

DISSERTATION

ASSESSMENT OF THE EXTENT TO WHICH THE VISION 2020 EYE CARE SERVICE
DELIVERY TARGETS HAD BEEN MET IN BURUNDI BY 2015

A DESCRIPTIVE CROSS-SECTIONAL STUDY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT FOR THE AWARD OF A
DEGREE OF MASTER IN MEDICINE (OPHTHALMOLOGY)

UNIVERSITY OF NAIROBI

DECLARATION

I declare that this dissertation is my original work and has not been presented for award of a degree in any other university.

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DEDICATION

To my wife Lyse IRAKOZE and my children Naïra Nera NINZIMA and Ben Karel IRISHURA,

You encouraged me to go ahead even when times were hard, very hard and uncertain;

You accepted and bore hard my long absence in the family;

This dissertation is fruit of your patience.

ACKNOWLEDGEMENTS

This research was made possible by Lions Hilfswerk Bayern Sud members, who financially supported not only this study but also my entire Ophthalmology course,

Dr. Emmanuel Muindi NYENZE and Prof. Jefitha KARIMURIO made this research an easy task by their availability and spontaneity, their sense of a polished work gave me motivation to carry out the best,

Dr. Lévi KANDEKE showed me the essential and therefore made the field visit well-structured and efficient,

That every one of you finds in this dissertation their own success and another step made towards the Vision 2020 targets.

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LIST OF ACRONYMS

CSR:	Cataract surgery rate
DALY:	Disability adjusted life year
DR:	Diabetic retinopathy
Dr.:	Doctor
FA :	Fluorescein angiography
FEACO:	Fellow of East African college of ophthalmology
IAPB:	International agency for prevention of blindness
IOL:	Intra-ocular lens
M.MED:	Masters of Medecine
MB.ChB:	Medecinae Baccalaureus, Baccalaureus chirurgiae
MSc-CEH:	Masters Degree in Science-Community Eye Health
MFPDE:	Ministère des Finances et du Plan pour le Développement Economique
MSPLS:	Ministère de le santé Publique et de la Lutte contre le Sida
NCPBL:	National committee for prevention of Blindness
NTD:	Neglected tropical Diseases
OCO:	Ophthalmic clinical Officer
OCT:	Optical coherent tomography
ON:	Ophthalmic nurse
Ophth:	Ophthalmology
OT:	Operating theatre
NGO:	Non government organisation

Phaco:	Phacoemulsification
SAFE:	surgery/antibiotics/Face-washing/environmental change
SICS:	small incision cataract surgery
USD:	United states Dollars
WHO:	World Health Organisation

ABSTRACT

Purpose: To conduct a situation analysis of the implementation of VISION 2020 “The Right to Sight” global initiative in Burundi.

Methods: This was a descriptive cross-sectional study targeting District, Regional, and National Hospitals in Burundi. Structured questionnaires were used to collect data on number and distribution of different cadres of eye personnel, infrastructure and equipment, Cataract surgical rate achieved one year prior to the study, availability of coordination, structure and membership of a prevention of blindness committee, eye training programmes and access to eye care services. Data were compiled in 7 ophthalmic regions.

The recommendations of Vision 2020 were used to benchmark resources as meeting, exceeding or not meeting targets.

Results: There was a National committee for Prevention of Blindness in place in Burundi even though it was operating on outdated strategic plan of 2006-2011 and managed to meet only once in 2011, 2013 and 2014 and no meeting in 2012 and 2015. Burundi had not met any of the Vision 2020 targets for human resources. The country had achieved the following: 37.5% of the target for Ophthalmologists, 66.0% for Ophthalmic Clinical Officers and 5.1% for Optometrists. The mean deficit for all cadres was 72.8%. Out of the 15 ophthalmologists in Burundi, 80% were based in Bujumbura with 4 out of 7 regions having no ophthalmologist at all. Sixty eight percent of eye care facilities belonged to private sector and 75% were in urban areas. The Cataract Surgical Rate for 2015 was 138. The ratio of ophthalmologists who performed cataract surgery to those who did not was 1:3.75. All the centres well equipped to offer refractive services whereas there were only two centres equipped with laser for management of diabetic retinopathy and three centres equipped with Visual fields for follow up of glaucoma patients.

Conclusions: Burundi had not met the targets for human resources by 2015. Most of eye care services were concentrated in the capital Bujumbura leaving most of other areas grossly underserved. Most of eye care activities were offered by the private sector. Only refractive services were available in most centres with inadequate equipment for management of diabetic retinopathy and glaucoma. The CSR was low and most ophthalmologists were not performing cataract surgery.

CHAPTER ONE: INTRODUCTION

1.1 Problem statement

The global initiative known as ‘VISION 2020: “the Right to Sight” is an established partnership between the World Health Organization (WHO) and the International Agency for the Prevention of Blindness (IAPB). It was launched in 1999 with the twofold aims of eliminating avoidable blindness by 2020 and preventing a projected doubling of avoidable visual impairment.

The ultimate goal of the initiative is to integrate a sustainable, comprehensive, high-quality, equitable eye care system into strengthened national health-care systems(1,2).

The prevention of blindness in Burundi was not enough documented and very little was known about human resources, infrastructure and eye care services available to population.

The World Health Organization estimates that 0.5 to 2 % of Burundians are blind and another 1-2% suffers from low vision even after treatment (3–5).The absence of programmes focusing on avoidable blindness prevention in the country resulted in absence of accurate information.

In 2012, a rapid assessment of avoidable blindness conducted in the north region of Burundi showed a 1.1% (95% CI: 0.8-1.4)prevalence of blindness(6). The study found that there were scanty eye-care services in the region. Some efforts to prevent avoidable blindness were made by different stakeholders but this needed monitoring, coordination and clear plan for the future.

Burundi is a landlocked country located in the eastern Africa region. It is one of the most overpopulated countries in Africa with an average population density of 310 inhabitants per square kilometre with 10% of the population living in urban areas. The main source of income for 90% of Burundians is agriculture. The number of health care providers is low, with approximately 1 physician for every 10,000 people(7). Needs for avoidable blindness prevention include human resources, well equipped health facilities, and an effective co-ordination. All these must evolve proportionally to the general population growth, especially the ophthalmic population who needs more eye care attention.

In 2013, the “*Institut de Statistiques et d’ Etudes Economiques du Burundi* (ISTEEBU), an institution in charge of statistics and economic studies in Burundi, published projections of population from 2008 up to 2030.(8) The population was expected to shift from 9,823,828 inhabitants in 2015 to 11,215,578 inhabitants in 2020. In the same perspective, human resources and equipment providing eye care service should increase in the same proportions if the Vision 2020 targets are to be met.

The number of eye health facilities reported from different sources by 2014 in the provinces of Burundi shows that Bujumbura the capital city had all national referral hospitals. Three out of four were providing eye care services (Table 1).

The table reflects a situation where eye care services are unevenly distributed.

Table 1: Distribution of eye care facilities in different regions of Burundi in 2014

Province	Public hospitals		Mission hospitals		Private clinics	Total
Bujumbura capital city	3***		2*		9	14
Bujumbura	0		0		1	1
Bubanza	0		0		1	1
Bururi	1**		0		2	3
Cankuzo	0		0		1	1
Cibitoke	0		0		1	1
Gitega	1**		1*		3	5
Karuzi	1**		0		1	2
Kayanza	1*		0		2	3
Kirundo	1*		0		1	2
Makamba	0		0		2	2
Muramvya	0		0		0	0
Muyinga	0		0		1	1
Mwaro	1*		1°		1	3
Ngozi	1**		1*		3	5
Rutana	0		0		1	1
Ruyigi	0		2		1	3
Total	*	3	*	2	31	48
	**	4	°	5		
	***	3				

District level hospital, **Regional level hospital, *National level, °Non classified*

1.2 Objectives

1.2.1 Broad objective

The broad objective of this study was to conduct a situation analysis of the implementation of VISION 2020 “The Right to Sight” global initiative in Burundi.

1.2.2 Specific Objectives

Specific objectives were to assess the:

1. Level of achievement of the VISION 2020 targets for human resources in Burundi
2. Adequacy and status of eye care infrastructure, equipment and supplies
3. Provincial and national Cataract surgical rates (CSR) for the year 2014
4. Availability and effectiveness of eye care coordination structures for Government and non-governmental eye care actors at all levels of health care services

The following activities were accomplished to fulfil the above objectives:

- Determination of the number and cadres of health care staff working in eye health, according to qualifications
- Establishment of the number and geographical distribution of facilities providing eye health services
- Determination of ownership structure of eye health facilities
- Ascertainment of information on ophthalmic equipment available within the country, including its reported state of repair
- Comparison of reported operational capacity, availability of human resources and equipment across provinces and between rural and urban areas
- Assessment of the existence of a clear plan for continuous chain supply of consumables
- Evaluation of Burundi’s progress towards Vision 2020 targets using CSR as the key indicator.

1.3 Literature review

1.3.1 Definition of related terms

1.3.2 Visual impairment and blindness

Blindness and low vision are conventionally measured and defined in terms of visual acuity and of reduction of visual field. Each country has its own definition of blindness for legal and social purposes but WHO has proposed a standard definition reflected in Table 2 below.

Table 2 : Revised WHO categorization of blindness and visual impairment (2)

Presenting distance visual acuity with available correction			Visual field from central fixation
Category	Worse than	Equal or better than	
0.mild or no visual impairment		6/18(0.3) or 20/70	
1.moderate visual impairment	6/18(0.3) or 20/70	6/60(0.1) or 20/200	
2.severe visual impairment	6/60(0.1) or 20/200	3/60(0.05) or 20/400	
3.Blindness	3/60(0.05) or 20/400	1/60(0.002) or 20/1200	5°<radius<= 10°
4. Blindness	1/60(0.002) or 20/1200	Light perception	radius<= 5°
5. Blindness	No light perception		

1.3.3 Avoidable blindness

Avoidable blindness is defined as blindness which can either be treated or prevented by known means. VISION 2020 aims at addressing main causes of avoidable blindness, in order to have the greatest possible impact on vision loss worldwide. 85% of blindness is avoidable.(9–12)

1.4 Priorities for VISION 2020

Priority setting is done to ensure that the eye care programme starts where success is easier or more likely to be achieved. The criteria used include:

- Magnitude of the disease/condition (number of people affected or number of disability adjusted life years (DALY) attributable to the condition)
- Cost of treatment
- Feasibility of control

Initially, VISION 2020 focused on five 'priority' diseases:

1. Cataract
2. Refractive error
3. Onchocerciasis
4. Childhood blindness
5. Trachoma

The focus has later broadened to include important chronic diseases namely diabetic retinopathy, glaucoma and age related maculopathy(1–3).

