIIs[21] were conducted with a variety of stakeholders at national, district and community levels to gather information on stakeholders' perspectives on the implementation and integration of eye care and NTD services within the PHC settings. Each KII lasted between 45 and 60 minutes. A two-stage purposive sampling[22,23] approach was used to first, identify the locations that had received the WHO PEC training and second, the team members who had been trained or were engaged in the delivery of the services.

For the KIIs, topic guides were developed to guide the discussions. It explored participants' experiences and opinions about both the PEC training, and the delivery of eye care and NTD services at primary level, including decisions around patient referrals.

Facility survey

The study also conducted a survey and collected data from 32 facilities (8 in each district) to understand the availability of infrastructure, equipment and medicines necessary for managing eye and NTD conditions.

For the facility survey, a paper-based questionnaire was developed based on the WHO PEC algorithms, and specialist expertise on case management and treatment of trachoma, LF and onchocerciasis.

Data collection

Team composition, training and data collection

Two local consultants conducted the national level interviews. Four teams of three fieldworkers were deployed to do the district and PHC level data collection. Data collection took eight days each in three out of four districts; in Falaba because of the difficult terrain,

[2] The terms of reference required that a focus group discussion be done with the health personnel but looking at the sparse distribution of health personnel across the PHUs, it was nearly impossible, so that aspect was dropped.

data collectors required three additional days. All interviews were audio-recorded using digital recorders.

Data management, analysis and presentation

Audio-recordings of the KIIs were transcribed verbatim into MS Word by a group of trained research assistants. Senior researchers developed a matrix of codes based on a sample of transcripts and the desk-based documentary review. All data was analysed thematically[24,25]. Research assistants were trained during a two-week period on the use of the coding matrix and how to allocate data into specific themes. The analysis involved transcribing the interviews, familiarisation with the transcripts and audio recordings, producing a coding framework, coding, and identifying key themes across the transcripts. Senior researchers supervised the data analysis process. The health system's building block framework was used for organising the final set of themes and findings.

Ethical considerations

The research protocol was submitted for technical review and clearance to the Sierra Leone National Ethics Committee (SLNEC) of the Ministry of Health and Sanitation. All participants were informed about the purpose of the study and what it involves in the language of their choice; they all provided a written consent, and all were informed about anonymity and confidentiality of their data. All data was anonymised and accessible only to the core research team. All participation in the study was voluntary and there were no incentives provided for those who agreed to participate.

Results

Participant characteristics

A total of 57 participants were interviewed, including the following:

- eight national level officials, who played the key roles in the PEC training and policies, including representatives of the Ministry of Health and Sanitation (MoHS), the WHO and INGOs
- 18 regional level staff, including three ophthalmic specialists, one NTD specialist and 14 directors and senior managers
- 32 out of the 599 PHC personnel who had been previously trained using the WHO PEC manual. These were recruited from four study districts and included a diverse range of PHU staff, such as maternal and child health (MCH) aides, community health officers (CHOs) and midwives. The sample included PHC workers with a broad range of characteristics (different cadres, CHOs and nurses), different years of experience/seniority, different locations (with regards to remoteness and populations served), and an attempt was made to have an equal split of male and female respondents.

Health system governance: key policies and guidelines

The critical role of PHC has been reflected in a number of strategic documents in Sierra Leone.

The most recent **2021-2025 National Health Sector Strategic Plan (NHSSP)**[26] is the blueprint for health sector governance and service delivery in the country; it places the responsibility of health sector governance on the Ministry of Health and Sanitation. The MoHS is responsible for formulating policies and setting standards and regulations and for monitoring and overseeing resource mobilisation. The NHSSP also stipulates that the MoHS provides leadership and coordinates the efforts of all health care providers and financiers at all levels. The plan is aligned with its national health and sanitation policy and universal health coverage (UHC) roadmap and outlines 11 strategic pillars that fit under the strategic direction priorities: Health care financing; Leadership and governance; Human resources for health; Health infrastructure; Community participation and ownership; Service delivery; Essential medicines and health technology; Health information, technology and monitoring & evaluation; Quality of care; Disease prevention, health promotion and healthy environments; and Health security and emergency. Each priority identifies specific objectives and targets to achieve by the year 2025.

Priority five (Community participation and ownership) aims to “build and strengthen community systems to effectively shape and influence health service design, provision and outcomes at all levels”. More specifically, it calls for (i) redesigning community structures and platforms to implement UHC roadmap by 2025; (ii) supporting community engagements; and iii) promoting healthy lifestyle at family and community levels. Priority six (Service delivery) aims to “expand service coverage and increase equitable access to improve uptake in quality health care services at all levels, with a special focus on community participation and ownership in service delivery” with one of its three specific objectives focusing on: the redesign, development and sustainment of a community-based primary health care delivery

model “that delivers improved equitable access and quality of services, efficiency and effectiveness”.

The **human resources for health (HRH) strategic plan 2017-2021**[27] highlighted key human resource issues, including the lack and unequal distribution of skilled health personnel and outlines a number of specific objectives to address the challenges. One of the objectives focuses specifically on improving HRH production. Under this strategic objective, the MoHS “aims to improve the quality and quantity of its health workers. Immediate plans include investments in increasing production of professionals in midwifery and higher nursing, along with strengthening the capacity of CHWs. The MoHS will also complement these investments with planning to determine how community-level cadres should evolve to respond to future primary care needs, which will then contribute to a long-term training plan.

The 2015 basic package of essential health services (BPEHS)[28] provided a framework for improving health service delivery. It represents a commitment from the Government of Sierra Leone (GoSL) to ensure that a basic level of essential health care is available to all people. The document defined different levels of care in relation to facility type.

Eye care has been integrated into the national health system in Sierra Leone and according to the **2013 eye health systems assessment**[29], this has led to the improved coverage and quality of eye care. However, the eye care provision across the country is challenging due to inequitable numbers of qualified eye care workers, insufficient government funding available for eye care and unequal distribution of eye care facilities. The **National Eye Health Policy (2021)**[30] has been developed to address these challenges.

The **Sierra Leone NTD Master Plan 2023-2027**[31] provides “a guide for the prevention, control, and elimination of NTDs in the country, including effective morbidity management and disability prevention. One of its major objectives is to improve the capacity of the national team, stakeholders and partners by developing the required skills for an integrated NTDs programme interventions delivery. The plan builds on the previous NTD plan, which stated that the NTD control programme (NTDP) is fully integrated into the PHC, with active community participation spearheaded by community directed distributors (CDDs).

The new NTD Master Plan identified a number of specific cross-thematic targets, including integrating NTDs into primary health care systems to identify early recrudescence; and improving capacity of workforce for NTD management.

Governance in primary health care

The public health care delivery system in Sierra Leone is comprised of three tiers[32]:

1) Peripheral health units, which deliver primary health care. There are over 1,000 PHUs across Sierra Leone[33]. More than 90% of these are physically located in rural areas[34]. In principle, PHUs are the entry point into health services, and secondary and tertiary facilities are only accessible via referral. There are three types of PHUs:

- Community health centres (CHCs) at the grassroots level serve as the first point of contact for individuals seeking health care. Sierra Leone has a network of 229 CHCs that are meant to cover populations of roughly 10,000-20,000 individuals; these are located in rural and remote areas[35]. They employ higher-skilled staff, such as

community health officers (CHOs), and midwives, with some focus on epidemiology and environmental health

- Community health posts (CHPs): there are 386 of these medium-sized facilities designed to serve a population of roughly 5,000-10,000 individuals[36]. They are generally staffed by lower-skilled health workers, such as state enrolled community health nurses (SECHNs) and maternal and child health aides (MCH aides).
- Maternal and child health posts (MCHPs): there are 616 MCHPs which provide the first point of contact with the facility-based health system[37]. These facilities are located at the village level and serve populations of less than 5,000 individuals. They are largely staffed by MCH aides.

Each of the above levels have specific functions, with MCHPs and CHPS providing basic care; they have beds that are only used for patient monitoring, while CHCs provide a wider range of services – they offer more complex health services and act as referral centres for the lower-level facilities[38].

2) District hospitals, one in each of 12 provincial districts and one in Western Area rural district provide secondary referral care, with at least one hospital per district functioning as a comprehensive emergency obstetric and newborn care (CEmONC) centre.

3) Regional/national hospitals, one in each provincial capital, plus Connaught Hospital in Freetown, provide secondary and tertiary care[39]. There are 24 hospitals, nine of which are located in the Western Area, including the three primary tertiary hospitals. Connaught, which is the largest hospital in the country, provides specialty care across a range of areas.

In addition to the above tiers of formal health care system, Sierra Leone employs community health workers who are trained to provide basic health care services and health education at the community level[40]. They assist in promoting preventive measures, maternal and child health and disease surveillance.

Within the MoHS, the Directorate of Primary Health Care is responsible for governance and delivery of PHC. One of the senior officials of the MoHS described the Directorate's role as follows:

> "To help to plan nationwide primary health care, coordinate primary health care, give directions and guidance to all the programmes working under the Directorate and partners as well, and also ensure that we monitor and supervise standards and operations of primary health care services." Key informant interview, senior manager, MoHS.

Within each district, the district health management team, headed by the district medical officer (DMO), is responsible for the PHUs. A senior district manager in Falaba described the primary health care workers as

> "the frontline health workers who are the first point of call for people seeking medical care in the communities".

He mentioned that, in total, he has 42 PHUs of different cadres in his district.

Eye health and neglected tropical diseases at the district level

Eye care services are included in the basic package of essential health services for Sierra Leone[41]. PEC is defined as an integrated, participatory and inclusive approach to the eye health component of PHC consisting of promotive, preventive, curative and rehabilitative services[42,43]. It aims to change the pattern of eye care services, currently often limited to central hospitals and eye units in the cities, to countrywide blindness prevention programmes. Eye health services start at the community level where CHWs identify and refer patients with eye diseases to the PHU[44]. The PHU is where ophthalmic community health officers, who are the primary eye care focal point in the community, are based. Preventive services, including immunisation and Vitamin A supplementation, are provided at peripheral health units and through outreach services.

The NTD control programme is fully integrated into PHC[45]. The programme conducts three integrated MDAs annually; the first half of the year is for integrated MDA for the control of schistosomiasis in seven health districts; and STH; and the second half of the year is for integrated MDA for the control and/or elimination of onchocerciasis, lymphatic filariasis (LF) and STH in 12 health districts. There is also an integrated MDA for the control and/or of LF and STH in Western Area.

The overall role of PHC in the delivery of NTD services is to sustain NTD elimination and control goals[46]. Data collection and reporting for NTD services is mainly based on the campaign approach. PHC facilities in each district support with data collection for surveillance, which is reported to their respective district health management teams, using harmonised tools, that include data on NTDs (onchocerciasis and schistosomiasis)[47]. Within each district there is at least one monitoring and evaluation officer and one disease surveillance officer whose roles are to coordinate data collection, management and dissemination at the district level.

The DHMT includes focal persons for different health conditions, including for eye care and NTDs, who manage these activities at that level, as one interviewee described:

> “In all the districts we have focal persons, we have NTD focal persons, and we have eye care persons in the district, so those people are there to ensure they monitor those services at the district level.” Key informant interview, senior manager, PHC.

