2014

Access to Optometric Education: Challenges in Sub-Saharan Africa

James Loughman
Technological University Dublin, james.loughman@tudublin.ie

V.R. Moodley
Technological University Dublin, moodleyvr@ukzn.ac.za

Brien Holden
Vision Institute, South Africa

See next page for additional authors

Recommended Citation

Loughman, J. et al. access to optometric education: challenges in Sub-saharan Africa, Literacy Information and Computer Education Journal (LICEJ), Volume 5, Issue 3, ISSN:2040, 2589. doi:10.21427/gjc2-6w19

Accessto Optometric Education: Challenges in Sub-Saharan Africa

VR. Moodley[1];J Loughman[2];KS Naidoo[3]
1.*University of Kwa-Zulu Natal, South Africa, Dublin Institute of Technology, Ireland*
(Corresponding Author Email: moodleyvr@ukzn.ac.za)
2. *Dublin Institute of Technology, Ireland*
3. *Brien Holden Vision Institute,South Africa*

Abstract

Access to education was identified as a key international priority by UNESCO as far back as 1998 when it called for "equality of access". The profession of optometry has been challenged to educate practitioners in increasing numbers in order to meet the eye care needs. The World Health Organization reported that globally, an estimated 285 million people are visually impaired and in Sub Saharan Africa (SSA) uncorrected refractive error is the main cause of visual impairment. The number of optometrists trained on the continent is currently insufficient to meet these eye care needs with limited access to education remaining a stark reality for students. A qualitative research design framed in phenomenology was used to conduct structured interviews with academic leaders in optometry across SSA. Finance for tuition andstudent maintenance, lack of knowledge of optometry and optometrists, high admission criteria, limited spaces at institutions,poor mathematics and science results, gender inequalities and geographical location were cited as barriers to optometric education. Lack of funding was the main contributing factor for the high attrition rate from university in countries where students have to pay their own fees.Where tertiary education is free, the limited number of spaces available in the programmes was the major barrier to access to optometric education for the ever-increasing number of aspiring applicants. The profession of optometry has a key role to play in eye care service delivery in Africa. Therefore educators, policymakers and health professionals must together formulate strategies to increase access to optometric education.

1. Introduction

Despite the numerous healthcare developments on the continent since the turn of the century most people in Africa have never had a visual and eye health examination. Globally, in 2010 an estimated 285 million people were visually impaired, of whom 246 million had low vision and 39 million were blind (Table 1).

Table 1: **Global estimate of the number of people visually impaired by age, for all ages in parenthesis the corresponding prevalence (%).**

Ages (years)	Population (millions)	Blind (millions)	Low Vision (millions)	Visually Impaired (millions)
0-14	1,848.50	17.518	1.421	18.939
15-49	3548.2	5.784	74.463	80.248
50 and older	1,340.80	32.16	154.043	186.203
All Ages	**6,737.50**	**39.365 (0.58)**	**246.024 (3.65)**	**285.389 (4.24)**

(Source: Global Data on Visual Impairments: WHO 2012 - http://www.who.int/blindness/GLOBALDATAFINALforweb.pdf.)

Africa has 15% of the world's blind population, 8.3% with low vision and 9.2% of visually impaired people with uncorrected refractive error (URE) causing 42% of the visual impairment [16]. Similar findings on URE were reported from studies in Sub-Saharan Africa where URE was the main (43%) cause of visual impairment [9] and was further cited as constituting a major public health problem [12].

Optometrists are the cadre of eye care workers that are trained to correctrefractive errors to prevent visual impairment and blindness so it will be expected that adequate numbers of optometrists will be trained to reduce the prevalence of URE. However, Naidoo highlights the fact that the number of optometrists being produced in Africa is insufficient to effectively meet eye care needs [8]. This bleak picture is not limited to optometrists as confirmed by Naicker *et al*. who describe the general picture in Africa as having 2.3 healthcare workers per 1000 population, compared with the Americas, which have 24.8 healthcare workers per 1000 population [7]. Effah reported that between 1996 and 2004, only about 25-40% of applicants to higher education in Africa were admitted [3]. To begin to increase the density of healthcare workers there has to be a significant increase in access to higher education in Africa. Shabani (2007) noted that there was an increase in access to primary and secondary schools in Sub Saharan Africa. He predicted that

this, coupled with increasing demographics, will increase the demand for higher education in the years to come [11].