1.5 Strategy for implementation

The concept of VISION 2020 is built upon four essential components:

1. Cost-effective disease control interventions. The action plan recognises that the diseases given priority are the main causes of blindness and visual impairment in many countries, and that effective treatment strategies were becoming more defined and available.
2. Human resources development (training and motivation) at all levels of health system particularly in Sub Saharan Africa, where on average there is only one ophthalmologist per million populations. To be efficient, an ophthalmologist needs to work in a team with optometrists, ophthalmic assistants and community assistants. Human resources needed for VISION 2020 are therefore both clinical and non-clinical.

3. Infrastructure development (facilities, appropriate technology/consumables, funds). The vision requires necessary diagnostic and surgical equipment and consumables to manage at least the five top priorities' causes of blindness. As services develop, equipment for diabetic retinopathy and glaucoma can be added. Equipment which is not used indicated or inadequately maintained leads to wastage and should be avoided.
4. Advocacy at global, national and local level is a key part of VISION 2020. The change in countries can only occur with government support(1).

1.6 VISION 2020 targets

The VISION 2020 targets were decided in accordance with the level of actual development of eye-care service delivery in the different WHO regions. Therefore, the reported targets are specific for African region (1,2,13).

1.6.1 Coordination

Each country was encouraged to put in place a national committee and draw up an action plan to achieve the Vision 2020.

1.6.2 Human resources

The targets for different cadres for sub-Saharan Africa are as follow:

- 1 Ophthalmologist for 250,000 population
- 1 Optometrist for 250,000
- 1 Refractionist for 100,000 population
- 1 Ophthalmic nurse for 100,000 population
- 1 Clinical officer for 200,000 population
- Community -based health workers were recommended without clear targets.

Based on the demographic projections, the Vision 2020 targets for Burundi can be deduced as shown in Table 3.

Table 3: Provincial estimation of human resources needs by 2015

Province	Population	Ophthalmologists	Optometrists	Refractionnists	Ophthalmic nurses	Ophthalmic Clinical officers
BUBANZA	412324	2	2	4	4	2
BUJUMBURA RURAL	678132	3	3	7	7	3
BURURI	700187	3	3	7	7	4
CANKUZO	279182	1	1	3	3	1
CIBITOKI	561643	2	2	6	6	3
GITEGA	884634	4	4	9	9	4
KARUSI	532377	2	2	5	5	3
KAYANZA	714091	3	3	7	7	4
KIRUNDO	766353	3	3	8	8	4
MAKAMBA	525615	2	2	5	5	3
MURAMVYA	356903	1	1	4	4	2
MUYINGA	771419	3	3	8	8	4
MWARO	333570	1	1	3	3	2
NGOZI	805949	3	3	8	8	4
RUTANA	406819	2	2	4	4	2
RUYIGI	488570	2	2	5	5	2
BUJUMBURA MAIRIE	606448	2	2	6	6	3
TOTAL	9823828	39	39	98	98	49

1.6.3 Infrastructure, technology and consumables supply

The target was to set appropriate number of infrastructure at primary, secondary and tertiary levels in each country's national VISION 2020 plan and to ensure an optimal supply of appropriate, high-quality, affordable equipment, instruments, consumables and resource materials essential for delivery of eye-care services.

1.7 National Eye Health and Prevention of Blindness Plans

In Burundi, blindness prevention is integrated into the programme for Neglected Tropical Diseases (NTDs). It is therefore a small entity with less attention compared to other health units which may attract more funding.

As per December 2006, it was reported that an action plan for blindness prevention in Burundi was at the draft level(1,14).

Experience has shown that, in low- and middle-income countries, a comprehensive national plan containing targets and indicators that are clearly specified, time-linked and measurable leads to substantially improved provision of eye health-care services(14).

Most low- and middle-income countries (104 Member States by the end of 2008) have reported the development of national eye health and blindness prevention plans but reporting on and assessment of their implementation and impact have been insufficient. Some national plans do not include measurable targets, an implementation timeline and adequate tools for monitoring and evaluation. In some countries, the plans have only been partially implemented(15).

Because of lack of resources and leadership, some countries have made only slow or fragmented progress and their plans for eye health and national prevention of blindness have not yielded tangible improvements in the provision of eye-care services(15).

It is necessary to ensure that the implementation phase of national plans is well- managed, and a standardized approach to monitoring and evaluation of national and sub-national eye health and blindness-prevention plans must be taken.

1.8 Overview of Human Resources and Infrastructure of Eye Health Service

In June 2006, the vision 2020 human resource development working group performed a global assessment for comprehensive eye care. The study used specific targets for each region in respect of Vision 2020 targets. At that date, Burundi had only one ophthalmologist for a 1,040,286 population. This meant that there was a deficit of 19 ophthalmologists to meet the target of 1 ophthalmologist for 500,000 population(5). The study reported there was no optometrist. The

proportion of ophthalmic allied personnel was as low as 1 for 809,111 populations and an additional 73 were required to meet the set targets.

Aggregated data from the same study showed that Africa as a whole met the VISION 2020 targets for human resources. However, disaggregation of data revealed a lot of disparities among countries and within countries.

Out of 46 countries in Africa region, only 14 countries (30.43%) met the targets for ophthalmologists, 3 countries (6.52%) for optometrists and 15 countries (32.60%) for ophthalmic allied personnel (13).

Morjaria P et al. found that Kenya had less than 1/3 of recommended workforce for refraction services; Nairobi being the best served with 56.8% of eye care personnel. The lack of essential equipment for refraction services was generalized(16).

In one study comparing three countries, the ophthalmologist to population ratio was 1:300,000 in Nigeria, 1:85,000 in Pakistan and 1:23,000 in Saudi Arabia Kingdom(17).

Despite the disparity between the different regions, Murthy et al in their study showed that India was comfortable to achieve the targets of 1 ophthalmologist for 50, 000 population and 1 dedicated eye bed for 20, 000 populations by 2020 while 1,000 cataract surgeries per 1,000,000 populations were expected(18).

Boniface Ikenna and Ferdinand Chinedu assessed the eye care workforce in Enugu State south-eastern Nigeria in 2009. The state as a whole met the Vision 2020 targets. However, misdistribution of the workforce was a major barrier to uptake of eye care services(19).

Recently, a meta-analysis study published in 2014 analysed data for 21 sub-Saharan countries. Only Botswana, Sudan and Senegal met the Vision 2020 for surgeons and Kenya and Gambia could achieve the targets should the cataract surgeons be included. Ten countries were less than half way to meeting the targets(20).

According to the same study, the targets for ophthalmic clinical officers and ophthalmic nurses were met by Botswana, Gambia, Ghana and Togo only. No one of the participating countries had enough refractionists recommended by Vision 2020.

The same authors analysed trends and implication for achieving the Vision 2020 in the 16 sub-Saharan Africa countries and discovered that, whilst some countries had already achieved the Vision 2020 targets, some countries like Togo were at risk of falling below target by 2020, and others like Sierra Leone would not have clinical officers at all because of the entry-exit rate of workforce(21).

Another important consideration was the projection of ophthalmic workforce to ophthalmic population. Resnikoff et al. found in their study in the year 2011 that on average, the population aged 60s was growing more than twice as fast as the number of ophthalmologists. This implied that in a number of countries, both developing and developed, it will be extremely challenging to train enough ophthalmologists to provide the care that will be needed in the years to come(22).

Although recent technological developments in eye care have resulted in advanced methods of diagnostics and treatment, the cost of properly equipping a secondary and/or tertiary eye-care centre is prohibitive for many low-income countries (23).

Despite the fact that many of these studies targeted sub-Saharan Africa, they overlooked Burundi hence the same methods should be used to produce comparable results.

CHAPTER TWO: JUSTIFICATION OF THE STUDY

Review of literature revealed there was scanty information on blindness prevention activities in Burundi. The blindness prevention unit was a small part of a nation-wide health programme for Neglected Tropical Diseases (NTDs).

While the diseases associated with a high rate of mortality and communicable diseases were top priorities in low income countries in general, it was unfortunate that in Burundi public eye care services were left behind.

Most of activities related to blindness prevention in Burundi were focusing on Onchocerciasis and Trachoma only. There was no clear plan for integration of eye care services in the general health system at the national level.

Even though some government hospitals, NGOs and private clinics provided eye care services to the Burundian population, there was a lack of monitoring and evaluation system of eye care services and accurate data to support blindness prevention plans.

At 5 years to the year 2020, there was no study carried out in Burundi to assess progress towards the Vision 2020 targets. Furthermore, there was no specific unit at the national level to collect and analyse data related to prevention of blindness.

It was anticipated that this study will provide the missing but important data on human resource, infrastructure and equipment necessary for blindness prevention.