There are no specific policies for eye health or NTDs at the primary care level, and the policies guiding eye health and NTDs are the general MoHS policies. The National Essential Medicines List details vital drugs that should be available for eye care at different levels, including PHUs, while the basic package for essential health services outlines a list of services provided, including eye injuries and infections.

The National Director for PHC explained that the draft eye care policy 2021 aimed to scale up eye care in the country, including at the PHUs level, while the NTD Master Plan aims to help coordinate NTD activities and enable partners to channel their financial and technical support to where it is needed.

Health system and PHC financing

The 1991 Constitution of the Republic of Sierra Leone[48] guarantees "the highest quality health care services to every citizen within the resources available". The National Healthcare Financing Strategy 2021-2025: Towards Universal Health Coverage and Health Security[49], makes further commitments around equity, stating that:

> "Health financing and delivery models should ensure that contributions are made based on the ability to pay, while everyone benefits depending on their needs for health care. Equity must be improved, and financial risks protection provided to the poor, marginalised and other vulnerable groups who are unable to pay for health care services."

The strategy acknowledges and is designed to address current challenges that include low health expenditure and low levels of investment in health care infrastructure with fragmented and poorly coordinated health financing; high out-of-pocket payments contributing to inequity of access.[50] Although the strategy does not focus on any specific health condition, it is relevant across the health sector and sets the scene for financing of all primary health care services. Aspects that are particularly relevant to this study are around payment for eye and NTD services in primary care settings: who pays, how much and how the resources necessary for the delivery of specific services at primary care level (for example, staff salaries, equipment, supplies medicines) are made available.

The government of Sierra Leone through the Ministry of Health and Sanitation is primarily responsible for financing and delivery of health care in the country. However, the funding available to the government is not sufficient to cover all health care needs and services in the country, and therefore, non-governmental sources of funding and non-governmental service providers supplement the government commitments, as stated in the 2015 Basic Package for Essential Health Services: "Sierra Leone has always relied on partners, including UN agencies, donors, international and national non-governmental organisations (NGOs) and the private sector to supplement its services"[51].

Study participants noted that health care services in Sierra Leone are co-funded by bilateral and multilateral donors, philanthropic funds and international NGOs and a significant proportion of health expenditure, 44.78% in 2018[52], was out-of-pocket expenditure. Study participants suggested an even higher level of out-of-pocket spending for some services:

> "I would say more than 90% of health care service payment comes from out-of-pocket, from individuals because we do not have a robust functioning insurance scheme... when it comes to primary health care centres and at community level, people pay for services out-of-pocket. …. Patients pay for services... whether it is... services or drugs, ...and this will go into the revolving fund for these facilities." Key informant interview, senior manager, Eye Care.

Sierra Leone's national health accounts 2019-2020[53] reported an increase in total health expenditure by 22 per cent from 3,420.88 billion Leones in 2019 to 4,184.50 billion Leones in 2020. Similarly, the capital health expenditure increased by 393.39 billion Leones from 66.57 billion Leones in 2019 to 459.96 billion Leones in 2020. The total health expenditure per capita also increased by 19 per cent from SLL 456,010.29 (USD 51.12) in 2019 to SLL 543,446.60 (USD 55.27) in 2020.

The World Bank review of Sierra Leone's public expenditure for health for the period 2015-2019[54] reported an average annual growth (both capital and recurrent, expenditure) of 14.17 per cent. However, this growth rate was not consistent. The spending fluctuated, with increases in 2016 and decreases in 2017 and 2018, and a significant increase in 2019. In 2018, household out-of-pocket payments accounted for approximately 45 per cent of the total health expenditure; it was the highest share of health care financing. 70 per cent of the household expenditures went towards drugs.

Health care providers interviewed explained that PHUs at the district level are funded through the district health management teams:

> "I know there is a system in place wherein the central government devolved health care financing for district level [facilities] to the DHMTs and then the DHMTs finance the primary health care." Key informant interview, senior manager, Pujehun.

Study participants also noted that performance-based financing[55] (PBF) schemes are used to fund staff, facility maintenance and supplies; these payments are made quarterly. A midwife in Pujehun described how the PBF worked in her facility:

> "The PBF is a fund that is given to deserving clinics in which 40% will go to the clinic and 60% will go to the staff. With the 40%, you have to ensure whatever goes wrong with the clinic, you use that money to fix the health facility. Let's say the roof has a leakage, you have to use part of the 40% to fix it. You will ensure you buy stationeries to ensure the clinic is up and running because sometimes your staff members will tell you 'I don't have a pen to ... write my report,' all of these should not happen, you have to take from the 40% and fix all those problems. You can even paint the facility to give it a facelift from 40%." Key informant interview, midwife, CHC, Pujehun.

A CHO in Pujehun described how the PBF fund assisted them to improve their facility:

> "They built an open hall, constructed a kitchen, and painted the facility. Additionally, they bought some equipment in the labour room, provided stipends to some support staff that are not on the government's pay roll and provided solar light for the facility."

PBF is a strategy to boost service use and health status of the poor by incentivising providers to improve targeted services, aiming to enhance equity and financial protection.

The implementation of the national PBF at the primary care level started in 2011[56]. The Health Results Innovation Trust Fund (HRITF) supports the PBF scheme with the funding from the governments of Norway and the United Kingdom. It is administered by the World Bank in partnership with the national government[57].

Eye Care and NTD financing in PHUs

Development partners complement government efforts in the delivery of eye care and NTD control programmes. Donor expenditures contribute to the total health sector expenditure in the country, but their support is provided largely outside the budget in the form of commitments to the implementation of vertical projects and technical assistance[58]. For example, USAID provides support to both eye care and NTD services, but the funding is

distributed through INGOs, such as FHI360 or Sightsavers and through the WHO. In 2016, the level of public funding for NTD control programmes was estimated at US$ 2.9 per capita, which is far below the required levels[59]. The **Sierra Leone's national health accounts 2019-2020**[60] reported that 0.8% of the total health expenditure was spent on NTDs and this expenditure was financed by the government, households and international donors.

Study participants explained that eye care and NTD programmes had been in place for a long time but have been historically underfunded, as one key informant pointed out:

> "Mostly, only 30% of the approved Ministry's budget for eye care and NTD programmes is actually disbursed making these services very resource deprived and inefficient. The rest of the 70% of the approved funding is always unaccounted for." Key informant interview, senior manager, Kailahun.

Another participant from Bonthe shared the following:

> "Eye health is often treated and funded as something outside the normal hospital activities and services. We realise that because of the restricted funding, even in those hospitals at secondary level, you will not find much of eye health delivery. There have been some improvements in recent times, but I can tell you most times eye health departments within these facilities are left on their own." Key informant interview, program manager, Bonthe.

It was further noted that eye health coordination activities at the NEHP secretariat that are jointly funded by the government, faith-based organisations and international development partners,

> "…only cover administrative issues at the secretariat, leaving nothing for service delivery. Despite government allocations to the NEHP, it is not always possible to access the funds." Key informant interview, monitoring and evaluation officer, Pujehun.

The funding provided through the DHMT is mostly for staff remuneration, the running costs of the facilities, such as water and electricity, as well as the fuel provided for outreach activities. Drugs and consumables are to be funded by international development partners.

Another source of funding for eye care is out-of-pocket payments. Eye care services are free for target populations who fall within the free health care bracket, such as pregnant/lactating women, children under five, older people and Ebola survivors. Cataract surgeries are often offered free of charge by faith-based organisations.

NTD services are funded by a wider range of partners, including the government, NGOs and international donors. Participants shared that there is some misalignment and confusion about who is expected to fund NTD activities at the district level:

> "The Sierra Leone NTD Master Plan ... states that the NTD control is included in the district health plans but it is expected to be funded by the MoHS and not by the districts, while the medicines used for NTDs mass drug administration are donated by pharmaceutical companies. This makes the whole system skewed and inefficient." Key informant interview, senior manager, Kailahun.

Infrastructure and medical supplies in the primary health care system

Primary health care facilities require a range of commodities, medicines, products and equipment in order to perform their functions adequately. Key facilities in support of adequate infrastructure are at the core of the success of PHC delivery. Electricity, computing hardware and internet networks are vital for health facility-based information systems[61]. In this section, we discuss 1) basic amenities (water, electricity, accessible toilets, and information and communication technology [ICT]); 2) consumables (pens, swabs, plasters, and so on); and 3) basic medications for common eye and NTD disorders, in terms of what is required and prescribed by policies, and the actual availability in the facilities surveyed.

Availability of amenities in health care facilities

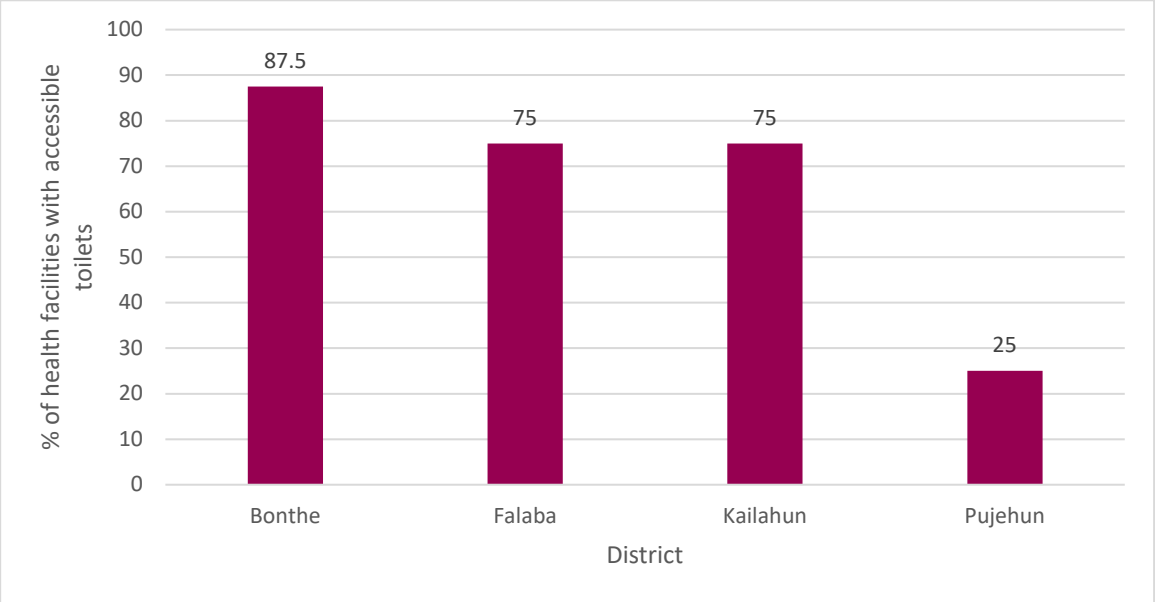
Health care facilities require safe and accessible water supply and hand hygiene and sanitation facilities, in order to provide quality care. Table 1 shows the type of water sources available in the 32 surveyed PHUs. All visited facilities had at least one source of water. Bonthe District had the most advanced water sources with three out of eight PHUs having water piped into the facility and another five having water piped onto the facility grounds. Facilities in Pujehun District had the most diverse sources of water with the majority of PHUs (six out of eight) having access to protected dug wells. Also, Pujehun was the only district where two facilities named surface water (the most unsafe source) as their water source, although these facilities had access to other sources of water, and it is possible that surface water was not used regularly. In Falaba and Kailahun Districts, the facilities used protected dug wells, tube wells or bore holes and unprotected dug wells. Tube wells and bore holes were more common in Falaba than in Kailahun.