As a potential strategy to address the enormous eye care service delivery challenges in Africa new optometry programmes were started across the continent. Programmes have commenced in Kenya, Mozambique, Malawi and Ethiopia and are planned for a few other countries in the near future. However, a stark reality facing these new schools, as with many of the existing programmes in sub Saharan Africa, is that potential students experience numerous challenges when attempting to gain access to the optometry programmes. This paper focuses on these challenges to optometric education in sub Saharan Africa and suggests practical solutions to begin to deal with them.

2. Methodology

The qualitative research approach was framed on phenomenology whereby the emphasis is on the person's subjective experiences and interpretations of the world. Purposeful sampling was used to identify key stakeholders in academic leadership from schools of optometry based in Malawi (2), Ghana (1), South Africa (5), Ethiopia (1), Tanzania (1) and Mozambique (1). The specific stakeholder sampling strategy involved identifying who the major stakeholders were that will have integral knowledge of the designing, policy formulation and processes involved in the entire programme.

Semi-structured telephonic or face-to-face interviews were conducted with the respective academic leaders. Data was transcribed and thereafter coded, captured and thematically grouped for qualitative analysis and reporting.

3. Results

Twelve heads of departments from optometry programmes in 6 sub Saharan African countries were interviewed. There were five female and seven male heads of departments and their terms of office ranged from 10 months to 30 years.

BARRIERS TO ACCESS TO OPTOMETRIC EDUCATION

Heads of departmentsidentified barriers to access to optometric education for students as shown in figure 1:

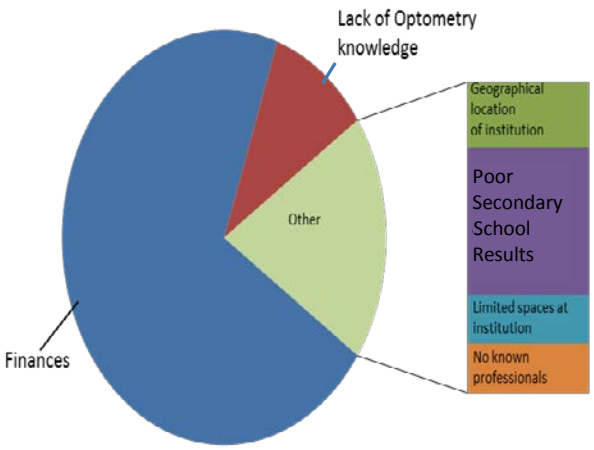

Figure 1: Barriers toaccess tooptometric education asidentified by academic leaders

Finance was cited by all the academic leaders as being the major barrier to access to optometric education. The lack of finance,both to get students admitted into university or college as well as for them to maintain themselves during their years of study, was identified as a huge barrier. Only in three of the 12 institutions (Ethiopia, Ghana and one of the two institutions in Malawi) are all students fully funded to attend university. Other institutions reported that there is limited funding available from governments and even less in the form of bursaries from the private sector. They confirmed the perspective of recruitment officers previously interviewed that the majority of university applicants in sub Saharan Africa are unable to self-fund their education. Optometric education programmes also involve students having to purchase some optical equipment for use in their clinical training. As most of these are imported into Africa, the costs are very high, adding an additional burden to the overall costs to the student.

The general decline of standards of secondary school public education and specifically the very poor mathematics and science results obtained by scholars in their exit examinations was cited by most of the heads of departments as being a huge challenge for universities and colleges. This was particularly problematic in a programme like optometry where knowledge and understanding in mathematics and scienceforms a foundation for many of the optometry courses. However, only one (Malawi College of Health Sciences)of the 12 institutions conduct entry examinations for prospective students and base their selection on the outcome of this test. The reason that the college chose to administer an entry examination for all applicants was to independently determine the competency levels of the students. Some institutions in South Africa request that applicants write the

national benchmarking test (NBT) and submit the results as part of the application. The results of the national benchmarking tests are weighted more than the results of the state examinations. Ethiopia reported that the standard of mathematics at schools in their county is of a high standard so the programme places extra emphasis on mathematics and science and expects applicants to have at least 70% in these subjects to qualify for admission into the programme.

An additional specific barrier, identified by the institutions in Malawi specifically,was the poor academic performance of female students, both at secondary school level and in the university admission test. This poor performance in the admission test is most prevalent in the areas of mathematics and science and has thus led to most of the students accepted into the optometry programmes being male. Cultural demands,includingexpectations of females to focus only on domestic chores within the homewas presented as a possible reason for this trend.Additionally, there are a large number of females that are excluded from going to school or may be allowed by the family to go to primary school only and not to continue into secondary school. This subsequently prevents access into university by these females. Therefore, the enrolment rates into the optometry programmes are evidently skewed in favour of males as these barriers result in females having to endure greater restrictions to access to higher education than their male counterparts.