CHAPTER THREE: MATERIALS AND METHODS

3.1 Study Design

This was a descriptive cross sectional study which comprised of:

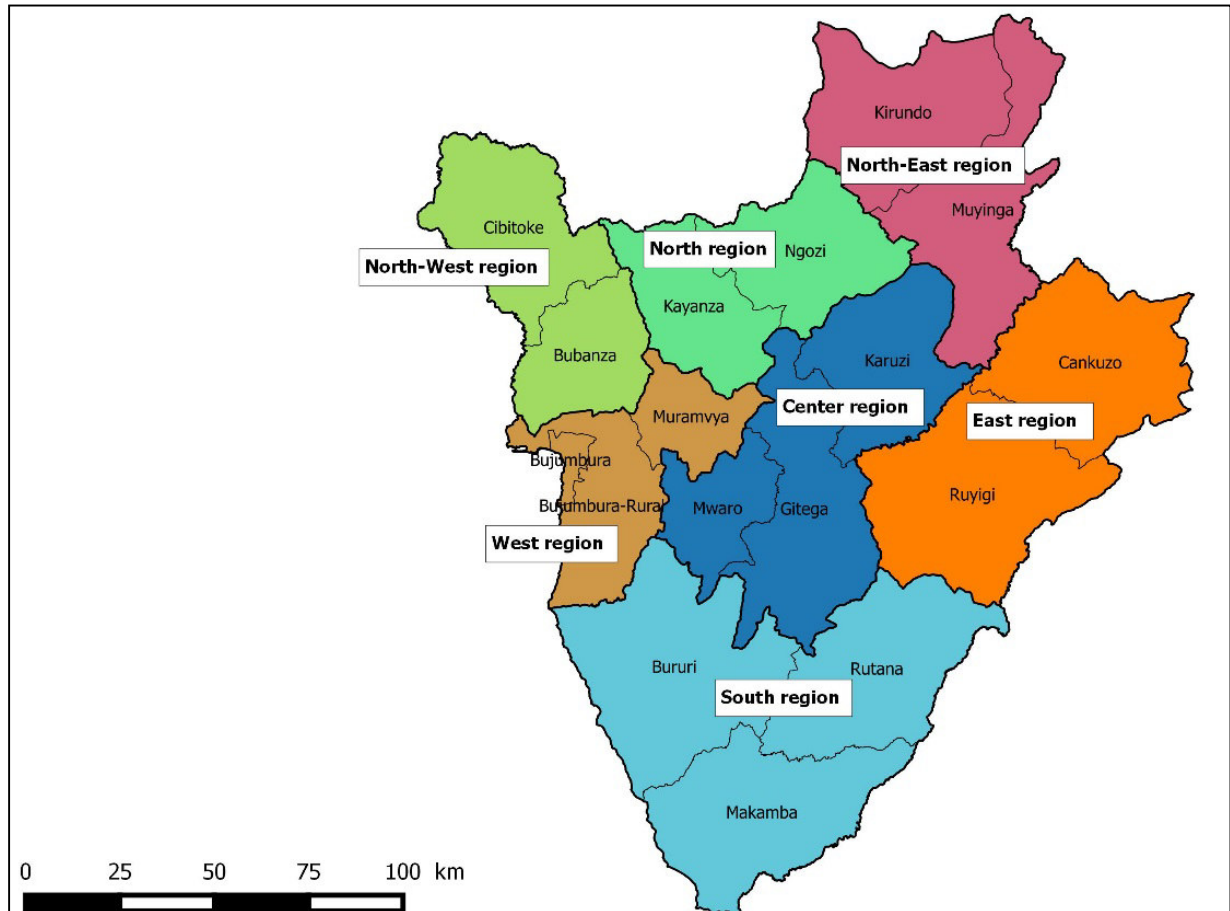
- A desk evaluation where relevant documents were reviewed. The documents were sourced from the Ministry of Health and Board of Ophthalmologists
- Field visits to interview eye care managers and inspect national, provincial and district hospitals to verify available facilities, eye care staff, equipment, and consumables

3.2 Study Setting

This study was carried out in the entire country. Burundi is an East African country of 27,834 km² subdivided in 47 health district entities (operational level) and 17 provincial entities (intermediate level). Provinces are grouped into 7 ophthalmic regions for coordination purposes.

The health system is organized on a pyramid pattern with health centres and district hospitals at the base and coordinated at district level, intermediate level and central level.

The ophthalmic regions in Burundi: West, North-west, North, North-East, Centre, East and South are shown in Figure 1



Courtesy of Dr. Lambert NKURUNZIZA

Figure 1: Map of the ophthalmic regions of Burundi

3.3 Study Population and Institutions

All eye care facilities, personnel and coordination structures in Burundi were eligible for the study. Preliminary enquiry indicated that a total of 3 national hospitals, 4 public regional hospitals and 5 district hospitals should be visited because they had eye care workers and equipment. Eye care workers included ophthalmologists and mid-level eye care workers such as clinical officers and nurses.

3.4 Inclusion Criteria

This study targeted public and private health facilities. The national and district hospitals, the private or Missionary eye health centres and their eye care professionals. Foreigners providing eye-care services in a regular manner were also included.

3.5 Exclusion Criteria

Foreign ophthalmologists who did not offer consistent eye care services and did not have a regular schedule were not included in the study because their contribution towards the achievement of VISION 2020 targets was unpredictable.

This study did not include community level personnel (Community Eye Care Workers) and general medical workers because they were not certified to offer eye care services and they were not included in eye care reports.

Similarly, not all eye diseases which were documented in health records were reported. Cataract surgical rate (CSR) was assessed because it is the most important monitoring indicator used in VISION 2020 programme planning.

3.6 Materials

Two questionnaires were used to collect data:

Questionnaire 1 (Appendix II,1) was used to capture data on the number and distribution of different cadres of eye care workers in the different areas in Burundi and the Cataract surgical rate reported in 2014-2015. The standard IAPB list for equipment was inserted in the questionnaire to collect data related to available equipment.

Questionnaire 2 (Appendix II,2) was used to capture data on coordination availability and membership of a prevention of blindness committee, eye training programmes and access to eye care services.

3.7 Data- Collection Procedures

For the desk evaluation, data for sub-district and other eye units were first collected from reports prepared by district level health care managers. The lacking information was collected from the ophthalmologists' board and the ophthalmic clinical officers' board.

A full list of government and NGO health care facilities providing ophthalmic services by 2015 was obtained from Heads of Health districts, Board of ophthalmic officers, Board of

Ophthalmologists and *Heart to Heart Foundation* NGO providing eye care services to children countrywide. Similarly, the list of eye care personnel working in the country and their distribution by geographical area and gender was obtained.

All the national, regional and district hospitals managers were contacted before the visit to inform them about data to be collected.

Data from review of documents and structured interview of committee members for prevention of blindness were collected using the study questionnaire in Appendix II, 2.

Data from all the districts were collected using the study questionnaire in Appendix II, 1.

3.8 Data Management and Analysis

3.8.1 Data from desk review

An Excel spreadsheet was used to capture, process and clean the data. The data were then entered in SPSS version 20 for further analysis where frequencies and proportions were calculated.

3.8.2 Data from field visit

The data were compiled in 7 ophthalmic regions for which the population projections until 2020 are available from the national service of statistics (ISTEEBU).

For human resource and equipment data analysis, proportions available versus recommended numbers by Vision 2020 were calculated automatically in Excel spreadsheet. Results were presented as meeting, exceeding, not meeting the vision 2020 targets.

For the cataract surgical rate in different hospitals, data were immediately compared in a table and a mean for the country was calculated.

Data for which vision 2020 did not set the targets were compared to other researchers' results.

3.9 Ethical Considerations

Ethical clearance was sought from Kenyatta National Hospital / University of Nairobi Ethics and Research Committee.

In Burundi, authorization of the study was sought and obtained from the cabinet of the Ministry of Health.

Informed written consent was obtained from eye health care professionals and managers who were interviewed. They were informed that they were free to withdraw from the study should they feel to do so at any time.

Anonymity of research subjects and confidentiality were highly maintained by using clinical cases in number. The researcher had no conflict of interest.

CHAPTER FOUR: RESULTS

4.1 National level

4.1.1 Main activities achieved the last 5 years

The main activities achieved the last 5 years and documented were summarised in the Table 4 below.

Table 4 : Main activities achieved the last 5 years

Activities	Quantity	Time of effect	Level of achievement
Elaboration of a strategic plan to prevent blindness once every 5 years since 2007	2	2007-2011 and 2012-2016	50%
Creation of a NCPBL	1	2011	100%
Renewal of the NCPBL yearly by MOH	5	2011-2015	100%
Elaboration of a document for the national policy to prevent childhood blindness	1	2014-2016	100%

The NCPBL was created in 2011 by the Minister of Health and members' renewal was done yearly. The NCPBL managed to finalize a document of strategies towards implementation of Vision 2020 covering the period 2007-2011. The same document was still guiding the NCPBL even though it had expired 4 years prior to this study. In 2013, with the support of Heart to Heart Foundation, the national policy to prevent childhood blindness was launched for three years.

4.1.2 Membership of the NCPBL

The leadership of the NCPBL was headed by the Assistant Minister for Health and the Head of the Neglected Tropical Diseases (NTDs) programme was the secretary. Other members were representatives of the Ophthalmologists and the OCOs, the focal person of NTD, blindness and

deafness in WHO Burundi office, representatives of NGOs such as CBM, Lions International, *Communauté des Eglises de l'Emmanuel* du Burundi (Community of Emmanuel Churches in Burundi), Fred Hollows Foundation and Heart to Heart Foundation.

4.1.3 Meetings of the NCPBL

From the inception of the NCPBL in 2011, less than half of the planned meetings were held as shown in table 5 below.

Table 5 : Meetings of the NCPBL

Year	Scheduled meetings	Meetings held (minutes available)	Percentage of target
2011	2	1	50%
2012	4	0	0%
2013	4	1	25%
2014	4	1	25%
2015*	4	0	0%

*until the time of study (September 2015)

4.1.4 Accomplishment of the strategic plan 2007-2011

4.1.4.1 Human resources

A few number of eye care cadres were trained since 2006 even though the targets were lower than those recommended by Vision 2020.

16.5% of all targeted cadres were trained. Some categories such as the optometrists and the cataract surgeons were not trained at all (Table 6).

Table 6: Training of eye care workers

Cadres	Ophthalmologists	Optometrists	OCOs	Cataract surgeons	ONs	All cadres
Targets	9	2	29	29	69	109
Actual	2	0	9	0	7	18
Percentage	22.2%	0%	31.0%	0%	10.1%	16.5%

4.1.4.2 Equipping hospitals for ocular surgery-strategic plan 2007-2011 (n=7)

It was agreed to get at least one regional referral hospital in each of the 7 ophthalmic regions in the strategic plan 2006-2011. By 2015, 57.1% of them were found equipped for medical and surgical procedures. In three regions (37.5%), there was no ophthalmic equipment in the targeted referral hospital (Table 7).

Table 7: Equipping hospitals for ocular surgery as per the strategic plan 2007-2011

Hospital	Equipped	Not equipped
HPRC	X	
BURURI	X	
GITEGA		X
NGOZI	X	
RUYIGI	X	
BUBANZA		X
MUYINGA		X
Total	4 (57.1%)	3 (42.9%)

4.1.4.3 Research activities

One of the strategies to prevent avoidable blindness in Burundi was to conduct and support research initiatives in the eye care system.

Few studies were carried out in the strategic plan time frame (26.6%). While a RAAB was to be done in each ophthalmic region, only one was done in the north of the country, leaving the rest of the country unexplored for the causes of blindness.