Table 1: Availability of water in the surveyed health facilities

Type of water facility	Bonthe	Falaba	Kailahun	Pujehun
Piped into facility	3	0	0	1
Piped onto facility grounds	5	0	0	0
Protected dug well	0	3	6	6
Surface water (pond, water, river water)	0	0	0	2
Tube well or bore hole	0	4	1	3
Unprotected dug well	0	1	1	0

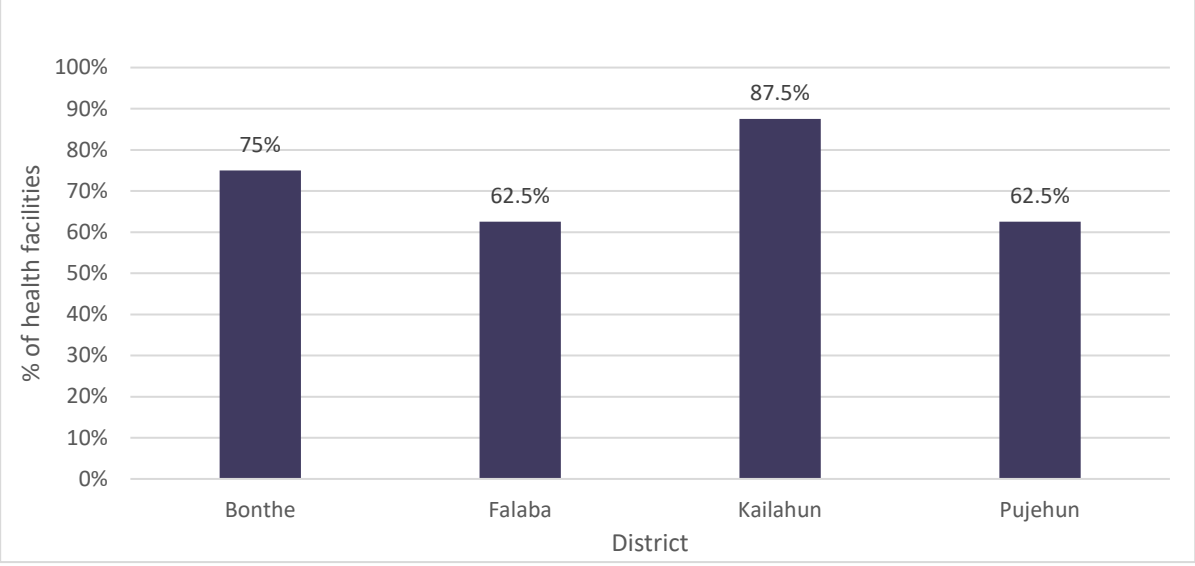
Bonthe District had the highest proportion of PHUs with accessible toilet facilities (87.5%). In Falaba and Kailahun, the majority of the visited facilities (75%) also had accessible toilets. In Pujehun District, however, only one in four of the visited PHUs had such facilities. Figure 1 shows the availability of accessible toilet facilities in the surveyed PHUs, by district.

Figure 1: Proportion of health facilities with accessible toilets



Soap for handwashing was available in the majority of PHUs visited in all four districts, but the proportion varied from five out of eight facilities (62.5%) in Falaba and Pujehun to seven out of eight (87.5%) in Kailahun (Figure 2).

Figure 2: Proportion of PHUs surveyed with soap for handwashing



Availability of electricity in a health facility is important for the sterilisation of instruments, storage of vaccines and medicines and emergency care at night. Electricity is listed as one of the essential amenities by the WHO handbook on monitoring building blocks of the health system[62]. Sierra Leone has approximately 130 mega kilowatts of electricity installed, with electricity per capita estimated at 15 kilowatt hours[63]. As of 2021, an estimated 27.5% of Sierra Leoneans have access to electricity, but only 4.9% of the populations in rural areas

have electricity access. Table 2 shows that the majority of PHUs surveyed in this study did not have access to central electricity, as one respondent pointed out:

> "Some of the facilities do not have proper infrastructure and of course there is zero electricity in most of the facilities." Key informant interview, NTD focal person, Pujehun.

The main source of electricity used by the PHUs visited was solar panels; this was followed by a generator. However, these sources of electricity were not reliable, as they were often broken, as one interviewee explained:

> "One of the problems we are facing in our facility here is that our solar panel is faulty, which means we do not have electricity now. If we happen to get a patient at night ... we use [mobile] phone light". MCH aide, Bonthe.

Table 2: PHUs with electricity

Main source of electricity	Bonthe	Falaba	Kailahun	Pujehun
Central supply	0	0	0	1
Generator	3	0	2	0
Solar	5	8	6	4
No electricity	0	0	0	3

For those health facilities where central electricity was available, the supply was reported as quite unstable. Only one facility in Bonthe, three facilities in Falaba, six facilities in Kalahum and two facilities in Pujehum reported having stable electricity most of the time. Other facilities reported:

> "disruption most of the time and had to rely on other unstable sources like solar energy and generator that often broke as a primary electricity source." Key informant interview, senior manager, Bonthe.

Globally, health systems technology infrastructure is considered to be a basic necessity for attaining national public health goals. Table 3 shows the number of PHUs that reported the availability of ICT. Overall, the availability of ICT was very limited in all four districts. Only two PHUs in Kailahun and three PHUs in Pujehun had access to functional computers, and facilities in Bonthe and Falaba had access to tablets, smartphones or basic phones (that could only be used for calls and SMS text messaging), but no access to functional computers. The number of devices of any type was six each in Bonthe and Kailahun, five in Pujehun and three in Falaba. The number of PHUs with access to the internet was one each in Bonthe and Falaba, eight in Kailahun and seven in Pujehun. None of the PHUs in these districts stored their facility data electronically on a regular basis. All data was collected on paper forms and uploaded on electronic ICT devices, where available.

The National Director for PHC explained that whilst there are plans to supply computers to at least all community health centres, this had not started yet. In the meantime, tablets were being supplied to PHUs:

> "We have just started giving them tablets, we started supplying PHUs with tablets, all the different cadres have been supplied. In some districts, [with]

NGOs' support and in others, the DHMT bought some tablets, so we are gradually coming into that phase. These tablets are to be used for reporting and entering data, we are now going into digitised form of reporting data." Key informant interview, national level director.

Table 3: PHUs visited with ICT facilities

ICT facility	Bonthe	Falaba	Kailahun	Pujehun
Computer	0	0	2	3
Tablet, smartphones and basic phones	6	3	6	5
Internet connectivity	1	1	8	7

Availability of consumables

The Basic Package of Essential Health Services provided at PHUs includes preventative and treatment services: awareness raising and sensitisation on the prevention of eye diseases and blindness; recognition, referral and treatment of red eye; recognition of suspected cataract and referral; and preventative and curative management of onchocerciasis cases[64]. The PEC manual states that the following consumables and medical supplies should be available to provide basic eye and NTD care at the PHC level: antibiotic eye drops and ointment; sodium cromoglycate drops; tetanus toxoid with syringes and needles; paracetamol tablets and syrup; swabs; cotton wool; cotton buds; eye pads and shields; adhesive plaster; paper towels; water and vessels for irrigation; warm water for compresses; soap for hand washing; a set of four glasses for near vision testing; a set of distance and near N8 par. testing charts; 3m string; torch and batteries; and epilation forceps.

In this study, we examined the availability of various consumables in the facilities surveys. Table 4 reports the findings.

Table 4: Number of PHUs that had essential consumables available in each district

Consumable	Bonthe	Falaba	Kailahun	Pujehun
Pens	4	4	1	8
Torch	5	6	5	5
Tetanus toxoid with syringes & needles	2	4	6	7
Swabs	0	0	4	3
Cotton wool	3	0	8	7
Cotton buds	0	0	0	2
Eye pads	4	0	1	1
Eye shield	0	3	1	1
Adhesive plaster	0	0	5	2
Paper towels/wipes/tissues	0	1	1	1
Water and vessels for irrigation	0	0	0	0

Warm water for compresses	0	4	1	1
Epilation forceps and gauze	6	5	7	5
Set of 4 glasses for near vision testing	4	4	3	4
+1.5 lenses	4	6	1	6
+2.0 lenses	2	7	2	6
+2.5 lenses	1	6	2	4
+3.0 lenses	3	5	2	3
Set of distance and near (N8 par.) testing charts	2	7	4	4
3m distance vision screen chart	5	7	2	6
String/tape measuring 3 metres	4	7	2	6
6m distance vision screen chart	4	7	3	6
String/tape measuring 6 metres	3	4	3	7
Scissors	1	4	8	7

No facilities visited in our study had a complete set of all medical supplies or consumables recommended in the PEC manual. Overall, the availability of consumables and supplies appeared to be better in Pujehun than in the other three districts. In this district, seven out of eight PHUs had cotton wool and tetanus toxoid with syringes and needles. In Bonthe, these were only available in three facilities. The most frequent consumables available in the visited PHUs were a torch, available in six facilities in Falaba and five facilities in the other three districts; and epilation forceps and gauze, available in seven facilities in Kailahun, six facilities in Bonthe and five facilities each in Falaba and Pujehun. None of the facilities visited had water and vessels for irrigation. Swabs were available in four facilities in Kailahun, three in Pujehun and no facilities in Bonthe and Falaba. Cotton buds were only available in two PHUs in Pujehun. Eye shields were available in three PHUs in Falaba, one PHU each in Kailahun and Pujehun and no facilities in Bonthe. Glasses for near vision with four different types of lenses were available in no more than half of the facilities visited in each district.

Availability of NTD and eye disease medication in health care facilities

The National Essential Medicines List[65] and the BPEHS[66] specify a list of key drugs that should be available in different types of health care facilities, including those for eye care and NTD morbidity management. However, our study found that the shortages of medicines were a significant issue for health facilities at all levels. The PHC workers who had participated in the PEC training also reported that despite their training, the medicines required to provide the basic treatment of eye care conditions and for managing morbidity related to trachoma, LF and onchocerciasis were not available in their facilities. The facility survey conducted in this study examined the availability of several essential medicines required in basic eye care and NTD treatment, and their availability in the facilities visited is shown in Table 5.

Overall, very few facilities had the medicines required for eye care and NTDs. The availability of the medicines was slightly better in Pujehun, while in Bonthe none of the visited PHUs had access to the medicines required for these conditions.