A lack of awareness of optometry was cited as being very common in most of the countries. Even in countries like South Africa which has over 3 000 optometrists, the knowledge of the profession in the rural areas was very limited as the practitioners are based primarily in urban areas. Academic leaders reported that in their respective countries there are very few optometrists practicing and in some instances the first cohort of optometric students are still in training.

Poor secondary school final examination resultsobtained in the last year ofhigh school also affects access to the optometry programmes in all the countries. As with most medical programmes, the admission criteria to get into optometry are higher than with other non- medical programmes at the institutions. The majority of the institutions weight mathematics and science higher than other courses and set a minimum acceptable grade for these subjects. None of the universities conduct interviews as part of the selection process and most programmes rely solely on the merit scores with no other factors considered.

Academic leaders at all the institutions agreed that the limited spaces that they have in theirvarious optometry programmes across Sub Saharan Africa were highly inappropriate when the need for optometrists are considered. Most institutions receive far more applications than they have spaces in their programmes for.The number of spaces in optometry was reported as being very limited with the highest intake being 58 in Ghana and the new programmes admitting only 10-20 students. In the countries where the optometry department or the institution is not involved in the selection of students (Mozambique, Tanzania and Malawi), the number of applications received was unknown and could not be reported by the academic leaders. These institutions are administratively informed by the respective departments of health as to how many students have been accepted into their programmes. The optometry departments are thus unable to contribute to the decisions relating to the number of students being accepted.The academic leaders in remaining countries that conduct their own selection processes indicated that the spaces offered are restricted largely due to a lack of infrastructure, limited human and other physical resources.

Table 3: Table showing barriers to access to optometric education and specific challenges related to each barrier.

BARRIER	SPECIFIC CHALLENGES
FINANCE	• Poor parents • No/limitedgovernment funding • Minimal private bursaries • Expensive optometric equipment • High costs of living expenses
LACK OF AWARENESS OF OPTOMETRY	• Profession is unknown in most countries • No career guidance at school • Minimaladvocacy by profession/education institutions • University offerings unknown • No known practitioners in local communities
POOR SECONDARY SCHOOL RESULTS	• Poor secondary school education standards • Very poor mathematics and science results • Poor results in exit high school examinations • High university

	admission criteria • Only overall merit scores used for selection purposes.
LIMITED SPACE IN HEALTH SCIENCES	• Inadequate numbers of tertiary institutions in countries across Africa • Medicine first choice • Due to limited resources very few spaces in Optometry
GEOGRAPHICAL DISTRIBUTION	• Poor national spread at universities • Urban bias in demographic profiles of students • Parents in urban areas in better financial positions to self-fund • Exposure to other professionals and role models mainly in urban areas
GENDER DISCRIMINATION	• Females are prevented from going to school due to cultural belief that the role of the female is "to keep the home". • Males in households given preference over female siblings to attend school

The fact that there are no optometrists in many countries in Sub Saharan Africa implies that students, when making applications to university, will list the professions known to them, which will most likely exclude optometry. As many countries have doctors and nurses only at community clinics, it is expected that most will apply for medicine or nursing. Academic leaders reported that in these instances, those not successful in medicine will be offered a place in optometry or, as reported in Mozambique, will be placed into the optometry programme by the administrators in the government department processing the applications. The academic lecturing staff within the optometry programmes get to meet the new students for the first time when they arrive for lectures at the start of the academic year. Hence there is no opportunity for the departments of optometry to determine the applicant's knowledge of optometry or suitability for the profession during this process.

4. Discussion

The United Nations Declaration on Human Rights guarantees the right to education [14]. However, in many developing nations and particularly on the African continent access to higher education still remains plagued with numerous and varied barriers. Academic leaders interviewed in this study agreed that there are a few common barriers affecting their respective countries across Sub-Saharan Africa and that working on strategies to increase access to optometric education is critical in addressing the general issues of eye care services delivery across the continent.