On total, 15 studies were planned, 4 were done, 3 of them related to trachoma and one RAAB (Table 8).

Table 8: Research activities

Research	Scheduled	Currently done(quantity)	Percentage of target achieved
Epidemiologic profile of ocular diseases and the causes of visual impairment	1	0	0
RAAB	7	1	14.3%
Prevalence of trachoma in selected provinces	2	2	100%
Assessment of the Impact of SAFE strategy	1	1	100%
Other operational researches	4	0	0%
Total	15	4	26.6%

4.1.5 Other important information for the Vision 2020

4.1.5.1 Cost to Patient (In USD) of Some Services in Eye Care System

The cataract surgery cost was found to be USD 45.5 to the patient in both public and Mission hospitals when there was no insurance cover. In one hospital, the fee came to USD 33.1 with insurance cover.

The cataract surgery for children was fully covered by Heart to Heart Foundation in a 3 year-running project 2013-2016. (Table 9)

Table 9: Cost to patient (in USD) of some services in eye care system

Item	Public/Mission centre	Private
Consultation ophthalmologist	1.3 - 3.2	4.00-15
Consultation OCO	1.3 - 3.2	4.00-5.2
Spectacles (simple)	6.50 - 7.790	6.50-7.790
Cataract surgery (SICS) with or without IOL	0- 45.5	162.3
Cataract surgery (Phaco)	162.3	260
Ocular globe repair	97.4	162.3

4.1.5.2 Training institutions in Ophthalmology

There is no training programme for ophthalmologists neither at the national university nor at private ones.

Most of the ophthalmologists were trained in Europe, West Africa and recently in Kenya and Tanzania.

Nine general ophthalmologists are currently being trained in different universities (Uganda, Kenya, Ivory Coast, Senegal and China).

A training programme for OCOs started in 2013 in a private university (Hope of Africa University) and has an average of 23 students per year.

4.2 Health facility level

4.2.1 Availability of Human resources

The distribution eye care workers in the 7 regions in Burundi are summarized in the Appendix III, Table 17.

4.2.1.1 Ophthalmologists

The number of Ophthalmologists available in the country was 37.5% of the Vision 2020 target (40 ophthalmologists). An excess of ophthalmologists is noted in the West region where 80% of all the ophthalmologists are found in Bujumbura, the capital city. Four regions in the country, namely East, North, North East and North West had no ophthalmologists at all.

The actual number comprised local and foreign ophthalmologists on one hand and private, public and Mission Ophthalmologists on the other hand.

Figure 2 shows the distribution of ophthalmologists into public, private and NGO/Missionary health facilities.

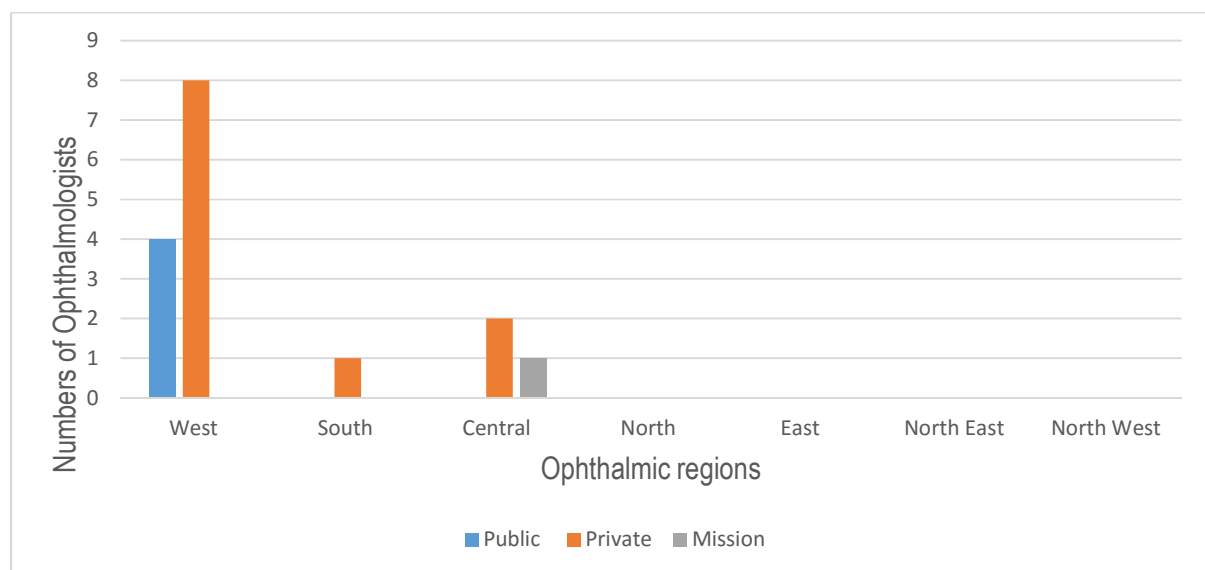


Figure 2: Distribution of Ophthalmologists into public, private and mission sectors

Of the 15 ophthalmologists, 10 were national and 5 were foreigner, furthermore 80 % were in the capital city Bujumbura (Western region) as shown in figure 3 below.

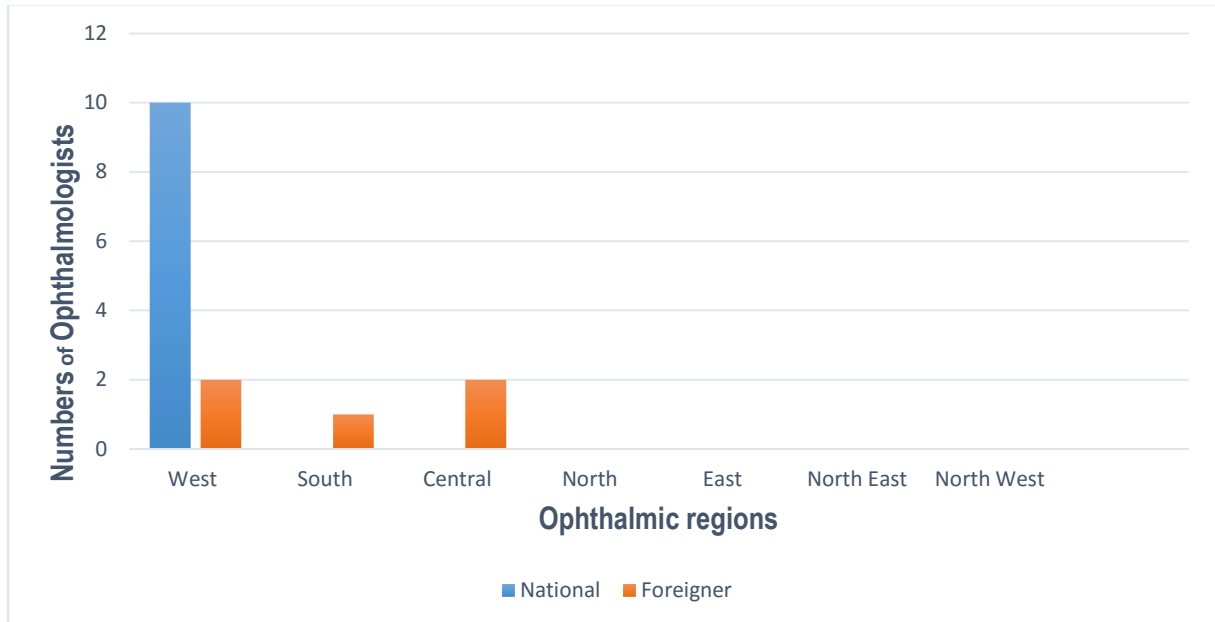


Figure 3: Distribution of Ophthalmologists into public, private and mission sectors

Forty six percent of ophthalmologists were working in public and Mission hospitals. Some of them worked part time in the private clinics as well.

All Burundian ophthalmologists were located in Bujumbura city.

4.2.1.2 Ophthalmic Clinical Officers (OCOs)

Burundi had 66% of required number of OCOs and had not met the Vision 2020 targets. The Western region just met the Vision 2020 target. The OCOs are unevenly distributed in the country with a minimum of 37.5% of the actual percentage of the target in the north-eastern region and a maximum of 100% in the western region.

Figures 4 and 5 show the distribution of ophthalmic clinical officers into public, private, NGO/missionary health facilities and their citizenship status.