Table 5: Numbers of PHUs that had basic eye care drugs available in each district

Eye care drugs available	Bonthe	Falaba	Kailahun	Pujehun
Antibiotic eye drops	0	1	2	4
Antibiotic ointment	0	1	1	3
Chloramphenicol eye drops, 0.5%	0	1	1	5
Chloramphenicol eye drops, 1.0%	0	2	1	4
Tetracycline eye ointment, 1.0%	0	0	1	4
Sodium cromoglycate drops	0	1	1	2
Gentamicin eye drops 0.3%	0	0	1	2
Tetracycline eye ointment, 1.0%	0	0	1	4
Paracetamol tablets	4	5	7	8
Paracetamol syrup	0	0	0	2

The lack of basic eye care medicines was noted as a significant challenge during the stakeholder interviews, as one of the respondents from Kailahun observed:

> "Drug supplies do not come enough; they supply small quantities of drugs. There are drugs for pregnant women and lactating mothers in the facility. Like last month, they came with nutritional drugs. For eye care, they came with two pieces of tetracycline and chloramphenicol ointment which is not enough. The tetracycline ointment is already finished, but there is chloramphenicol." Facility worker, Kailahun.

Similar comments were made by a representative of a partner INGO:

> "Even when we have trained PHU staff on basic eye conditions which is in the PHU toolkit, they have the training but the basic commodities for treatment are not available within the health facilities. So, even though a good policy and guideline is created, the provision for the supply chain process for the delivery of those drugs to PHU has not been strengthened. I see a gap in the central supply chain process. Supply of drugs is not demand driven. Drugs are sent to the PHUs as and when they are available and in some cases, these are not the drugs that they need". INGO representative.

It was further noted that even in maternal and child health services, which receive significant donor funding and guarantee free access to health care for pregnant women and children under 5, the shortage of tetracycline ointment to prevent eye infections in infants was very common. One of the respondents from a facility in Pujehun shared:

> "Immediately after the delivery, we should administer tetracycline to the newborn, and we were doing that after the training when tetracycline was available in the labour ward. But they stopped sending it a long time ago, so for any newborn that we should administer tetracycline, we just leave them exposed to infection risk." Key informant interview, facility worker, Pujehun.

A similar comment was made by an informant in another district:

> "Tetracycline is a drug that is required in the labour room for neonates that are being born in the PHUs. Most of these drugs are not there, and even in the free health care dispensation, the drugs that come do not have eye care drugs". Key informant interview, eye care manager, Kailahun.

For NTDs, study participants spoke primarily about the drugs used for MDA, ivermectin (Mectizan®) and albendazole. They argued that these drugs were primarily supplied by donors through the WHO country office. After the MDA campaigns, the remaining drugs were stored in the local facilities for the use with patients, who come to the facility:

> "We treat people coming here to report oncho, LF and trachoma at this facility. Drugs like ivermectin (Mectizan) are only available when we have campaign. After the campaign, the remaining drugs are kept in the facility. The same with albendazole because we administer Mectizan and albendazole together. Sometimes after the campaign, the drugs will be available in the facility but are used up within a few days. Usually, there are still some people who will be left out during the mass administration so if they come to the health facility, we provide treatment for them until the drug runs out. We don't get regular supply of the drugs to provide treatment regularly." Key informant interview, facility worker, Falaba.

As Sierra Leone does not meet the requirements for the MDA for trachoma, most informants said that azithromycin was not routinely available in their facilities:

> "We have albendazole at the facility as we have to deworm the kids and pregnant women. I have not set eyes on Zithromax® for years at this facility". Key informant interview, facility manager, Kailahun.

Table 6: Districts that had resources and medication to manage onchocerciasis and lymphatic filariasis

Medication and equipment available for onchocerciasis	Medication and equipment available for lymphatic filariasis	Medication and equipment available for trachoma
Bonthe: Ivermectin tablets Measuring stick Albendazole tablets	Bonthe: None. They refer them to higher level	Bonthe: None. They refer them to MCHP and CHCs level
Falaba: Albendazole tablets Ivermectin tablets Measuring stick	Falaba: Albendazole tablets Ivermectin tablets	Falaba: Albendazole tablets
Kailahun: Albendazole tablets Ivermectin tablets Measuring stick (height)	Kailahun: Lab request Referral card Albendazole tablets Ivermectin tablets	Kailahun: Forceps Chloramphenicol eye ointment
Pujehun: Ivermectin tablets Albendazole tablets Measuring stick (high board) Book and register	Pujehun: Ivermectin tablets Albendazole tablets	Pujehun: Ivermectin tablets Albendazole tablets Tetracycline eye ointment Book and register

Facility space

The WHO PEC training manual[67] requires that an eye examination should be done "in a space which is properly lit" and the person to be examined should be seated comfortably. This requires proper lighting or ventilation and comfortable seats. Table 7 shows the availability of the environment conducive to effective eye examinations. Only a few of the visited PHUs had appropriately lit space and comfortable seats. The availability was slightly better in Pujehun and Falaba Districts.

Table 7: Proportion of facilities with a conducive space for an eye assessment

	Bonthe	Falaba	Kailahun	Pujehun
Sufficiently lit area	1	4	0	7
Comfortable seat	1	4	0	6

Human resources

Human resources for health are crucial for realising quality and affordable health care for all. The Human Resources for Health Strategy 2017-2021[68] of Sierra Leone acknowledges the persistent gaps in human resource capacity and states that attracting and retaining health workers is a challenge due to low remuneration, lack of incentives – especially for hard-to-reach areas, poor career development, and cumbersome and bureaucratic recruitment

processes that cause unnecessary delays. The National Health Sector Strategic Plan 2017-2021[69], envisages a resilient health workforce that is delivering cost-effective, evidence-based and high-quality health care services that are equitable and accessible for everybody in Sierra Leone. The facility survey sought to identify the numbers and cadres of staff working in district hospitals, health centres and PHUs in the four districts. Our results show a great variability of cadres available in the districts. Among the four districts, only Bonthe had a surgeon, an anaesthetist and three theatre nurses. Kailahun had 40 and Pujehun had 38 medical officers compared to Bonthe which had eight, and Falaba did not have any. Falaba is the most deprived district in terms of health personnel. It is also the most remote of the four districts and has a total of 25 health personnel, all within the low-level cadre.

Employment contracts and volunteerism

The Human Resources for Health Strategy 2017-2021 reported that almost 50 per cent of community health workers, including 3,600 clinical health workers providing patient services, in government health facilities are not on the government's pay roll and therefore it is difficult to subject them to regulations that govern the formal workforce. Unpaid health workers – essentially volunteers – are considered to be less committed and more likely to leave their workplace at a short notice, compared to the colleagues who are paid.

Key informants in this study indicated that there were many volunteer staff in primary health care facilities in the study districts, as a respondent from the national level explained:

> "Most of those staff at the primary level are not pin coded [enrolled in payroll], so in situations where you have volunteers working without salary, it means you are not too sure that you can retain them in the facility." Key informant interview, program officer eye health, INGO.

The difficulty with staff commitment and retention was corroborated during another key informant interview:

> "They have several volunteers in health facilities that need pin codes so that they will be committed to their work as fulltime staff." Key informant interview, NTD focal person, Pujehun.

The lack of a permanent health workforce was more acute in Bonthe district, as one PEC trainee from this district reported:

> "From our boss down to us, we are not on payroll", there is not a single person in their facility who is on government's payroll."

Another problem highlighted during the interviews was unauthorised leaves of absence. It was explained that for those employed on the MoHS government contracts, all leaves of absence including sick leave, maternity leave and annual leave must be authorised at two levels: at the district level and at the central MoHS level. This often-caused significant delays in approvals, resulting in health workers taking leave without an official authorisation.

In-service training for primary health care workers

The Human Resources for Health Strategy 2017-2021 aims to address the most critical human resource challenges, across multiple intervention areas, including pre-service and in-service trainings. In the strategy, the MoHS committed to investments in the quality training

with a focus on community-level cadres to respond to future primary care needs. Further, the government prioritised establishing a system for improved coordination of in-service training, clinical mentoring and supervision.

PHC workers interviewed highlighted the importance of quality in-service training, which helped them to raise awareness of eye diseases and promote health seeking behaviour in the local communities and reduce their uptake of potentially harmful traditional medicines:

> "Trainings have been critical in capacity building for enabling us to take the primary eye care to the village level because we realised that patients were coming only when the conditions were very …[advanced] and irreversible. In addition, we realised that patients did not bother to go to the PHU because they knew that they were going to be referred. They ...[patients] preferred to go to traditional healers because they couldn't afford to travel long distances to secondary or tertiary health care facilities. Going to traditional healers who use toxic materials just worsen the situation...so that by the time they come to us, it is too late ... to be able to restore vision or to salvage the eye". Eye care trainer, national level.

Study participants also said that although they received good general in-service training, it did not include topics on how to conduct an eye care assessment. and health graduates were lacking the necessary skills to provide eye care:

> "Implementing ... eye care is new in the primary health care; and most of our colleagues were not taught about eye care extensively whilst they were studying; like the MCH aides, SECHN ..., they just browsed through basics and now lack the skills for eye assessment." Key informant interview, eye care focal person, Kailahun.

The National M&E officer for NTDs said that PHU workers received training on NTDs but mainly on the annual MDA. PHU workers were trained on the integrated management of NTDs, signs and symptoms and the concept of community directed intervention where social mobilisation, advocacy and other community directed activities took place. Facility staff were also trained on advocacy, community sensitisation and supply chain management. The national programme manager for NTDs also confirmed that the PEC training did not include NTD personnel. However, there was training for PHUs annually on MDA:

> "From 2007, when we started this yearly mass drug administration for NTDs, we have been training the PHU staff and community-based volunteers every year before we do social mobilisations. We train them properly for two days about what the disease is, causes of the disease, mode of transmission, incubation period, signs and symptoms and treatment. Additionally, we train them on the complications, when to refer, what the adverse effects are, and what to do in case you have severe adverse effects." Key informant interview, national programme manager for NTDs.

Some participants also suggested that the PEC manual could be incorporated into the formal training curriculum of all pre-service nursing training institutions. This would be a more cost effective and sustainable way of the development of eye care competencies in primary health care in the long run.

Some interviewees also argued that there was a need to develop and test specific measures to incentivise eye care workers deployed in remote locations; some suggested that PEC trainees could work on a performance-based incentive plan that would motivate them to deliver eye care in their catchment area. Some, for example, suggested that they could partner with the district hospital eye care unit and conduct screening exercises and surgical camps in the PHUs and send referred patients to the hospital. However, it remained unclear how such a performance-based plan could be funded or how aligned they would be with the funding mechanisms of the rest of the primary health care.

Perception of the WHO primary eye care training and services post-training

The PEC trainees interviewed in this study included CHOs, CHAs, MCH aides, state SECHN and CHWs. At the time of the study, 46 staff trained using the WHO PEC manual were employed in the 32 PHUs participating in this study (these included staff trained in the first cohort of trainees and other staff in subsequent trainings).

The WHO manual states that the PEC training should use a hands-on approach, which implies showing trainees what to do rather than telling them what to do[70]. PEC trainers interviewed further explained that the PEC curriculum was comprehensive but simple; it was taught in a clear and coherent way and using simple language to allow even the lowest level of PHC cadres learn and apply the necessary skills:

> "The WHO manual for Primary Eye Care training is very holistic and easy to understand... They [trainees] are trained how to pick out the red eye, and conditions that are normal or not. In fact, the WHO manual makes things so simple, it's like a taboo for you to call those disease names like onchocerciases, trachoma. They do not want you to talk about cataract; it is just for you to know the black of the eye is white. If it is white, what should I do; and then you still know the exact treatment you give, and it will be in line with the same treatment that you give for cataract." Key informant interview, Master Trainer, national level.