In Africa 7300/million people are blind, 25 400/million have low vision and 32 700/million are visually impaired [16]. It is therefore inconceivable that less than 10 of the 48 countries in Sub Saharan Africa, with an estimated population of 800 million, have education programmes in optometry. Hence the first apparent barrier to optometric education is the lack of political will and impetus to develop national eye care plans that include strategies for service delivery and education. To begin to meaningfully address the lack of eye care services that the majority of countries across Africa face, a common understanding of the challenge, coupled with commitments and concrete decisions will have to be made at the highest political and administrative levels in each country. Individual countries must create legislative and regulatory frameworks that will integrate eye care education and services into national health and education policies. This should also be actively advocated and supported by international bodies such as the World Health Organization and the World Council of Optometry. National human resource plans must include eye care personnel including, but not limited to optometrists, dispensing opticians, ophthalmic nurses and ophthalmologists.

As a start, to expand the eye health workforce in each country in Sub Saharan Africa, countries must register an optometric education programme on the education framework with their respective departments of higher education. The optometry education programmes will then need to be incorporated into tertiary institutions in each country as a means to institutionalize the professional training. In those countries where a single programme currently exists, there should be a review of the impact that the graduate output has made on the practitioner to patient ratio and additional programmes be planned to further increase access to optometric education. Additionally, the national departments of health must pass appropriate legislation for the recognition and licensure of optometrists that will graduate with the approved qualifications.

Manuh *et. al*. have stated that access to tertiary education in Ghana is limited and differentiated by socio-economic status, region of origin and types of location of secondary school[6]. Academic leaders interviewed were requested to identify factors that thwarted efforts to increase access to their existing optometry programmes. There was a considerable level of consensus amongst the academic leaders relating to the factors that most affect access as well as on what may be done to improve the situation.

Finance

The main barrier to optometric education identified by the academic leadership was the lack of finances. An ideal situation will be for students to be fully funded throughout their school and tertiary education periods by their respective governments. However, there is no standard practice amongst the countries represented. Government funding ranges from 100% in some countries such as in Ghana and Ethiopa to less than 20% in countries such as South Africa. Letseka and Breier conducted a survey in South Africa and reported that the principle reason that 40% of students drop out of university in the first year is due to a lack of funding for fees as well as to be able to sustain themselves. Their survey further revealed that 70% of the university drop-outs come from low income families[4]. The world bank in 2010 reported the poverty head count ratios (PPP) in Sub-Saharan Africa as being 48.5% at 1$/day and 69.9% at 2$/day[16]. Most families are thus unable to afford tertiary education fees which place enormous financial burdens on the limited government financial aid resources.

However, there is an untapped multi-billion dollar optical industry serving optometry in the developed world and governments as well as international and national professional organizations should promote and facilitate public-private partnerships to acquire funding for both the setting up of new schools of optometry and supporting financially disadvantaged students. In addition, financial institutions should, as part of their social responsibility programmes, provide unsecured loans with minimal interest rates to needy students that have been accepted into optometry programmes. These loans can be structured in a manner whereby the graduate only begins to pay back on completion of the degree. The payment by employed graduates enables the funding pool to be sustained to ensure that new needy students are able to access funding as well.

Additionally, the high costs of optometric equipment required by students for clinical training can be reduced if universities in sub Saharan Africa undertake research and innovation projects aimed at developing appropriate, affordable equipment locally.At government level, there must be innovation funding allocations made to encourage academics and entrepreneurs to engage in design and development of optical equipment. Consideration should also be given to designing equipment that will easily functionin under-resourced contexts such as areas with no electricity.

Knowledge of the profession of optometry

It is indeed a concern that the optometric profession has been in existence for centuries and yet many students do not hear of optometrists until they arrive at the university, most having arrived there seeking to do medicine. In Ethiopia it is reported that students do meet the minimum entry criteria but do not apply for optometry because they have no knowledge of the profession. Countries such as Mozambique and Malawi highlighted the fact that most students just apply to do medicine as it is the most commonly known profession. The trend is more prevalent with students from rural areas who, in almost all the representative countries, do not have any optometrists practicing in their areas. However, in South Africa and Ghana, the programmes are oversubscribed due to the lengthy period of existence of the profession and the general advocacy conducted by the education and professional bodies within these two countries.

With the advent of mobile technologies and its recognized value in health promotion with expansive reach, universities, professional associations and international bodies could utilize this cost effective platform to conduct advocacy programmes for the profession of optometry.The use of mobile phones is exponentially increasing and can be explored by government departments as a means of conducting large scale advocacy and career education programmes amongst prospective university students. Universities can additionally contribute by recruiting existing students and alumni to conduct awareness programmes and serve as role models within their communities.