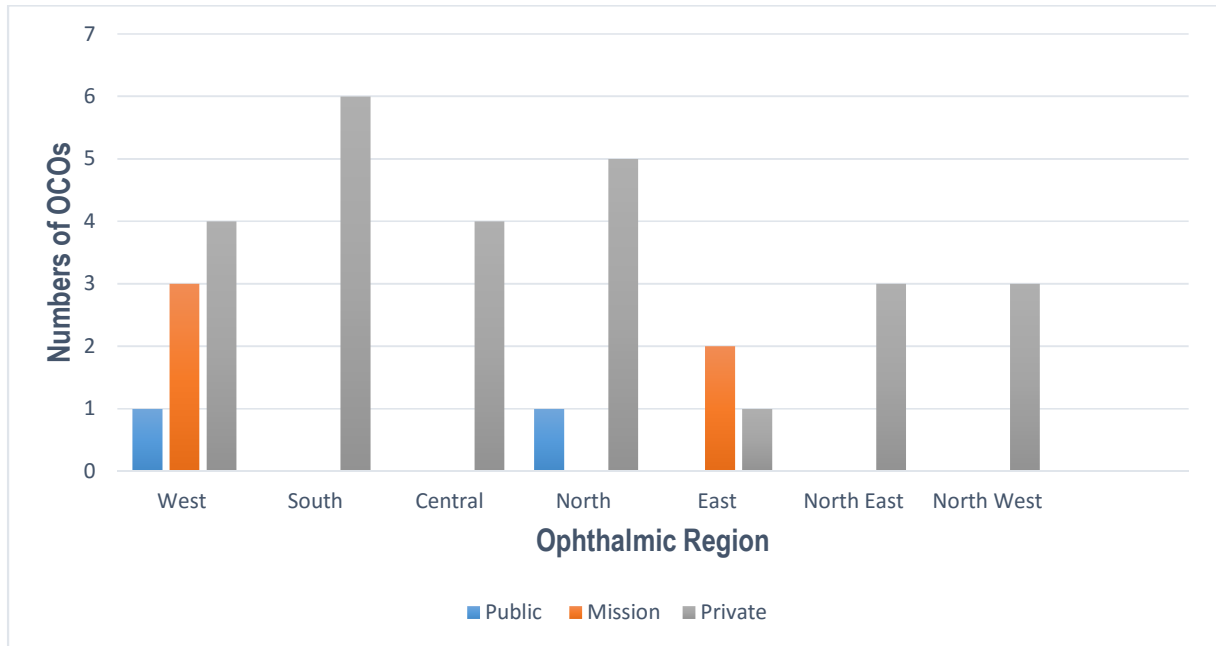


Figure 4: Distribution of OCOs into Public, Private and Mission sectors

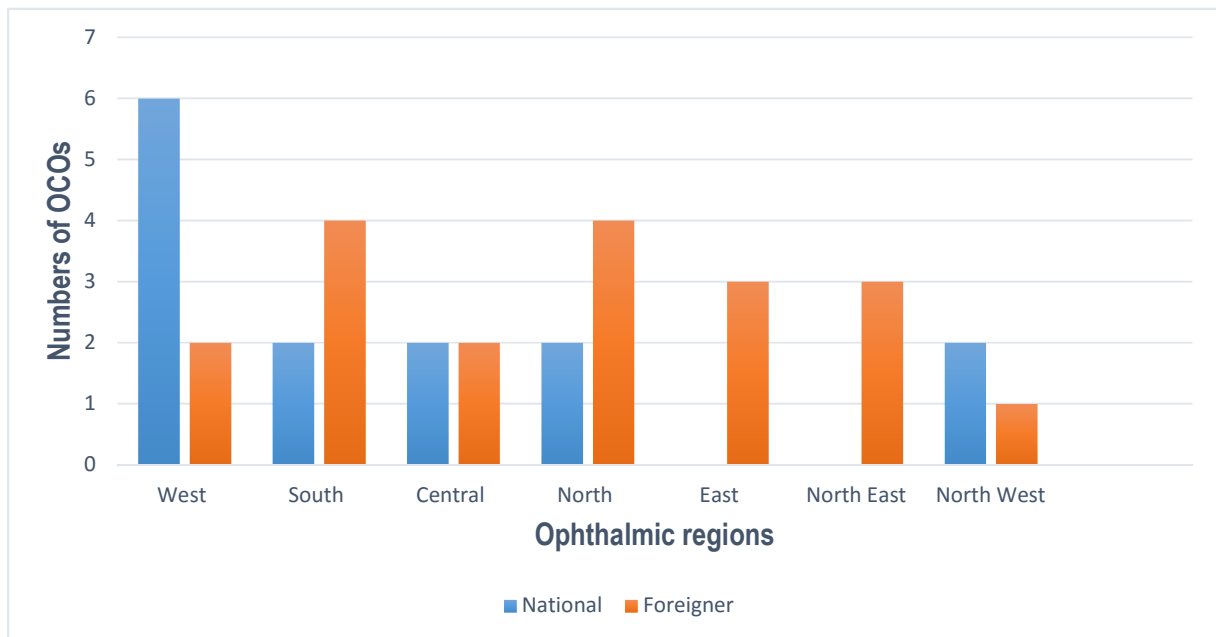


Figure 5: Distribution of OCOs according to their citizenship

The majority of OCOs (19/33) were from neighbouring countries either Rwanda or Congo. Most of the OCOs were working in the private sector (27/33), leaving a few number in the public and Mission hospitals.

4.2.1.3 Ophthalmic nurses (ON)

Burundi had not invested much in training of ophthalmic nurses. There were 23 ophthalmic nurses in the country. This was 23.5% of the 98 targeted nurses. The majority (78.3%) were working in the western region.

4.2.1.4 Optometrists

Only two optometrists worked in Burundi in 2015. Both were from India and worked in the private sector. Their activities were limited to refractions and supply of spectacles.

Burundi had not met the Vision 2020 targets in terms of ophthalmic personnel in any of its region by 2015. Countrywide, the deficit was 72.8%. The West region was better served with a deficit of 11.1%. The rest of the regions had deficits varying from 68.9% to 92.0%. The deficit is summarized in the figure 6.

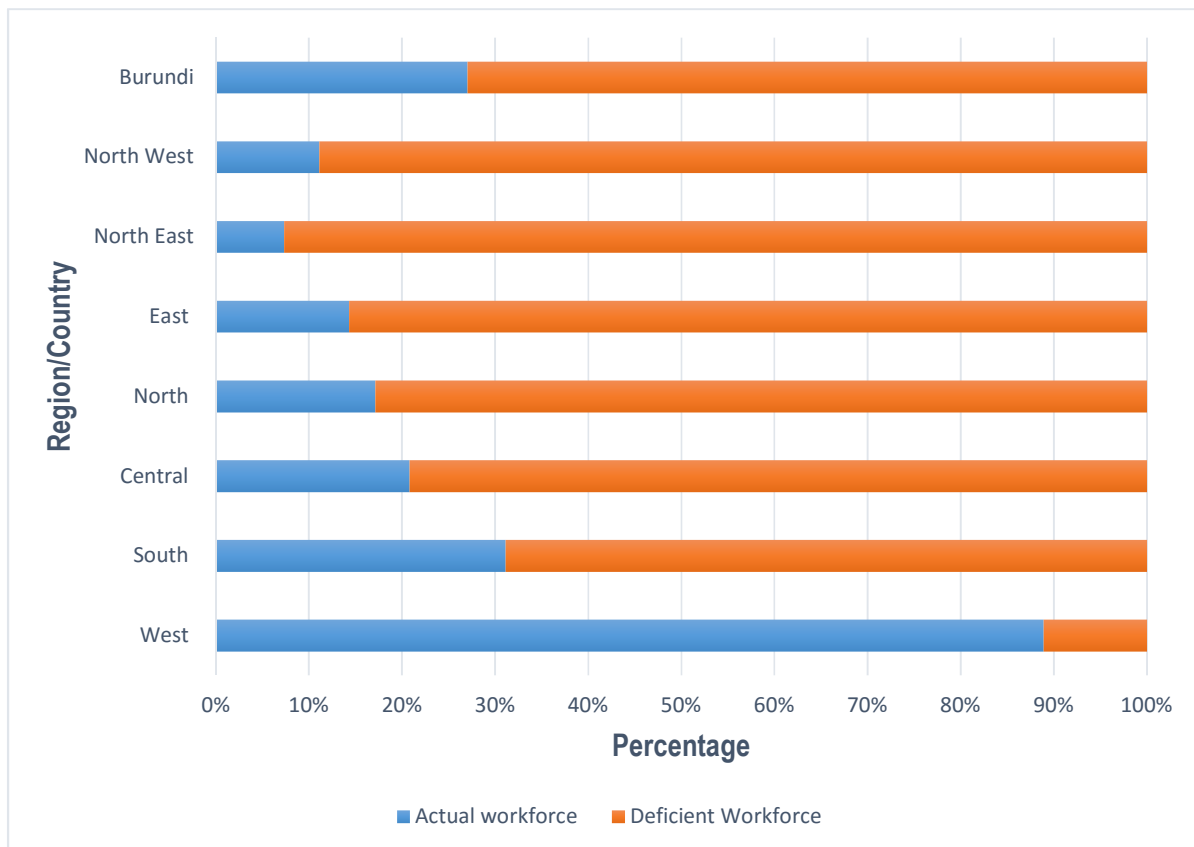


Figure 6: Deficit in workforce needed to achieve vision 2020 target

4.2.2 Eye health facilities and their equipment

4.2.2.1 Distribution of ophthalmic facilities

Forty six ophthalmic facilities distributed unevenly in the Country, three of them were not in use (Table 10).

Table 10: Distribution of ophthalmic facilities in the ophthalmic regions

Region	West	South	Central	North	East	North East	North West	Burundi
Public hospital	2	1	1(1)	1(1)	0	(1)	0	5(3)
Mission hospital	3	0	1	1	1	0	0	6
NGO hospital	0	0	0	0	1	0	0	1
Private hospital	1	0	0	0	0	0	0	1
Private clinic	9	5	4	5	1	3	3	30
Total	15	6	6	7	3	3	3	43(3)

**Figures in (...) represent hospitals with ophthalmology unit currently not in use*

The distribution of ophthalmic facilities into public, private and NGO/missionary sectors is shown in the Figure 7 below.