The training in Siera Leone was conducted mainly in Krio, the language spoken by the majority of PHC staff, with only a few terms used in English, as highlighted by one respondent:

> "Of course, we were using the English language when necessary... but we tried to break it for their level. Just imagine some of us studied the eye for three years but they did it for three days. Therefore, we went an extra mile to make it simple and basic for them to understand. We did not use any medical jargon." Key informant interview, ophthalmic clinical health officer, national level.

Although NTDs were not a significant focus of the training, blinding NTDs were covered to some extent:

> "The training was more about eye care, even though NTDs were mentioned. ... All the facilitators were eye care people, but they mentioned NTDs because it causes blindness. So, NTDs were discussed during the training." Key informant interview, programme manager, INGO.

Some of the PEC trainees had been previously trained on trachoma and the Master Trainer described how they covered trachoma with those trainees:

> "PEC trainees were trained how to pick trichiasis out, how to rotate the eye lid, how to look for the follicle, those basic things. ... So those basic things, I think, they captured in the training". Key informant interview, PEC trainer, national level.

Trainees interviewed thought that the training they received went well because their knowledge and skills had changed after the training. It provided them with a better understanding of different eye conditions and how to manage them. They were also trained on how to sensitise community members and encourage them to seek eye care in the local PHUs instead of self-treatment or visiting traditional healers, who were common sources of eye remedies in the local communities. Interviewees further explained that one of the challenges in rural communities was late presentation of eye health conditions because many patients waited until their condition either resolved or reached a more advanced stage and only then presented to hospital. They argued that one of the advantages of PEC trained staff at the PHU level was their ability to reach to such patients and raise their awareness of eye health and the need to get care from formal health facilities as soon as possible. Following the PEC training, PHC workers disseminated health information in their communities. Many believed that their messaging had led to a reduction in potentially harmful traditional medicines, and to an increase in timely appointments with health care providers:

> "In the past, whenever they [patients] had problems with their eyes, they would go in search of local herbs. When they have conditions like conjunctivitis, they apply native herbs into their eyes. Because of the integration of eye care into the primary health care system, whenever we go on outreach, we educate them. Now cases of eye problems have reduced because they visit the health centre." Key informant interview, MCH aide, Bonthe.

Reaching out to patients with NTD conditions through community sensitisation and mobilisation was thought to be equally effective. Health workers interviewed noted that during the NTD outreach, they raised awareness on causes, preventative measures and treatment available for many NTD conditions:

> "When we go on outreach sessions, we give them health talks and advise them to go to PHUs, instead of going to herbalists. We explain to them that having conditions like elephantiasis, does not mean that evil spirits have trapped them, because that is what most people think. We encourage them to visit the PHU where there is medication." Key informant interview, MCH aide, Bonthe.

Trainees further described different practical skills they were taught to examine eyes, measure visual acuity, remove a foreign body, use prevention ointment with newborns and select lenses for people with refractive error, as the following quote illustrates:

> "They taught us skills to identify people with visual problems; provide eye care to the newborns; gave us a rope to measure distances and a chart. We were allowed to practise more than two times. They [also] introduced lenses

> to us which are +1.5, +2.0, +2.50 and +3.0. They issued them to us after training us how to use them." Key informant interview, facility worker, Bonthe.

Senior stakeholders also recognised the strength of the training and described it as an important step in the effective implementation of the national eye health policy:

> "I think the PEC training has changed the way health care staff deliver eye care services in the PHUs. I have seen an increase in the number of trained personnel on primary eye care services and I have seen an expansion in eye care at the primary level, so I believe this is contributing to all of these achievements in eye care." Key informant interview, senior health care manger, national level.

Study participants argued that the PEC training allowed PHC workers to acquire new skills and provide basic eye care services closer to the local communities, which made these services more accessible and affordable:

> "Over the years, eye care services have not been embedded in the primary health care system, only at the secondary level. People who wanted to have screening for their eyes or any form of eye care, had to travel to the secondary health care facility. Now, screening can be done at PHU level during outreach activities, which means they do not have to pay for transportation. They will only be referred to the government hospital if their situation cannot be handled at the PHU." Key informant interview, monitoring and evaluation officer, Kailahun.

Programme staff, who supported the delivery of the training, made a number of practical recommendations on how the future training could be improved:

- Supervisors from the district teams should have information about the training and at least one supervisor should be present during the training, to ensure that the adapted PEC training manual is strictly adhered to
- A supervisor's summary report of the PEC training should be sent to the Maser Trainer within a week following the PEC training. These should be collated and added to the final report of the training
- Pre- and post-test should be conducted to assess trainees' skills and performance and the results should be included in the supervisor's training report. Trainees' feedback from their training evaluation forms should also be collated and added to the supervisor's training report
- All trainees should receive their own learning materials pack, and particularly the five algorithms, so that they are comfortable using them after the training

It was also pointed out that it was important to ensure the continuity of the PEC services when PHC staff are transferred from one PHU to another.

Integration of new skills in practice: equipment and medical supplies

PEC trainees were provided with a manual and basic equipment to use in clinics, including a visual acuity chart for distance and near, a distance measurement tape, algorithms, touch light, primary eye care manuals and spectacles:

> "We were given things like books, spectacles, concave [lens], a near vision chart, a distance vision chart. They also gave us algorithms, one up to five, and a test chart." Key informant interview, facility worker, Kailahun.

Some participants, however, said that the spectacles with different lenses that were given to them after the training were supposed to be used as prototypes only. To receive their own pair of spectacles, patients were referred to the hospital:

> "They ... gave us three [types of] glasses which they asked us to be using in our centre, to know the vision of the patient when they report eye problems. They gave us number 1, number 2, and number 3 as specimens, they told us that if anybody wants glasses, we should refer them [to] the government hospital and to our eye focal person who stays in Mong." Facility survey, facility staff, Falaba.

PEC trainers interviewed also confirmed that trainees were given some basic equipment they needed. However, spectacles for prescription to patients were not available in some facilities due to the lack of financing:

> "They [trainees] have a visual acuity chart; this is a special one that utilises very minimal of their time. They have a 3 metre rope to measure [the distance from the chart] and even the spectacles that they should be using to check the eyes. However, the spectacles that they are supposed to dispense …[are] not available because of cost issues." Key informant interview, PEC trainer, national level.

PEC trainees were also provided with referral forms to refer patients with complex eye conditions to hospitals. All PHU respondents verified that they still had their copies of the WHO PEC manual with them in the facility. About a third of them said that they had participated in an eye care training prior to the PEC training, but could not specify which training it was, who led it, or which topics were covered.

Some interviewees suggested creating a system, where each facility, where PEC trained staff are deployed, receives a small consignment of medications as a start-up kit which they can restock on a cost-recovery (user fee) basis, with a clear system of accountability and setting up a bank account/mobile money account. It is believed that this system will help PEC trainees to practise their new skills and increase their confidence, although it remained unclear from the interviews how these additional user fees may affect the demand and uptake of eye care services at the primary care level. Having PEC trained staff in the PHU should have a number of positive outcomes. The community gains access to advice and treatment from those who have had PEC training; where they are unable to carry out treatment with medications or ready-readers at the PHU, they can refer patients elsewhere – the referral will have credence and the patient will be aware that his/her eye condition requires attention.

Some participants also suggested that to improve the availability of basic medicines and supplies in the PHUs, the district hospital eye care units/regional eye care projects could support highly performing PEC PHUs, to act as small resource centres, where other PEC PHUs would procure their eye medications and reading spectacles instead of having to travel all the way to the regional headquarter town to procure them.

Integration of new skills in practice: staff supervision

Study participants explained that OCHOs and other eye care specialist staff were assigned to supervise and monitor the performance of PEC trainees through regular visits or combined with other monitoring activities. However, the delivery of such supervision in practice was challenging due to the lack of financing earmarked for facility visits. PEC supervisors had to wait until the financing was made available to them; they also tried to combine supervision activities with outreach activities. But the funding was largely only available through INGO partners:

> "We do undertake a lot of activities in the regions... we receive funds from Sightsavers, [when] we go to these districts .... With regards [to] the monitoring and supervision, we make sure we go together with these [outreach] health workers to these communities. That is, the eye committee ... and the DHMT, all of us will come together to do the monitoring. We call this process 'joint monitoring supervision'." Key informant interview, OCHO, Falaba.

It was further noted that WhatsApp[71] was extensively used by health care workers for informal communication and colleagues' support. All PHUs mentioned having

> "… a WhatsApp group where, if you have any difficulty with service delivery, you can explain it and there are experts like the DMO, DHS, CHA and many others that help with any uncertainty that is posted on the forum. Facility survey, facility staff, Kailahun.

Following the PEC training, PEC trainees and eye care staff formed WhatsApp groups for the purpose of sharing information and discussing specific patient cases:

> "…good thing is that immediately after the PEC training in Falaba and Koinadugu we set up a WhatsApp group where we discuss conditions. People take photos of some of these conditions and then send them in the group, so if any one of us...or any other ophthalmic person happens to see the picture he or she will comment and give directions on what to do. Those cases that they can manage we can give directives and those cases that need referrals will be referred." Key informant interview, OCHO, Falaba.

WhatsApp groups were also reported to be used for the purpose of further online learning; for some staff, it was the only opportunity to discuss their eye care experiences with their colleagues:

> "WhatsApp ...[groups] were set up immediately after the PEC training as... a way of ... online learning; an opportunity, which would further support the training that they had already received." Key informant interview, senior manager, INGO.

Staff working on NTDs also said that WhatsApp was their main way of communicating with colleagues, including setting up meetings and online communication:

> "We do not have many opportunities for online digital learning. The only online tool we have is the WhatsApp that we use to communicate and coordinate meetings." Key informant interview, NTD manager, Pujehun.

Integration of new skills in practice: referrals

Study participants pointed out that eye care services provided at the PHU level were basic; and staff dealt primarily with identifying eye conditions, providing treatment for minor illnesses, and referring more difficult cases to the higher (usually secondary) level. Interviewees further explained what the process of referral looked like and how the patient referral form was used:

> "In the process of referral, we take their [patients'] names and other details before we send them [to the hospital]. After sending them, we will call at the referral centre and will pave the way for them. For instance, if am sending a patient I will call the ophthalmologist and tell them about the condition and referral. I also give the contact number to the patient so when they reach the hospital they call if required. After the treatment, the doctor will also write his own comments in the same referral paper that I give to the patient. The referral paper has two sections, one of the sections contains information about the nurse that is making the referral, and the other section is for the doctor who will have to provide treatment and then will write his own report." Key informant interview, SECHN, Kailahun.

WhatsApp groups were also used for communicating information on patients referred to the hospital and for tracking their referrals.