Geographical Distribution

Academic leaders in countries where the government selects and funds students reported that there is a better geographical spread of students gaining access to the optometry education programmes. This however was not evident in countries where the majority of students self-fund their education. A typical example of this phenomenon exists in Malawi where, in the Malawi

College of Health Sciences almost two thirds of the students come from rural communities and a third from urban areas whereas this is the opposite for Mzuzu University where the majority of students are from urban areas. This thus lends support to the theory that when government funds tertiary education it creates greater access for students from rural areas whereas where students self-fund their education, the programmes attract mainly urban students. This is most likely due to the better socioeconomic status of urban families as compared to rural families.

Government funded students recruited and selected from rural areas also help to improve access to eye care services in these underserved rural areas as they are usually expected to return to work in those areas as part of the bursary conditions. These arrangements help to improve the geographical spread of optometrists. Apart from being placed in areas that government has identified as being most needy of eye care services,students on bursaries from the Malawi College of Health Sciences are also compelled to work for the government for a minimum of 5 years before they may work privately. This model serves both to provide the student the necessary funding to access optometric education as well as provide the country with the much needed human resources for eye care service delivery.

There is howeverstill very limited government funding made available for optometry students in all the countries participating in this study. The more established health programmes, such as medicine, tend to get the bulk of the bursaries. In Malawi, due to the limited funding made available, only 20 students may be admitted annually at the college. The high costs of optometric education at universities, with few government bursaries being made available, therefore creates a major barrier for students from poor rural families as reflected in the low numbers of rural students in the majority of the other university programmes included in the study.

Almost all of the universities use advertisements in national newspapers as a recruitment strategy. Since most of the students interviewed only found out about the optometry programme when they arrived at the universities, this strategy seems not to be reaching most learners. This may be due to these national publications not being available in rural areas as well as the fact that many parents may not be literate or able to afford the newspaper on a daily basis. Hubley and Gilbert highlighted that a limitation of newspapers is that they only reach the literate, newspaper reading section of society, but they are particularly useful if the aim is reach professional and middle class groups, which might be important for advocacy. The relative importance of radio and television varies from region to region. It is thus important to find out what media are available and who accesses them, and base the choice of media on the local pattern of use.[5]Hence, universities should evaluate their recruitment strategies, with an assessment conducted on whether their current strategies are achieving the geographical distribution they desire. Government bursaries should be allocated for each region of the country to ensure a national spread of students and eye care practitioners.

Poor Standards of Secondary School Education

All the heads of departments interviewed, apart from the academic leader in Ethiopia, indicated that the standard of education at secondary schools is not very high. This serves as a barrier to access into tertiary education and many of those who do acquire the necessary admission points find that they are inadequately prepared to cope with first level university courses, a phenomenon that is exacerbated in mathematics and science. Ottevanger *et al.* undertook case-studies from ten Sub-Saharan African countries and identified a number of huge challenges in science, mathematics, and ICT education (SMICT): poorly-resourced schools; large classes; a curriculum hardly relevant to the daily lives of students; a lack of qualified teachers; and inadequate teacher education programs [10]. The education sectors need to address these problems which are common to almost all countries on the continent with specific attention being given to the improvementof the standards of mathematics and sciences at school level. Universities should actively engage their respective governments on this issue as well as, in the interim, introduce bridging programmes that can serve to upgrade the school leaver's knowledge and competencies to enable them to gain access into optometry.

Of the twelve programmes included in the study, only one utilizes an admissions test. To ensure that students with the necessary competencies are accepted into the programme and to address the huge gaps in secondary and tertiary level education, it is advised that optometry programmes across the sub-continent collectively design and implement an entry examination for the profession.

Gender Distribution

Females were very poorly represented at both institutions in Malawi despite the fact that 49.9% of the population in the country is female. This is of additional concern when one considers that the WHO indicates that in every region of the world, and at all ages, females have a significantly higher risk of being visually impaired than males [15]. Unesco Institute for Statistics in 2010 reported that contrary to global trends, women remain disadvantaged in terms of access to tertiary education in sub-Saharan Africa where the growth enrolment ratio for women is 4.8%, compared to 7.3% for men. The report goes on to state that women face significant barriers to tertiary education in countries with the lowest levels of national wealth such as Central Africa Republic, Democratic Republic of the Congo, Ethiopia, Malawi and Niger [13].