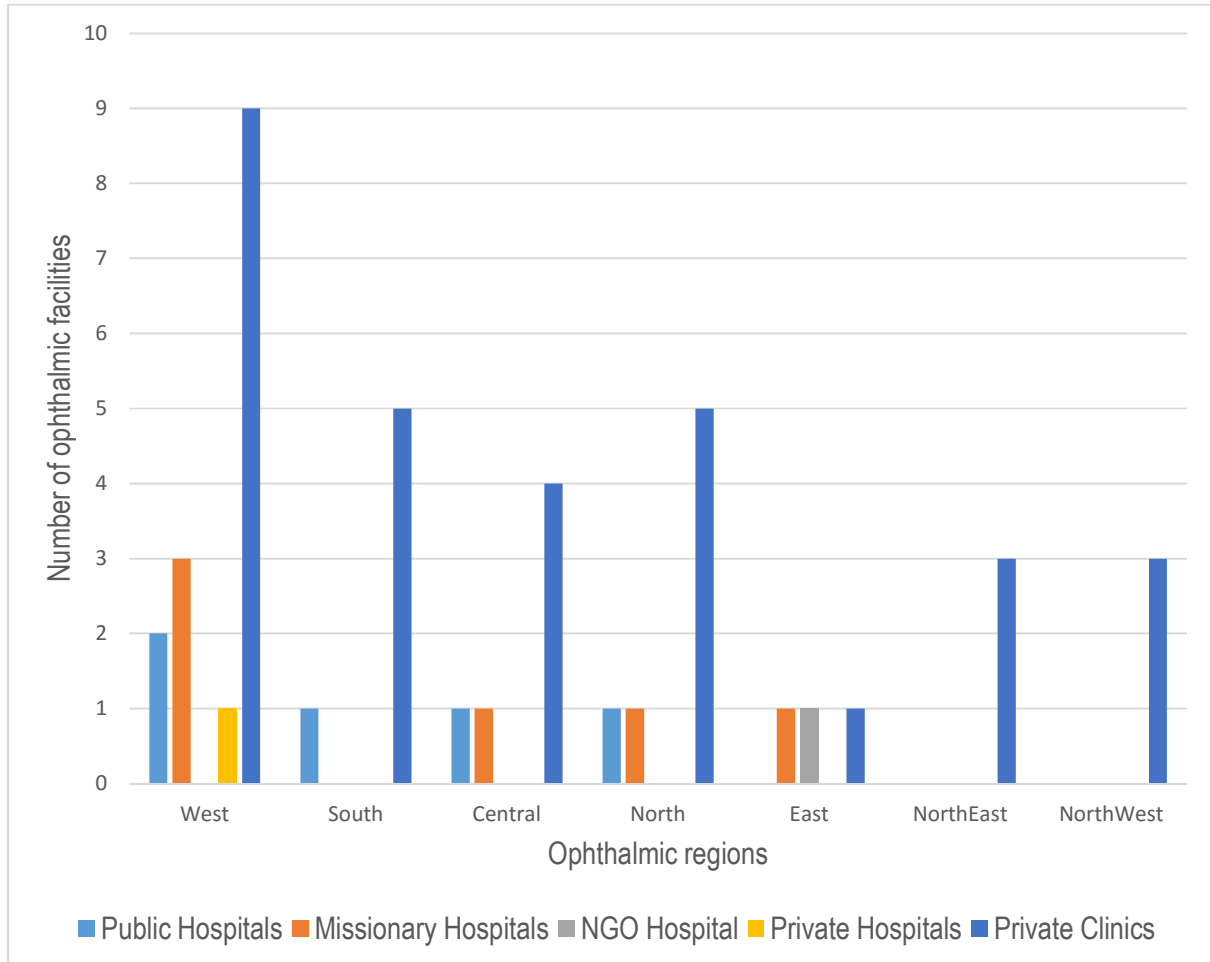


Figure 7: Distribution of actual ophthalmic facilities into private, public, missionary and NGO sectors

Thirty clinics and one hospital were private while six were missionary and five public hospitals. Other three public hospitals had an ophthalmology department with diversified equipment but were actually not in use.

4.2.2.2 Operating theatres (OT) for cataract surgery

Out of 12 theatres available in the country, 9 were used to offer ophthalmic surgical services. Mission hospitals were leading in ocular surgical services delivery in Burundi as they owned 43% of the theatres dedicated to eye surgery (Table 11).

Out of 5 hospitals whose theatres did not perform cataract surgery, 3 reported that they did not have surgeons, 2 reported that intra-ocular lenses were not available and other 2 would like to have biometry equipment before engaging in cataract surgery.

Table 11: Distribution of OT for eye surgery in the country

Region	West	South	Central	North	East	North East	North West	Burundi
Equipped theatres	6	1	2	2	1	0	0	12
Public	2	1	1	1	0	0	0	5
Mission NGO	2	0	1	1	1	0	0	5
Private	2	0	0	0	0	0	0	2
Offering services	6	1	1	1	0	0	0	9

4.2.2.3 Equipment for Refraction and refracting personnel availability

The equipment for refraction referred to was a minimum of Visual acuity testing charts, retinoscope with a refraction box (trial lenses) or an automated refractometer and the trial frames. Three centres were found equipped for refraction services but did not have any trained personnel. Other 4 centres in public/Mission sector could only deliver refraction services when

an ophthalmologist is available, leaving some periods of the year not covered especially in centres held by foreigners who are not substituted when they go for holidays.

In one hospital, an ophthalmic nurse did not have a retinoscope and could only perform a subjective refraction.

Only 6 centres were found to serve rural people. A big number of patients have to travel to urban area to get refraction service (Table 12).

Table 12: Distribution of centres offering refraction services

Region	West	South	Central	North	East	North East	North West	Burundi
Equipped centres	15	6	7	8	3	4	3	46
Urban	13	4	4	5	2	3	2	33
Rural	2	2	2	2	1	1	1	11
Offering services	15	6	5	7	3	4	3	43

The refraction was essentially performed by Ophthalmologists and OCOs and a few only by ONs (Table 13).

Table 13: Distribution of personnel offering refractive services

Cadres	Ophthalmologists	Optometrists	OCO's	ONs	Refractionnist	All cadres
Targets	40	40	50	98	98	273
Actual	15	2	33	23	0	73(26.7%)
Refracting	15	2	33	2	0	52 (19.0%)
Deficit	25	38	17	96	98	200(73.2%)

4.2.2.4 Availability of centres equipped for DR screening and treatment

At least all the ophthalmic centres offering services (eye care personnel available) could perform a funduscopy either with a direct ophthalmoscope or indirect ophthalmoscope or with a slit lamp examination. In the remaining 2 ophthalmic centres, the equipment was lacking. However, 1 hospital had new equipment but there were no trained personnel. A fundus camera and Fluorescein angiography were found in one private clinic.

Two centres were equipped with laser machines, one in west region and the other in the Central region. The OCT machine for confirmation of macular edema and follow up after treatment was missing in all centres (Table 14).

Table 14: Equipment for DR screening and treatment

Region	West	South	Central	North	East	North East	North West	Burundi
Ophthalmic centres	15	6	7	8	3	4	3	46
Fundoscopy possible	15	6	7	7	3	3	3	44(95.7%)
Fundus camera	1	0	0	0	0	0	0	1(2.1%)
OCT	0	0	0	0	0	0	0	0(0%)
FA	1	0	0	0	0	0	0	1(2.1%)
Argon laser	1	0	1	0	0	0	0	2(4.3%)

4.2.2.5 Availability of equipment for glaucoma screening, surgery and follow up equipment

Three centres, 1 in the central region and two in the capital Bujumbura were equipped with visual field machines (Goldman). The rest of centres used the IOP as the only measure of follow up. However, 3 ophthalmologists (all of them in public sector) reported having problems with

IOP measure; the old slit lamps were not equipped with a tonometer and no alternative solution was available.

The OCT machine for ganglion cells complex and optic disc parameters measure was missing in all centres. Summary of equipment as shown in Table15 below.

Table 15: Equipment for glaucoma screening, surgery and follow up equipment

Region	West	South	Central	North	East	North East	North West	Burundi(Frequency)
Ophthalmic centres	15	6	7	8	3	4	2	46
Fundoscopy possible	15	6	7	7	3	3	3	44(95.7%)
Visual Field	2	0	1	0	0	0	0	3(6.5%)
OCT	0	0	0	0	0	0	0	0(0.0%)
Pachymetry	0	0	0	0	0	0	0	0(0.0%)
Yag laser	1	0	1	0	0	0	0	2(4.3%)
Diode laser	0	0	1	0	0	0	0	1(2.1%)
Glaucoma surgery theatre	3	0	1	1	0	0	0	5(10.9%)

4.2.3 Cataract surgery services

4.2.3.1 Ratio of ophthalmologist surgeons / medical ophthalmologists

Four out of fifteen ophthalmologists (26.6%) were performing the cataract surgery with different numbers operated, which gave a ratio of 1:3.75. Two surgeons were operating in more than 1 theatre.

4.2.3.2 The cataract surgery quantitative performance

In 2014, 8.5% of the targeted number of cataracts have been operated, leaving a backlog of 14,594 cataracts not operated. The CSR achieved was therefore 138 (Table 16).

Table 16: Distribution of numbers of cataract surgery done per regions where the surgery took place

Region	West	South	Central	North	East	North East	North West	Burundi	
Surgery Performance	Population	1, 641,483	1, 632,621	1, 750,581	1, 520,040	767,752	1, 537,772	973,967	9,824,216
Cataract Surgeries	Target*	2970	2410	2924	2546	1144	1506	2449	15949
	Actual	777	0	224	354	0	0	0	1355
	% target	26%	0%	7.7%	14%	0.0%	0.0%	0.0%	8.5%
CSR		473	0	128	233	0	0	0	138

**targets were set in the strategic plan 2007-2011, they are still used now waiting for a new plan.*

Table 17 breaks down the cataract surgeries done by age and sex of the patients.

Table 17: Distribution of surgery done by age groups and by sex

Distribution of surgeries	Hospital	CHUK	PHYLLIS	NGOZI	KIBUYE	IJENDA	CLINIQUE DE L'OEIL	IRIS	Burundi
Total surgeries		110	402	354	224	180	89	20	1379
Age	0-15	86(78.2%)	0	0	0	0	0	0	86(6.2%)
	>15	24(21.8%)	402	354	224	180	89	20	1293(93.8%)
Sex	Female	40	221	204	113	78	40	8	704
	Male	70	181	150	111	102	49	12	675
	Ratio	1.75	1.2	1.3	1.0	1.3	1.2	1.5	1.04

Six point two percent of operated cataracts were children patients. Paediatric cataract surgery was performed in one centre. Surgery cost was covered by Heart to Heart Foundation NGO. Children attending the theatre were coming from all over the country.

CHAPTER FIVE: DISCUSSION

5.1 National level of prevention of blindness

This study revealed that Burundi was lagging behind in the implementation of Vision 2020 program. There was scanty information about prevention of blindness at the national co-ordination level. Moreover, data about eye care personnel, eye care services except for onchocerciasis and trachoma projects, eye care facilities and their equipment were not available in the Programme for Neglected Tropical Diseases and prevention of blindness. Lack of reliable health information is a general concern in Africa where human resources data especially are insufficiently or not reported or not updated (24).

The NCPBL had a mandate to meet regularly and propose strategies to prevent avoidable blindness(25). Meetings of the National committee for prevention of blindness (NCPBL) had put the renewal of the outdated strategic plan on its agenda several times but could not achieve this goal until late 2015.

The small number of NCPBL meetings during the last 5 years gives a clue of insufficient motivation among committee members to meet the Vision 2020 targets at the coordination level. Members of the committee were chosen at the high level of the health system and therefore were engaged in many other activities leaving a little chance to the prevention of blindness.

The technical staff of the MOH would have contributed better by their availability and their focus on the field. The targets fixed in the strategic plan 2006-2011 were not reached. Few cadres were trained and most importantly, neither optometrist nor cataract surgeon were trained at all. Out of seven hospitals targeted to be equipped for ophthalmic services, nearly half of them were equipped for surgical services delivery.

Only few of the scheduled surveys studies were done. All the planned surveys for trachoma elimination had been completed. On the other hand, only one 1 RAAB out 7 was done in one ophthalmic region. Reasons why this plan failed to reach its targets were beyond the scope of this study.