Study participants commented on the referrals for NTD case management. They explained that PHUs are responsible for identifying and referring NTD cases to higher level cadres in the health system. For example, for lymphatic filariasis, annual MDAs are undertaken by PHUs, but hydrocele, a complication of LF, has to be referred to hospitals. Similarly, trichiasis, a clinical manifestation of trachoma infection, has to be managed at levels higher than PHUs:

> "Cases of hydrocele are referred to Pujehun government hospital ... I think the programme is ongoing now, as we speak. PHUs have been charged with the responsibility of identifying cases of hydrocele in their community and they refer these to Pujehun government hospital for ... surgery". Key informant interview, PEC facilitator, Bonthe.

The WHO PEC Master Trainer also confirmed that the PEC trainees were only trained on how to identify a health condition and then refer it for management:

> "In the case of trichiasis, we did not train them to epilate because we really think that the instrument is not readily available, and we do not want them ... to do something to cause more damage. But yes, they were trained how to pick this [trichiasis] out and refer the patient to the district or regional hospital

where they have the required instruments and know how to handle it." Key informant interview, Master Trainer, national.

It was further explained that PHC workers were trained on how to treat basic eye conditions such as conjunctivitis, removal of a foreign body (but not those that are embedded), check refraction using the visual acuity chart, itchy eye and minor trauma. The decision to treat or refer according to the WHO PEC Master Trainer, is guided by five colour-coded algorithms that were extracted from the WHO manual and given to the PEC trainees. For certain complex conditions, such as severe trauma, the PHC workers had to make immediate emergency referrals:

> "Trainees were given laminated colour-coded algorithms that would guide them in their decision-making. They know that when I see red as the final decision that type of referral should be urgent. The code makes it so easy for them even without reading. If it is green, you will say okay, I am going to take this action I am not going to refer but I am going to take an action." Key informant interview, WHO PEC Master Trainer.

In cases where trainees were permitted to treat on their own, they were expected to monitor and refer where there was no improvement.

OCHOs in the district health facilities reported that they were satisfied with how PEC trainees were able to sensitise community members to visit local health centres with eye problems, and highlighted an increase in community interest in eye care and in the number of referrals since the training. OCHOs at the district health facilities also praised the activities of the PEC trainees in saving patient eyesight by preventing them from seeking care from traditional healers. The OCHOs pointed out that although the diagnosis of the health conditions referred was not always accurate, the fact that these conditions were referred was commendable. Additionally, interviewees from the district health facilities highlighted that due to the management of simple eye conditions at the PHU levels, specialist eye workers at the district level were no longer overwhelmed by the number of cases presenting in their facilities:

> "It has reduced the workload because patients with minor eye conditions no longer come here; they are taken care of at the PHUs. Health workers are now issuing glasses and they are doing it correctly." Key informant interview, OCHO, Pujehun.

According to the OCHO in Pujehun, the major cases that were now referred to the district level were trauma, glaucoma, cataract, redness of the eye and minor surgical problems like pterygium, pinguecula and other small lumps in the eye. They received on average 30 of such cases per month. In Falaba, the referral cases were eye infections, trauma, cataracts and congenital conditions. According to the OCHO in Kailahun, the major cases referred to him were trauma, cataract, glaucoma and bacterial conjunctivitis. He commented specifically on the cases of eye trauma due to accidents or violence:

> "Even though these trauma cases happen to people of all ages, younger people are the most affected. For males, it starts from as early as age 12 up

> to 50 with motor bike accidents without helmets and sometimes beeto[3] getting into the eyes. For women, as early as 15 up to 50, most of the cases are caused by domestic violence." Key informant interview, OCHO in Kailahun.

However, several participants noted that although the number of referrals for eye problems had increased overall, not all referred patients visited hospital, mainly due to the challenges with transportation, poor road networks and costs associated with the commute. So, the staff at the PHU had to continue chasing the cases they referred. This is how one respondent from Bonthe described their system of following up on referrals:

> "The difficulty lies with the transportation because the referral ambulance we have in the district does not cover eye care or eye conditions. When we have issued a referral letter to a patient to go for further treatment and the patient does not go, after 24 hours we will make a physical check at the home of the patient. If the relative informs us that he/she went as referred, then we would call at the referral centre. We must communicate with the referral centre to get key information about the patient in the referral form. Later, the referral centre would give us feedback either through a phone call or during ...a meeting, where feedback is given on all referrals made per centre." Key informant interview, MCH aide, Bonthe.

Some interviewees reported that patients did not buy the prescribed medicines and did not take up referrals because it was too costly for them, and they preferred to wait in the hope that their condition will resolve:

> "This has been our biggest challenge here. These people will come to the centre and when you write the drugs for them to buy, they won't buy them. The only time you will see a patient leaving this place to go to either Falaba, or Mongo or Makeni for treatment is when the case has gone out of our hands. When the case is a minor one even if you refer them, they will not go." Key informant interview, MCH aide, Falaba.

Some participants said that if all facilities had the required medication and could treat simple eye conditions on site, their referrals will be more effective. Patients would know that they were referred because their condition requires more specialist care and would take the referral to seek help elsewhere more seriously.

Some participants reported that telephone networks were often poor and created barriers to an effective monitoring of referrals. Only one facility in Pujehun reported having access to both a landline and mobile phone, and no other facilities surveyed had access to landline phones. Most facilities in the districts studied had access to a mobile phone or a tablet which they use for referral communication.

Health information systems

For timely and effective disease surveillance and response, reliable data and information need to be shared promptly and regularly. Communications among frontline health workers at all levels are critical, especially in the health systems like Sierra Leone where access to

[3] Beeto is a small scrubby tree that grows in dry regions of tropical Africa and Asia.

health care is influenced by the distance to the nearest health facility and health workers' ability to reach patients and communicate with them regularly and effectively. The health management information system (HMIS) unit in the Directorate of Policy, Planning, and Information (DPPI), MoHS is responsible for setting up appropriate systems to collect, store and analyse routine health information at all levels of health service delivery[72]. This unit manages the district health information systems 2 (DHIS2) platform, a central repository for routine health data.

Study participants pointed out that the HMIS in Sierra Leone used a bottom-up approach, where data is collected at the health facility level and passed through the DHMTs to the national level in a standardised format. At the time of the study, health data was mostly collected on paper, summarised and reported electronically. In each DHMT, there was at least one M&E officer and one disease surveillance officer who coordinated data collection, management and dissemination in various districts:

> "Once a patient comes to the health facility, we ask for her/his name, address, age, occupation and .... about a particular disease s/he has come to report. We then enter that data in the register." Key informant interview, facility worker, Kailahun.

Study participants further explained that patient information is collected daily and entered into a designated form to be sent to the DHMT. The DHMTs collate this information in the summary reporting forms and enter it in the computer or tablet for reporting:

> "We access data based on the forms we collect. We have registers and summary forms given to all PHUs and, in the register, they will state the name and diagnosis of any patient. The information is transferred into the summary reporting form, so at the end of the month they bring it to us; we input it in the computer, we have a software called DHIS2[4] and that is where we do our analysis." Key informant interview, member of staff, DHMT, Bonthe.

Data entry is paper based because most PHUs do not have computers and internet connectivity (see Table 3). This implies that most data is entered manually and delivered to the DHMT manually. Even though this system of data collection and reporting is not a problem, it is highlighted as not the most efficient method and has some challenges. A PEC trainee in Falaba reported that sometimes they hired a motorbike rider to take the data to the DHMT in Mongo by himself. In most cases, however, the staff took the data collected to the DHMT during their monthly meetings where together with the DHMT, the data was assessed, and errors were addressed:

> "We do not just input the data, we look for what we call the three Cs, that is: correctness, completeness, and consistency. We go through all the data that comes in from the PHUs, the data clerk will now enter them. Then we will do all the data checks first before sending it. At the end of the month, the specialist in Freetown will look, analyse the data, and give us feedback on

[4] DHIS2 is district health information system 2, an open source, web-based platform most commonly used as a health management information system (HMIS).

the area where we made mistakes." Key informant interview, M&E officer, Falaba.

In terms of access to the DHIS2 and HMIS data at the higher levels, the interviewees reported that data on eye conditions and NTDs was shared either electronically via the Integrated Disease Surveillance and Response (IDSR) database installed on the phones of directors, senior managers and M&E staff, or during the meetings at the district and national levels. The directors and senior managers also had access to the database using a specific code assigned to them:

> "Health care providers are making efficient use of their personal android phones to ensure that they are on track to deliver health care services, including eye and NTDs. The PHUs have an app called Integrated Disease Surveillance and Response [5] which is used to collect data from PHUs in addition to the health facility summary forms. I and senior [staff] access that data electronically; we have a phone with an IDSR database that is filled every morning and submitted to us. If there is an issue that the IDSR cannot capture, then we will call and explain the issue." Key informant interview, M&E officer in Pujehun.

It was further explained that the DPPI developed, reviewed and defined all the relevant health indicators considering both local and WHO standards. Until 2021, the HMIS collected data on one eye health indicator: eye infections. More recently, the number of eye health indicators have increased to include the following: the number of people with different eye problems – glaucoma, cataracts, trachoma, conjunctivitis, trauma and other eye infections; number of eye screenings; number of eye operations; and number of referrals. The increase in the number of indicators in the HMIS has made data harmonisation easy between those coming from the districts and those collected by the National Eye Care Programme:

> "Before, we had our own system of collecting data and reporting to our partners. The new system is of course more robust and that is what we have been using to monitor our own performance indicators. The addition of the nine indicators will help us as a programme to monitor the districts. Before now, it was difficult to harmonise the information that was collected by the DHMTs versus the one that is being collected by us. This new system has made it easier." Key informant interview, programme manager, National Eye Care Programme.

Data on onchocerciasis and schistosomiasis was also entered in the HMIS form and at the time of the study the NTD Programme was in negotiation with the MoHS to include data on LF.

The HMIS policy 2021[73] states that each health facility (public, private, NGO and faith-based), directorate, programme and DHMT shall conduct monthly data analyses of key performance indicators. All diseases, including eye conditions and NTDs, should be recorded in the health facility summary form for disease surveillance and management purposes.

[5] The Integrated Disease Surveillance and response (IDSR) is a tool for an integrated approach to disease surveillance.

Discussion

Key study findings

The study explored how eye health and NTD services are integrated within the primary health care system in Sierra Leone, both in terms of policy and practice.

Specific objective 1: Understand the requirements of the current policies, guidelines and toolkits with regards to eye care and NTD service provision at PHC level, explore the extent to which they are implemented, and identify where the gaps are.

While a number of policies govern primary care services, eye health and NTDs, operational details on how eye health and NTDs should be provided at the primary level are often missing.

The NTD Master Plan is well understood by NTD stakeholders and enables partners to channel their financial and technical support to where it is needed. But at present, the plan focuses primarily on reaching elimination targets through vertical NTD-specific support. The integration of NTD services into the general health system post-elimination is stated, but there are uncertainties about how it will be done and resourced in practice.

The WHO PEC manual provides guidelines and structure for primary health workers on basic eye treatment, referrals and making eye care services more accessible in hard-to-reach areas. Blinding NTD diagnosis and treatment is mentioned in the manual and training, but is not covered in any great detail.