Academic leaders interviewed in Malawi cited poor academic performance of females as the main reason for non-acceptance into the programmes and that fewer applications are received from females. Other possible reasons are traditional cultural roles defined for women to prioritize domestic duties and respect hierarchy in the homes where education for males takes priority over females. Thus the number of females completing secondary school and going on to tertiary level is thus significantly reduced.

Noting that females have to endure additional socio-cultural barriers to education to those experienced by males, it is important that governments embark on programmes to address the gender disparities in education with females being encouraged to take mathematics and science subjects at school level. Tertiary institutions should institute affirmative action policies which actively recruit female students. Other additional strategies that could be used are: setting aside a specific number of spaces for females in each intake, offering bursaries specifically for females and providing bridging programmes and ongoing academic and social support to female students accepted into the optometry programmes. Additionally, gender organizations should engage in advocacy programmes in communities to highlight the impact of the discrimination of females in education.

5. Conclusion

To begin to meaningfully address issues of eye care services delivery on the continent and reverse the visual impairment and blindness statistics in sub Saharan Africa, human resource development must be prioritized. As the profession of optometry has a key role to play in eye care service delivery, global, national and regional educators and health professionals must come together to develop strategies to remove the barriers to optometric education that students currently experience. The ultimate aim should be to have optometry graduates of both genders, from across the geographical, economic and social spectra in each sub Saharan African country. It is urged that we remain cognisant of the warning by Anyangwe and Mtongathat “only when enough health workers can be trained, sustained and retained in sub-Saharan African countries will there be meaningful socio-economic development and the faintest hope of attaining the Millennium Development Goals in the sub-continent”[1].

10. References

[1] Anyangwe SC, Mtonga C. Inequities in the global health workforce: the greatest impediment to health in sub-Saharan Africa.*Int J Environ Res Public Health.* 2007 4(2):93-100.

[2] Azcona G, Chute R, Dib F, Dookhony L, Klein H, Loyacano-Perl D, Randazzo D, Reilly V. Harvesting the Future: The Case for Tertiary Education in Sub-Saharan Africa. The Maxwell School of Syracuse University. 2008 pp 229.

[3] Effah, Paul . (2003). Ghana. In D. Teferra and P. Altbach (Eds.), *African Higher Education.* Bloomington: Indiana University Press.

[4] HSRC Press (2008) *Education and Poverty Reduction Strategies: Issues of policy coherence*, Section 2: Poverty in Education, Student Pathways Study, M Letseka and M Breier, "Student Poverty in Higher Education: The impact of higher education drop out on poverty".

[5] Hubley J, Gilbert C. Eye health promotion and the prevention of blindness in developing countries: critical issues. Br J Ophthalmol. 2006 March; 90(3): 279–284.

[6] Manuh T, Gariba S and Budu J. (2007). *Change and Transformation in Ghana’s Publicly Funded Universities.*Partnership for Higher Education in Africa. Oxford, UK: James Currey and Accra, Ghana:Woeli Publishing Services.

[7] Naicker S, Plange-Rhule J, Tutt RC, Eastwood JB. Shortage of healthcare workers in developing countries-Africa.*Ethn Dis*. 2009 Spring;19 (1 Suppl 1): S1-60-4.

[8] Naidoo KS. Poverty and Blindness in Africa. *Clinical and Experimental Optometry* 2007 90.6.

[9] Naidoo KS, Jaggernath J. Uncorrected Refractive Errors.*Indian j Opthalmol* 2012 60 432-7.

[10] Ottevanger, Wout; van den Akker, Jan; de Feiter, Leo. Developing Science, Mathematics, and ICT Education in Sub-Saharan Africa: Patterns and Promising Practices.
© Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/6645 2007

[11] Shabani, J. (2007). Shifting Demographics in Sub-Saharan Africa. *International Higher Educatio,*47.

[12] Sherman JC, Lewallen S, Courtright P. Blindness and Visual Impairment due to uncorrected refractive error

in Sub Saharan Africa: review of recent population based studies. *Br J Ophthalmol* 2012 96 7 927-0
[13] Unesco Institute for Statistics Fact Sheet. Trends in Tertiary Education: Sub Saharan Africa. December 2010.
[14] United Nations: Declaration on Human Rights. Article 26
[15] World Health Organization. Prevention of Blindness and Visual Impairment 2002http://data.worldbank.org/topic/poverty (Accessed 19/07/2013).
[16] World Health Organization. Global Data on Visual Impairments WHO 2010.World Bank Statistics http://www.who.int/blindness/causes/magnitude/en/index.html(Accessed 20/07/ 2013).