Even though no study was done to assess affordability of ocular services costs in Burundi, long distances to ocular health facilities, the fact that the bulk of ocular health facilities were private and unevenly distributed must contribute to render the services inaccessible.

The strategic plan did not target to build local ophthalmic training institutions. This made the training of human resources expensive and may have contributed to the failure to achieve the targets. A new academic institution which has launched a programme for training of Ophthalmic Clinical Officers was about to graduate the first class of 23 students. This will improve the progress towards achievement of Vision 2020 targets by 2020. Quality assessment of the training programme was complex to be monitored in this study but the low numbers of available supervisors and training facilities definitely had an impact on the graduates' skills.

5.2 Health facilities level

5.2.1 Human resources

The “inverse care law” by Tudor was confirmed in this study by a total absence of eye care personnel in the poorest corners of the country where more needs may even be expected (26). This study indicates that as a country, Burundi had not met any Vision2020 target by 2015 in terms of human resources. There was a generalized shortage of human resources for eye care services of all categories and at all level except the West region in which Bujumbura the capital city is. The cadres were unevenly distributed in the country, Bujumbura capital city was better served than the rest of the country with an excess of Ophthalmologists and adequate number of OCOs. The same picture of the situation is generally reported in other African countries. Morjaria et al. found in Kenya an excess of Ophthalmologists (33%) in Nairobi whereas Nyanza County had only 15% of required Ophthalmologists by 2013(16). In Nigeria, a survey done in Enugu state found 77% of ophthalmologists in urban area and no ophthalmologist at all in Enugu east(19).

The common reason for a misdistribution of human resources is often associated with the low socioeconomic status and opportunities for professional development for eye care staff in remote areas which therefore affects the uptake of eye care services in these underprivileged areas(27).

Recently, opportunities for ophthalmology postgraduate training had increased and 9 residents in ophthalmology who were being trained in different countries were expected to improve the ophthalmologist to population ratios in the different regions in Burundi.

The numbers of OCOs was expected to rise markedly due to the new training programme in one local university.

By the time this study was completed, there were no clear plans to train the other cadres including optometrists, cataract surgeons, refractionnists and ophthalmic nurses.

One solution should be the training of existing nurses in different hospitals already dedicated to ophthalmic services so as to improve their motivation and their retention.

The foreign resources significantly contributed to eye care in Burundi: they represented approximately half the numbers of ophthalmologists and OCOs and no local Optometrist existed at the time of study; this is a very important finding as their support to eye care has been relevant while the country was trying to build-up its own workforce which may take several years.

5.2.2 Ophthalmic facilities and equipment

Burundi had 46 health facilities equipped at different levels to dispense eye care services. Three of them were not used at all, the reason being that there were no eye care personnel. One of the three had complete equipment for refraction services and was even equipped with a new operating theatre which was not in use.

Morjaria et al. in Kenya found that 9 out 77 facilities were no longer offering refraction services in 2013 because the personnel in charge left the facility.

This finding underlines the generalised problem of eye care personnel both in Kenya and Burundi.

Finally, surgical services were available in 9 centres. The public eye health facilities were generally rare in all the regions.

Bozzani et Al. in Zambia found 74 eye care facilities among them 39% were public, 24% belonged to NGOs and 37% were private. An operating theatre for one million population set as

a target for sub Saharan countries was not met in Zambia but relatively met in Burundi at least in terms of availability of facilities(28).

In Enugu state in Nigeria, 45 eye health facilities served a population of 3,000,000 in 2006, among them 31% were public and relatively high than Kenya where 77 eye health facilities were reported for a population of 35,112,200 in 2013, representing grossly a facility for approximately 456,003 people versus a facility for 223,278 people in Burundi. However, the eye care facilities ownership for the public sector was higher in Kenya (83%)(16,19).

This crude data cannot be used to assess how easy the access to eye care is, if other factors such as the status of the facility and services offered to the population are not assessed.

In the case of Burundi, most of the facilities were private, owned and run by OCOs and therefore were offering limited services.

This finding could find its explanation in the Burundian government priorities which were more oriented towards primary health care in general whereas Ophthalmologic services were not yet set as priority.

The level at which the Government funded prevention of avoidable blindness in Burundi was not documented but it may be a good indicator to monitor in the future.

5.2.3 Cataract surgical rate

The CSR was 135 surgeries for a million of Burundians in 2006 and had increased only to 138 after 8 years. Even though the rate was very low compared to WHO recommendation ranging between 2000 and 5000 surgeries per year, varying country to country, it was achieved by local surgeons. This may improve the quality of surgery because of improved post-operative follow-up (14,29) .

The poor CSR is positively correlated with development of countries and it is relatively high in developed countries (7,000-11,000) where numbers of surgeons and new technology are adequate and thresholds for surgery are low(30) .

In this study, the low number of surgeons was the apparent cause of the low CSR, less than a third of Ophthalmologists were performing the cataract surgery. Other possible reasons were not assessed in this study.

Biometry and availability of Intra-ocular lenses and other consumables were advanced as reasons why the cataract was not performed in 2 public hospitals whereas one Mission, one NGO and one public hospitals did not have surgeons.

It is likely that the available theatres were underutilised as five hospitals with equipped theatres did not perform cataract surgery throughout the study period.

The cataract surgery in private sector was a new phenomenon which has the potential to improve the CSR over time.

5.2.4 Refraction equipment and services availability

The refraction services were the most available eye care service offered, most of the eye care facilities had comprehensive equipment. However, this service was found mainly in urban areas and private sector. Access to refraction services may still be limited for rural population.

5.2.5 Equipment for Diabetic retinopathy and Glaucoma

Fundoscopy was the main means of screening of these diseases. Only one private centre had a fundus camera for DR screening, there was neither visual field for early detection of glaucoma nor OCT to support diagnosis in case of difficult diagnosis of normotensive glaucoma or ocular hypertension.

Treatment of DR with laser was possible in only 2 centres. The lack of equipment for treatment in most regional hospitals explains the minimal investment in DR screening.

Surgical procedures for glaucoma management were found to be done in the centres where cataract surgery was performed.

Only 3 centres in the whole country could follow up their glaucoma patients with visual fields.

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The following conclusions drawn from the findings of this study:

1. Burundi was using an outdated VISION 2020 plan and some of the NCPBL scheduled meetings to monitor the progress towards the targets were not convened.
2. By 2015, the country had not met any of the Vision 2020 target in terms of eye care personnel but might achieve the target for OCOs because of the recently introduced training programme
3. Eye care services were mainly offered at private facilities, they were not fully developed in public health facilities
4. Human resources and ophthalmic equipment were unevenly distributed and concentrated in the capital city
5. The cataract surgical rate was low
6. Equipment for management of the emerging major blinding diseases such as Glaucoma and DR were available in a few centres

6.2 Recommendations

1. Revitalize the Vision 2020 programme by a strong coordination team, regular NCPBL meetings and an updated strategic plan
2. Focus on the training of eye care personnel cadres
3. Initiate strategies to attract eye care personnel at the periphery
4. Equip the ophthalmic facilities with the lacking instruments

6.3 Interesting areas of research

The current funding status and affordability of eye care services in Burundi may reveal other areas of urgent interventions and support the advocacy for more funds to prevent the avoidable blindness in Burundi.

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APPENDICES

Appendix I: Informed Consent and Consent Form

Informed Consent

I am Dr. NIYONZIMA Jean Claude from Burundi. I'm currently a postgraduate student at the Department of Ophthalmology, School of Medicine, University of Nairobi, Kenya. I am conducting a study on “**Assessment of the extent to which Vision 2020 eye care services delivery targets have been met in Burundi by 2015.**” I am carrying out this study as part of the requirements for my course.

My objective is to conduct a situation analysis of the components of VISION 2020 “The Right to Sight” global initiative in Burundi.

Members of the Committee for the prevention of blindness and staff of the National, Regional and District Hospitals have been chosen for this study because they are involved in the eye care system and know it better than any other one.

The results of this study will form a basis on which interventions can be planned, and the recommendations when implemented would go a long way in helping Burundi reduce the prevalence of preventable blindness and visual impairment.

My Supervisors are:

1. Dr. NYENZE Muindi, MB.ChB, M.MED (Ophth), FEACO

Lecturer University of Nairobi

Signed _____ Date _____

2. Prof. KARIMURIO Jefitha

MB.ChB, M.Med (Nairobi), MSc-CEH (London), FEACO, PhD (Melbourne)

Associate Professor at University of Nairobi

Signed _____ Date _____

3. Dr. Lévi KANDEKE

MB.ChB, M.MED (Ophth), Fellow of European Board of Ophthalmology

Senior Lecturer University of BURUNDI

Signed _____ Date _____

I respectfully request your voluntary participation in this study. You are free to decline or withdraw from the study at any time and refusal to take part will not attract any penalty. You retain the right to withdraw without risking any consequence from any authority. No names are necessary on questionnaire. Any information you provide will be treated as confidential.

There are no perceived risks for your participation. The findings of this study will be published in national and International scientific journals.

Procedure: I will inform you on the study being performed and seek an informed consent. Once granted I will ask you questions in respect with the eye care services delivery. The coordination of the prevention of the blindness, the ophthalmic personnel, the facilities dedicated to eye care, their equipment and the consumables supply are the keys points of the questionnaire. For the equipment, I will need to check their current status. For the surgeries done, I wish to get numbers from your theatre records. I will then record your answers and my findings in my questionnaire, section by section to complete it. This should take approximately 1 to 3 hours to complete. You are free to ask questions and seek clarifications about the study now and any time. I will be available to answer any questions that will help you to understand the nature of the study.

Benefit: Participation or non-participation does not come with any financial costs. Equally, no compensation will be provided for participation in the study.

If you need to seek clarification, you can contact

Dr. NIYONZIMA Jean Claude

Department of ophthalmology

University of Nairobi

P.O. Box 19676 – 00202

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E-mail: claudeniyonzima@gmail.com

Consent Form

I.....having received adequate information regarding the study research, risks/benefits, hereby AGREE / DISAGREE (Cross out as appropriate) to participate in the study. I understand that my participation is fully voluntary and that I am free to withdraw at any time. I have been given adequate opportunity to ask questions and seek clarification on the study and these have been addressed satisfactorily.