The principal health care provider in Sierra Leone is the government through the Ministry of Health and Sanitation, which is responsible for health care financing, delivery and quality assurance in the country. However, financial resources currently available in health care are not sufficient to cover all population needs. Therefore, partners, such as development donors, international and national NGOs, and the private sector supplement health care financing and delivery. The funding available through these channels, however, is not sufficient and is often limited to certain programmes or population groups, such as pregnant and lactating women or children under five. As a result, out-of-pocket payments for eye care services and medicines are common, affecting access and demand for health care.

Specific objective 2: Understand the training provided to PHC workers, their perceptions about it, and how they and local ophthalmic specialists think it has influenced their management of eye conditions and the services they provide.

The recent WHO PEC training provided to primary health care workers has been well received by the trainees and specialist eye care staff. The training applies a hands-on approach, using simple terminologies, language and decision algorithms.

Both the trainees and trainers interviewed thought the training went well; it met its objectives and created a positive change in PHC worker and community behaviours. The improved skills and positive community feedback have increased the confidence of the trainees to deal with eye problems in their facilities. Ophthalmic specialists felt that they were now making better-informed referrals, which have reduced the workload of the specialist secondary facilities' staff. Specialist eye care staff also believed that more people could now access examination and treatment for their eyes.

Even though NTDs did not form part of the WHO PEC training per se, the link between NTDs and eye conditions was discussed, and the trainees were trained on how to identify those with blinding NTDs symptoms and refer them for treatment.

Specific objectives 3 & 4: To understand how PHCs are currently set up, financed, equipped with permanent and consumable goods and supported to manage patients presenting with eye conditions and NTDs.

One of the key issues identified in this study was that many primary care settings across all study districts were extremely under resourced, lacking basic amenities, consumables and medications. This made the application of the newly acquired skills in practice difficult. In addition, this affected the morale of health workers since the delivery of services without the essentials was frustrating.

Many facilities involved in the study did not have electricity. The main source of electricity for those that had it was solar power, followed by on-site generators. The National Essential Medicines List and the Basic Package of Essential Health Services specify a list of key drugs that should be available in health care facilities for eye care. However, the documentary analysis, facility audit and interviews showed that most of these drugs were not available in the health facilities on a regular and sustained basis. PEC trainees reported that even though they had been trained and given tools to treat simple eye conditions, there were no appropriate drugs to do it and they had to refer patients to upper-level facilities, even though they had skills to treat them. The facility survey showed the lack of basic drugs for eye care such as chloramphenicol, antibiotic ointment, sodium cromoglycate drops, gentamicin eye drops and tetracycline eye ointment.

Training of eye health professionals without the accompanying system strengthening is not sufficient to improve access to health care in remote locations. PEC trainees reported that because of the lack of basic medicines, they had to refer minor cases of eye illnesses, which defeated the purpose of the PEC training and task shifting.

Also, the WHO PEC training manual requires that the assessment of the eye should be done "*in a space which is properly lit*" and the person examined should be seated comfortably. This requires appropriate facility space and lighting, which most facilities visited did not have. The environment negatively affected the perception of the quality of services and accuracy of the assessment.

Specific objective 5: Explore how the health management information system captures data on eye conditions and NTDs, explore the barriers faced in capturing data, and understand if and how that data is used at different levels of the health system.

The HMIS collects data using the DHIS-2 platform. Data on eye conditions and NTDs are captured at the PHU level and later transferred to the DHMT M&E unit where it is entered into the DHIS. The DHIS captures the data on specific service delivery indicators and a registration book collects basic information about the patient which includes name, telephone number, sex, age, health conditions, history of illness and the number of times the patient has visited the facility. The data collected is the same for all patients, including NTD patients. The captured data is processed to report on DHIS-2 platform on several indicators for planning and health service management purposes: the number of people with different eye

conditions (glaucoma, cataracts, trachoma, conjunctivitis, trauma, eye infections), the number of people screened, received treatment, or referred.

At present, most facilities capture data manually, and the information systems available in the facilities are very limited. For example, none of the health facilities surveyed in Bonthe and Falaba had computers. Even though a few health facilities in Kailahun and Pujehun had access to computers, none of them stored data electronically, the situation which the directorate in charge of PHC was seeking to address; and the government's intention to move to electronic data collection systems was noted in the study. If delivered at scale, electronic data capturing can significantly improve data collection processes and planning, including timely procurement of medicines and resource allocation.

Specific objective 6: Explore the current approaches used by PHCs to make referrals to specialist providers, understand where challenges exist, and identify examples of success.

PEC trainees were given five colour-coded algorithms that guide them on the eye conditions to either treat or refer. These algorithms for referral appeared to be simple but robust and most PEC trainees understood them well. Study interviewees also showed their commitment to following up on referrals made, including effective communication using the WhatsApp platform. OCHOs at the district health facilities noted higher numbers of patients referred to them. However, the uptake of referrals was reported to be an issue for many patients, largely due to high costs of transport and user fees.

The distance to referral centres, poor road infrastructure and high costs of treatment and medication were reported to be the main barriers impeding the uptake of referrals for patients from rural communities.

Implications for programmes, policy, and future research in Sierra Leone

The study has a number of implications for policy and programmes. These need to be addressed to maximise the effectiveness of the new PEC initiative.

Overall, both the PEC trainees and other eye care stakeholders were very positive about the training programme and the new knowledge and skills acquired by the PHC workers trained. The training manual and content appeared to be pitched at the right level and delivered in a clear, simple way, focusing on the competencies required at the primary level. Findings of the study suggest that the newly trained PHC workers could establish good relationships with the local communities and engage them in the conversation about their eye care needs. They could raise awareness about eye care services and conduct basic eye examinations and treatments, where the required equipment and supplies were available. This study collected only qualitative data and we cannot quantify the impact of the training in terms of increased uptake of eye examinations or reduced number of visits to traditional healers or the redistribution of patients with simple eye conditions from secondary to primary level. A quantitative study examining the number of patients presenting at PHUs, the type of conditions treated and referred and the workload of health providers at the secondary level will be needed to quantify this impact.

Insufficient funding of the health system, including its primary care level, retention of staff and high costs associated with user fees and the uptake of referrals continue to be critical issues creating barriers to the uptake of eye care services. Findings indicate that funds provided to support the functioning of PHUs are inadequate to provide a wide spectrum of services, and adding additional services, such as eye examinations, eye treatments or provision of spectacles without additional funds, creates more pressure on already stretched facilities. Most PHUs visited in this study did not have access to appropriate electricity sources; the availability of accessible toilets and WASH facilities was very limited. The space and lighting available for eye examinations was inadequate and the supply of consumables was patchy. Health workers reported having no funds to conduct outreach programmes; motor bikes, where available, could not be used, as there was no money for fuel and maintenance. As a result, the newly trained staff could not use their new skills to the extent they wanted and felt frustrated. The lack of medicines and medical supplies at the primary care level led to the situations, when simple cases that could be treated in PHUs had to be referred to the secondary level, undermining the whole purpose of task shifting and increasing patient costs.

We also found some indication that the PHU workers may be reluctant to work in the rural remote locations. One of the key purposes of task shifting is the recruitment of the lower level but locally available personnel. However, our participants suggested that the PHU staff may need to be provided with additional incentives to deliver eye care services. We did not have detailed information about the purpose of such incentives or how they can be integrated within the existing system. Some further research into staff motivation and potential performance-based schemes would be desirable.

Finally, similarly to many low-income settings, user fees and high costs of travel to secondary facilities were found to be an important factor undermining the uptake of PEC

services and referrals. We did not have details on the prices or pricing structure charged to different groups of patients in this context. There was some evidence that certain groups of patients, including older people, who are at highest risk of visual impairment may be exempt, but there was no information on how these exemption schemes work. A study into health care financing at the PHU and upper levels of the system will be needed.

As for the PEC training itself, the study indicates a need to strengthen the system of supervision and better integration of NTD topics, particularly those relevant to NTD services in the post-elimination period.

In conclusion, the study shows that, overall, the PEC training of primary care workers has been well received and has the potential to improve access to eye care and post-elimination NTD services for all people, and particularly those in remote locations. However, the weaknesses of the broader health system, such as poor infrastructure, the lack of consumables, poor motivation of staff and high patient costs needs to be addressed to maximise the effectiveness of this new task shifting initiative.

References

[1] World Health Organization (2018) “PRIMARY EYE CARE TRAINING MANUAL - A course to strengthen the capacity of health personnel to manage eye patients at primary-level health facilities in the African Region”. Brazzaville: World Health Organization. Regional Office for Africa. Licence: CC BY-NC-SA 3.0 IGO. **https://www.afro.who.int/publications/primary-eye-care-training-manual**

[2] World Health Organization (2019) World Report on Vision. Geneva: World Health Organization. Licence: CC BY-NC-SA 3.0 IGO. Available at: **https://www.who.int/docs/default-source/documents/publications/world-vision-report-accessible.pdf** .

[3] Ibid

[4] Bright T., Kuper H., Macleod D., Musendo D, Irunga P., et al. (2018) Population need for primary eye care in Rwanda: A national survey. PLOS ONE 13(5): e0193817. **https://doi.org/10.1371/journal.pone.0193817**

[5] Du Toit, R., Faal, H.B., Etya’ale, D., Wiafe, B., Mason, I., Graham, R., Bush, S., Mathenge, W. and Courtright, P., 2013. Evidence for integrating eye health into primary health care in Africa: a health system strengthening approach. *BMC health services research*, *13*(1), pp.1-15.

[6] Bukhman et.al. **The Lancet NCDI Poverty Commission: bridging a gap in universal health coverage for the poorest billion.** The Lancet 2020.

[7] Jolley E., Mustapha J., Gondoe T., Smart N., Ibrahim N., Schmidt E. Rapid Assessment of Avoidable Blindness (RAAB) report, Sierra Leone. Haywards Heath (UK): Sightsavers. 2022 43p. Available at: **https://research.sightsavers.org/wp-content/uploads/2022/06/Sierra-LeoneRAAB2021_Report_FINAL.pdf**

[8] Ref: National indicators: Vision Atlas. International Agency for the Prevention of Blindness. **https://www.iapb.org/learn/vision-atlas/solutions/national-indicators/** *Accessed 10/06/2021.*

[9] Ministry of Health and Sanitation. Human Resources for Health Strategy 2017-2021. Freetown: Government of Sierra Leone; 2016.

[10] Ibid.

[11] NEHP Pilot WHO PEC Training report.

[12] Ministry of Health and Sanitation. Government of Sierra Leone. The National Neglected Tropical Diseases Programme Master Plan for Neglected Tropical Disease Elimination in Sierra Leone 2016-2020. **https://espen.afro.who.int/system/files/content/resources/SIERRA_LEONE_NTD_Master_Plan_2016_2020.pdf**

[13] World Health Organization (2007). Everybody's Business: Strengthening Health Systems to Improve Health Outcomes – WHO's Framework for Action. Geneva, Switzerland: World Health Organization. **https://iris.who.int/bitstream/handle/10665/43918/9789241596077_eng.pdf**

[14] Global Data lab (2023) Subnational HDI, Sierra Leone. Available at: **https://globaldatalab.org/shdi/shdi/**

[15] MOPED (2023) Sierra Leone Development Encyclopaedia 2003. Falaba District Profile. Available at: **https://sldevelopmentencyclopaedia.org/2_gov/2_6falaba.html**

[16] Ibid

[17] Ibid

[18] Ibid

[19] Krippendorff, K. (2004) Content analysis: An introduction to its methodology (2nd ed.). Thousand Oaks, CA: Sage.

[20] White M.D., Marsh E.E. Content analysis: A flexible methodology. Library trends. 2006;55(1):22-45.

[21] Taylor G.A., Blake B.J. Key informant interviews and focus groups. Springer; 2015.

[22] Green, J. & Thorogood, N. 2009. Qualitative methods for health research, London, SAGE.

[23] Robinson, R.S. (2014). Purposive Sampling. In: Michalos, A.C. (eds) Encyclopaedia of Quality of Life and Well-Being Research. Springer, Dordrecht. https://doi.org/10.1007/978-94-007-0753-5_2337

[24] Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper, P. M. Camic, D. L. Long, A. T. Panter, D. Rindskopf, & K. J. Sher (Eds.), *APA handbook of research methods in psychology, Vol. 2. Research designs: Quantitative, qualitative, neuropsychological, and biological* (pp. 57–71). American Psychological Association. Available at: **https://psycnet.apa.org/record/2011-23864-004**

[25] Clarke, V., Braun, V., & Hayfield, N. (2015). Thematic analysis. *Qualitative psychology: A practical guide to research methods*, *3*, 222-248.

[26] MoHS (2021) National Health Sector Strategic Plan 2021-2025. Ministry of Health and Sanitation. Government of Sierra Leone. Available at: **https://extranet.who.int/countryplanningcycles/planning-cycle-files/national-health-sector-strategic-plan-2021-2025**

[27] MoHS (2017) Human Resources for Health Strategy 2017-2021. Ministry of Health and Sanitation, Government of Sierra Leone. Available at: **https://www.afro.who.int/sites/default/files/2017-05/hrhstrategy2017.pdf**

[28] MoHS (2015) Basic Package of Essential Health Services for Sierra Leone 2015-2020. Ministry of Health & Sanitation. Sierra Leone. Available at: **https://mohs2017.files.wordpress.com/2017/06/gosl_2015_basic-package-of-essential-health-services-2015-2020.pdf**
[29] Potter AL, Vandy, M, Smart N, and Blanchet K. I. (2013) Eye Health Systems Assessment (EHSA): Sierra Leone Country Report, Ministry of Health and Sanitation, International Centre for Eye Health, Sightsavers. Available at: **https://www.iapb.org/wp-content/uploads/2020/10/Eye-Health-System-Assessment-in-Sierra-Leone_2013.pdf**
[30] MoHS (2021) National Eye Health Policy Sierra Leone 2021-2030. Towards Attaining the Highest Possible Standard of Eye Health for All People in Sierra Leone. Ministry of Health and Sanitation. Government of Sierra Leone.
[31] MoHS (2023) Sierra Leone NTD Master Plan 2023-2027. Ministry of Health and Sanitation, Government of Sierra Leone. Available at: **https://espen.afro.who.int/system/files/content/resources/Sierra_Leone_NTD_Master_Plan_2023_2027_Final.pdf**
[32] Potter, A.L., Vandy, M., Smart, N., Blanchet, K.I., 2013, *Eye Health Systems Assessment (EHSA): Sierra Leone Country Report*, Ministry of Health and Sanitation, International Centre for Eye Health, Sightsavers.
[33] MoHS. Basic Package of Essential Health Services for Sierra Leone 2015-2020. Ministry of Health & Sanitation. (2015)
[34] MoHS (2012) Human Resources for Health Policy: "Motivated Health Workforce contributing to National Development". Ministry of Health & Sanitation. Government of Sierra Leone: Freetown, Sierra Leone. **https://extranet.who.int/countryplanningcycles/sites/default/files/country_docs/Sierra%20Leone/hrh_policy_dec2012.pdf**
[35] MoHS (2017) *Human Resources for Health Strategy 2017-2021*. Ministry of Health and Sanitation Freetown: Government of Sierra Leone.
[36] Ibid
[37] Ibid
[38] MoHS (2015) Sierra Leone Basic Package of Essential Health Services, 2015-2020. Available at: **https://mohs2017.files.wordpress.com/2017/06/gosl_2015_basic-package-of-essential-health-services-2015-2020.pdf**
[39] MoHS (2015) Sierra Leone Basic Package of Essential Health Services, 2015-2020. Available at: **https://mohs2017.files.wordpress.com/2017/06/gosl_2015_basic-package-of-essential-health-services-2015-2020.pdf**
[40] MoHS (2017) National Health Sector Strategic Plan 2017-2021. Ministry of Health & Sanitation. **https://extranet.who.int/countryplanningcycles/sites/default/files/planning_cycle_repository/sierra_leone/sierra_leone_nhssp_2017-21_final_sept2017.pdf**
[41] Potter, A.L., Vandy, M., Smart, N., Blanchet, K.I., (2013) *Eye Health Systems Assessment (EHSA): Sierra Leone Country Report*, Ministry of Health and Sanitation, International Centre for Eye Health, Sightsavers.
[42] Murthy G., Raman U. (2009) Perspectives on primary eye care. Community eye health/International Centre for Eye Health. 22(69):10-1.
[43] Sightsavers (2019) Evaluation of the Ophthalmic Community Health Officer (OCHO) training programme in Sierra Leone.
[44] Sightsavers (2019) Evaluation of the Ophthalmic Community Health Officer (OCHO) training programme in Sierra Leone.
[45] MoHS (2016) Master Plan for Neglected Tropical Diseases Elimination in Sierra Leone 2016-2020.
[46] MOHS (2017) *Human Resources for Health Strategy 2017-2021*. Ministry of Health and Sanitation Freetown: Government of Sierra Leone.
[47] MoHS (2016) Master Plan for Neglected Tropical Diseases Elimination in Sierra Leone 2016-2020.
[48] The Constitution of Sierra Leone, 1991 (Act No. 6 of 1991) and subsequent Amendment Act, 2001.
[49] Healthcare Financing Strategy 2021-2025. Available at: https://portal.mohs.gov.sl/wpfd_file/healthcare-financing-strategy-2021-2025-final-version-for-printing-19-11-21/
[50] Ibid
[51] Sierra Leone Basic Package of Essential Health Services 2015-2020.
[52] The World Bank (2021) Sierra Leone Public Expenditure Review 2021: Improving Quality of Public Expenditure in Health. Macroeconomics Trade and Investment Global Practice, The World Bank Group. Available at: **https://documents1.worldbank.org/curated/en/329991623665655127/pdf/Sierra-Leone-Public-Expenditure-Review-2021-Improving-Quality-of-Public-Expenditure-in-Health.pdf**
[53] MoHS (2021) Sierra Leone National Health Accounts 2019-2020. Government of Sierra Leone. Ministry of Health and Sanitation, Directorate of Policy, Planning and Information.

[54] The World Bank (2021) Sierra Leone Public Expenditure Review 2021: Improving Quality of Public Expenditure in Health. Macroeconomics Trade and Investment Global Practice, The World Bank Group. Available at: **https://documents1.worldbank.org/curated/en/329991623665655127/pdf/Sierra-Leone-Public-Expenditure-Review-2021-Improving-Quality-of-Public-Expenditure-in-Health.pdf**
[55] Performance-based financing (PBF), often referred to as pay-for-performance (P4P) or results-based financing (RBF), refers to payment to a government, organization, or individual conditioned on taking measurable actions toward or achieving desired goals. Source: Bertone et al. BMC Health Services Research (2016) 16:286 DOI 10.1186/s12913-016-1546-8
[56] Fritsche, G. B., Soeters, R., & Meessen, B. (2014). *Performance-based financing toolkit*. World Bank publications.
[57] World Bank. RBF Health. Available from: **http://www.rbfhealth.org/mission**
[58] The World Bank (2021) Sierra Leone Public Expenditure Review 2021: Improving Quality of Public Expenditure in Health. Macroeconomics Trade and Investment Global Practice, The World Bank Group. Available at: **https://documents1.worldbank.org/curated/en/329991623665655127/pdf/Sierra-Leone-Public-Expenditure-Review-2021-Improving-Quality-of-Public-Expenditure-in-Health.pdf**
[59] MoHS (2016) Master Plan for Neglected Tropical Diseases Elimination in Sierra Leone 2016-2020.
[60] MoHS (2021) Sierra Leone National Health Accounts 2019-2020. Government of Sierra Leone. Ministry of Health and Sanitation, Directorate of Policy, Planning and Information.
[61] Chukwu E., Garg L., Foday E., Konomanyi A., Wright R., and Smart F. (2022) Electricity, Computing Hardware, and Internet Infrastructures in Health Facilities in Sierra Leone: Field Mapping Study. JMIR Med Inform. 10(2): e30040. doi: 10.2196/30040. PMID: 35113026; PMCID: PMC8855303.
[62] WHO (2010) Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies. World Health Organization. Available at: **https://iris.who.int/bitstream/handle/10665/258734/9789241564052-eng.pdf**
[63] Energy consumption in Sierra Leone. World Data info. [10-02-2024]. Available at: **https://www.worlddata.info/africa/sierra-leone/energy-consumption.php .**
[64] MoHS (2015) Sierra Leone Basic Package of Essential Health Services, 2015-2020. Available at: **https://mohs2017.files.wordpress.com/2017/06/gosl_2015_basic-package-of-essential-health-services-2015-2020.pdf**
[65] WHO (2016) National Essential Medicines List 2016. Sierra Leone. Available at: **https://platform.who.int/docs/default-source/mca-documents/policy-documents/essential-medicines-and-equipment/SLE-MN-78-01-EMD-2016-eng-National-Essential-Medicine-List-2016-Sierra-Leone.pdf**
[66] MoHS (2015) Sierra Leone Basic Package of Essential Health Services, 2015-2020. Available at: **https://mohs2017.files.wordpress.com/2017/06/gosl_2015_basic-package-of-essential-health-services-2015-2020.pdf**
[67] PRIMARY EYE CARE TRAINING MANUAL - A course to strengthen the capacity of health personnel to manage eye patients at primary-level health facilities in the African Region... Brazzaville: World Health Organization. Regional Office for Africa; 2018. Licence: CC BY-NC-SA 3.0 IGO.
[68] MoHS (2017) Human Resources for Health Strategy 2017-2021. Available at: **https://www.afro.who.int/sites/default/files/2017-05/hrhstrategy2017.pdf**
[69] MoHS (2017) National Health Sector Strategic Plan, 2017-2021. Available at: https://extranet.who.int/countryplanningcycles/sites/default/files/planning_cycle_repository/sierra_leone/sierra_leone_nhssp_2017-21_final_sept2017.pdf
[70] Report on Pilot Primary Eye Care Training in Four Districts in Sierra Leone (MoHS).
[71] WhatsApp is a free messaging and video calling app.
[72] MoHS (2021) Sierra Leone Health Information System (HIS) Policy. Government of Sierra Leone, Ministry of Health and Sanitation.
[73] Ibid