Participant's Signature..... Date

I.....declare that I have adequately explained to the above participant, the study procedure, risks, benefits and given him / her time to ask questions and seek clarification regarding the study. I have answered all the questions raised to the best of my ability.

Interviewer's Signature Date.....

Translated Consent Form in to French

Formulaire de consentement

Moi.....ayant reçu l'information adéquate en ce qui concerne cette recherche, les risques/les bénéfices, par la présente déclare être d'accord/ en désaccord (crocher là où c'est approprié) à participer dans cette étude. Je comprends que ma participation est entièrement volontaire et que je suis libre à me retirer à n'importe quel moment. J'ai reçu l'opportunité de poser des questions de clarifications sur cette étude et j'ai été satisfait.

Signature du Participant.....date

Moi Dr Jean Claude NIYONZIMA déclare que j'ai suffisamment expliqué au participant ci-dessus, la procédure de l'étude, les bénéfices, et lui ai donné le temps de poser les questions d'éclaircissement à propos de l'étude. J'ai répondu à toutes les questions soulevées au meilleur de ma capacité.

Signature de l'enquêteur.....Date.....

Appendix II: Questionnaires

1. Hospital based Questionnaire

COUNTRY:

BURUNDI

Province

POPULATION

--

Prevalence of
blindness

--

District

POPULATION

--

Prevalence of
blindness

--

Eye Unit general information

Eye Unit Name

Location

Address

P .O. Box

City

Tel.

Email

Eye support	Unit	MOH	MOH Secondary
Eye type	Unit	Primary	
Number of Beds			

	MOH		Private	
	Tertiary		MISSION	

Contact

Person:

PO Box

Address

City

Telephone

number

Fax

Email

OPHTHALMIC STAFF

Cadre	Total	National	In Training	Number with Training in	
				Com. Eye H.	Management
Ophthalmologists					
Cataract Surgeons					
OCO					
Ophthalmic Nurses					
Optometrist					
Refractionist					
Low Vision Technicians					
Manager (eye care)					
Maintenance Technicians (eye care)					
Community Eye Care Workers					

Equipment and Instruments for an Eye Hospital									
Location	Eq.Type	Equipment	Total Number	Functional Status (Give number for each)					Comments
				Broken down	Poor	Satisfactory	Good	Excellent	
Refraction Room		Snellen chart							
		near vision chart							
		Trial Set (20 Diaptor)							
		Jackson Cross Cylinder							
		AutoRefractometer							
		RAF Ruler							
		Retinoscope							
		Prism Bar							
		Electric Torch							
		A Scan							
		Keratometer							
		Mirror (18" x12")							
		Occluder							
		Colour Vision Book							
Visual Field Recording Equip.									
Consultation room	Major	Ophthalmoscope							
		Indirect Ophthalmoscope							
		Slit Lamp							
		20 D Lens							
		90 D Lens							
		Gonio Lens							
		Applanation Tonometer							
		Non-Contact Tonometer							
	Minor	Torch Light							
		BP Apparatus							
		Stethoscope							
		Tonometer							
		Thermometer							
		Scissors							
		Surgical Blades							
	Utensil	Kimura Spatula							
		Weighing Machine							
Laser Clinic	Major	Bin							
		Stainless Steel Jar							
		Yag Laser							
		Diode GL with Slit Lamp							
		Fundus Fluorescein Angiography machine							

Ward (number of beds.....)	Major	Slit Lamp								
		Indirect Ophthalmoscope								
		Ophthalmoscope								
	Minor	Torch Light								
		Surgical Bin								
Sterilization Room	Utensil	Single Drum Autoclave								
		Surgical Bins (Big)								
		Surgical Bins (Medium)								
		Surgical Bins (Small)								
	Major	Horizontal Autoclave								
		High Speed Sterilizer								
		Ultrasonic Cleaner								
Operation Theatre Block Room	Minor	Balancing Weight								
		Stethoscope								
		BP Apparatus								
		Oxygen Cylinder with Ambu Bag								
		Endotracheal Incubation Tube set								
	Laryngoscope									
	Major	Surgical Operating Microscope								
		Suction Apparatus								
		Biopolar Machine								
		Anterior Vitrectomy								
		Cryo System								
		Boiling Sterilizer								
		Surgical Instruments Sets								
		Pulse Oximeter								
		Phaco Machine								
	Operating Light									
	OT Care Machine									
	Furniture	Surgical Table(SS)								
		Trolley(SS)								
		IV Stand								
Stretcher										
Wheel Chair										

**CATARACT SURGERY
ACTIVITIES**

No. of outpatient clinics/week		<input type="text"/>	Average Number of Patients per clinic	<input type="text"/>
Outreach Services	Non	<input type="text"/>	If no outreach, why?	
	Yes	<input type="text"/>	As outreach provider?	<input type="text"/>
	Outreach clinics/year	<input type="text"/>	As host?	<input type="text"/>
			Distance to nearest clinic (km):	<input type="text"/>
			Distance to furthest clinic (km):	<input type="text"/>
School Screening	Yes	<input type="text"/>	Non	<input type="text"/>
Cataract Surgery	Yes	<input type="text"/>	Non	<input type="text"/>

Cost of basic eye care services		Currency	<input type="text"/>
	Public	Mission/NGDO	Private
Eye Clinic Fee per Patient	<input type="text"/>	<input type="text"/>	<input type="text"/>
Cost of Simple Spectacles	<input type="text"/>	<input type="text"/>	<input type="text"/>
Cost of Cataract Surgery per Patient			
With IOL	<input type="text"/>	<input type="text"/>	<input type="text"/>
Without IOL	<input type="text"/>	<input type="text"/>	<input type="text"/>

Surgery details	Total Previous Year	Current Year 200....Activities							
		Jan – Mar		Apr – Jun		Jul – Sep		Oct – Dec	
		Base Unit	Outreach	Base Unit	Outreach	Base Unit	Outreach	Base Unit	Outreach
Total Cat.									
Cat. – IOL									
Cat.+ IOL									
Cat. male/female ratio									
Cat. 0-15									

2. Coordination level based questionnaire

Country General Information				National Committee for PBL (NCPBL)	
Country				Year of Creation	
Capital				No. of Meetings/year	
Population		Last Census		Date last meeting	
		Last Update		Prevalence of blindness	
Pop. Density				Causes of Blindness	
Population Growth		Urban Growth		1	
Literacy Rate				2	
GNDP (per capita)				3	
				4	
				5	

Other questions related to NCPBL	
1.	What is the current membership (MOH/NGO representatives)?
2.	How functional is the current committee?
3.	What are their main achievements in the last 5 years?
4.	How is the funding status of NCPBL activities

PBL surveys	Please indicate for each survey (if available) the year, the area covered (e.g. part or whole country), and the population sample.

Training Programmes for Ophth. Personnel	Please list training programmes & institutions available in the country for ophthalmic personnel, their duration, the number trained per cycle or per year.

Do they meet the training needs in the country? If not, why not?
What are their main sources of funding (government, NGO, others)?

Cost of eye care services (average or range in US\$)*			
Sector Services	Public	Private	Mission/NGOs
Consultations			
Cataract Surgery			
Cataract+ IOL			
Aphakic Specs.			
IOL			
Simple Sph. Specs			
Antibiotic Eye Drops			
Antibiotic Ointment			
*Give a range of costs (highest-lowest) for each sector if more appropriate			
Comments: Add any other useful information/comment on PBL here			

Other Cost-related questions of great relevance to Vision 2020
Availability of essential eye medicines services: Are there in the country services or structures for the regular supply of affordable essential eye drugs? If yes, in which part(s) of the country (Geographic coverage)?
Availability of low-cost specs services and low-cost Low Vision devices: Are there in the country services or structures for the regular supply of low-cost spectacles or LV devices? If yes, in which part(s) of the country?
If not, how are these currently accessed?
Affordability of eye care services: Are current eye care services affordable? To what percentage of the population?
If not, why not?
Special Provision for poor patients: What measures exist in the country to ensure that poor patients have full access to eye care services?

Other questions relevant to Vision 2020 mission and mandate

Tertiary Eye Care Units

How many tertiary Eye Care Units are there in the country? _____

- What are their specific missions/functions in the provision and promotion of eye care in the country?
- 1) _____
 - 2) _____
 - 3) _____

Do they actually and effectively fulfill those missions/functions? Y/N If not, why not?

What have been to date their main contribution to the prevention of blindness in the country?

Primary Eye Care

Is there any structured primary eye care service(s) in the country? _____

If yes, does it cover the entire country and what are its main functions?

Appendix III: Availability of Human resources in the ophthalmic regions in Burundi by 2015

The table 17 is a summary of the human resources found in different ophthalmic regions. It breaks down the workforce by professional category and in which region served at the time of data collection.

Table 18: Availability of eye care human resources in Burundi by 2015

Cadres	Region	West	South	Central	North	East	North East	North West	Burundi
	Population	1, 641,483	1, 632,621	1, 750,581	1, 520,040	767,752	1, 537,772	973,967	9,824,216
Ophthalmologists	Target* (1:250,000)	7	7	7	6	3	6	4	40
	Actual	12	1	2	0	0	0	0	15
	% target in place	171.4%	14.3%	28.6%	0.0%	0.0%	0.0%	0.0%	37.5%
Ophthalmic Clinical Officers	Target* (1:200,000)	8	8	9	8	4	8	5	50
	Actual	8	6	4	6	3	3	3	33
	% target in place	100%	75.0%	44.4%	75.0%	75.0%	37.5%	60.0%	66.0%
Ophthalmic Nurses	Target* (1:100,000)	16	16	18	15	8	15	10	98
	Actual	18	0	4	1	0	0	0	23
	% target in place	112.5%	0.0%	22.2%	6.7%	0.0%	0.0%	0.0%	23.5%
Optometrists	Target* (1:250,000)	7	7	7	6	3	6	4	40
	Actual	2	0	0	0	0	0	0	2
	% target in place	28.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.1%
Refractionists	Target* (1:250,000)	7	7	7	6	3	6	4	40
	Actual	0	0	0	0	0	0	0	0
	% target in place	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
All Cadres	Target* (1:250,000)	45	45	48	41	21	41	27	268
	Actual	40	14	10	7	3	3	3	73
	% target in place	88.9%	31.1%	20.8%	17.1%	14.3%	7.3%	11.1%	27.2
	% deficit	11.1%	68.9%	79.2%	82.9%	85.7%	92.7%	88.9%	72.8