Digital Innovations & Contemporary Research in SCIENCE, ENGINEERING & TECHNOLOGY

Vol. 6. No. 4, Dec, 2018

Article Citation Format
Dania, A.V. (2018): Creating A Refractive Error Plan
Journal of Digital Innovations & Contemp Res. In Sc., Eng & Tech. Vol. 6, No. 4. Pp 75-106

Article Progress Time Stamps

Article Type: Research Article
Manuscript Received: 24th Oct. 2018
Review Type: Blind
Final Acceptance:: 27th Nov, 2018
DOI Prefix: 10.22624

Creating A Refractive Error Plan

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ABSTRACT

Refractive error is a very common eye disorder. It is a phenomenon wherein the parallel rays after refraction through the optical components of the eye do not focus on the retina when accommodation is at rest. The result of refractive errors is blurred vision, which is sometimes so severe that it causes visual impairment. The three most common refractive errors are: Myopia (short sightedness); Hyperopia (long-sightedness); Astigmatism: distorted vision resulting from an irregularly curved cornea. Visually disabling refractive error affects a significant proportion of the global population, occurring in both genders, in all ages and in all ethnic groups. VISION 2020's major priorities are cataract; trachoma; onchoccriasis; childhood blindness, and refractive error and low vision. These have been selected not only because of the burden of blindness that they represent but, also, because of the feasibility and affordability of interventions to prevent and treat these conditions. The way to eliminate uncorrected refractive error is through the development of all these aspects of a self-sustaining system, including personnel to provide eye care services; and spectacles, to correct vision. In most developed countries the optometrist to population ratio is approximately 1:10,000. However, in developing countries the ratio is 1:600,000. This lack of practitioners is the main reason for high rates of vision problems due to uncorrected refractive error in developing countries, hence, the need for more eye care practitioners in developing countries.

Keywords: Refractive error, Myopia, Hyperopia, Astigmatism, Cataract and Trachoma.

1. INTRODUCTION

Refractive error is a very common eye disorder. It is a phenomenon wherein the parallel rays after refraction through the optical components of the eye do not focus on the retina when accommodation is at rest. The result of refractive errors is blurred vision, which is sometimes so severe that it causes visual impairment. The three most common refractive errors are: Myopia (short slghtedness): dr"ffrculty in seeing distant objects clearly; Hyperopia (long-sightedness): difficulty in seeing close objects clearly; Astigmatism: distorted vision resulting from an irregularly curved cornea. A fourth condition is presbyopia, which leads to difficulty in reading or seeing at arm's length. It differs from the other disorders in that it is linked to ageing and occurs almost universally. Refractive errors, cannot be prevented, but they can be diagnosed by an eye examination and the most frequently used options for correcting refractive errors are: spectacles, the simplest, cheapest and most widely used method; contact lenses, which are not suitable for all patients or environments; and coraeal refractive surgery , which entails reshaping the cornea by laser.

Refractive error as a cause of blindness has been recognized only recently, since many of population based surveys of blindness have used best-corrected distance visual acuity to define blindness.

This definition of blindness misses cases of refractive error blindness, since it does not take into account the level of vision with which people actually function in their daily lives. Those who have poor enough vision to qualify as "blind" due to unconnected or inadequately corrected high refractive error are considered as ' 'not blind" because their vision improves with best refractive correction Bien Holden, 2007). However, these people are actually blind because they function with poor vision due to lack of appropriate refractive correction. Because refractive error blindness is missed with the best-corrected distance visual acuity definition, assessments of blindness 'should be based on presenting distance visual acuity if refractive error blindness is t o receive its due attention and be eliminated. This definition would give the “real” magnitude of blindness in a population.

Visually disabling refractive error affects a significant proportion of the global population, occurring in both genders, in all ages and in all ethnic groups. The most common cause of visual impairment and the second leading cause of treatable blindness, uncorrected refractive error has severe social and economic effects on individuals and communities, restricting educational and employment opportunities of otherwise healthy people (Taylor, 1997). The duration of the effect is also significant - refractive error can account for twice as many blind-person-years compared to cataract, due to the earlier age of onset. The need is very great for both children and adults. Studies have shown that refractive error in children causes up to 62.5% of blindness (< 6/60 in t he better eye) - in Chile 22% in Nepal, 77% in urban India and 75% in China. For visual impairment in children (< 6/12 in the better eye), refractive error is responsible for 55% in Chile, 86% in Nepal, 93% in China, 70% in The global initiative, VISION 2020: The Right to Sight, established by the World Health Organization(WHO) and the International Agency for the Prevention of Blindness, has created valuable and effective collaborations of organisations involved in a wide range of eye care and community healthcare activities aimed at the elimination of avoidable blindness and impaired vision(WHO 2000).

VISION 2020's major priorities are cataract; trachoma; onchoccrciasis; childhood blindness, and refractive error and low vision. These have been selected not only because of the burden of blindness that they represent but, also, because of the feasibility and affordability of interventions to prevent and treat these conditions. It i s only recently that uncorrected refractive error has achieved prominence as a major cause of functional blindness and significantly impaired vision, as a result of landmark population-based studies in adults, children an d in post-cataract patients. Apart from individuals who have taken an active role in the elimination of disease s such as onchocerciasis or have been in cataract teams, optometrists have had little opportunity to take part in the frontline elimination of four of the major, preventable blindness-producing conditions targeted by VISION 2020. The realisation of the impact of uncorrected refractive error has provided the opportunity for optometry to play a major part in alleviating vision loss for those most in need.

The need to mobilise optometry to deal with uncorrected refractive error has been accompanied by the possibility of better integration of optometry into prevention of blindness in general, with some major benefits in areas such as: rural India and 83% in urban India. What is also disturbing is the amount of this refractive error t hat is uncorrected on presentation - 46% in Chile, 92% in Nepal, 58% in China, 86% in rural India. The burden even reaches to developed countries, with uncorrected refractive error causing 25% of all blindness (<6/60) in an Australian adult population, and 56% of visual impairment (<6/12)8.The burden of refractive error is s et to grow alarmingly due to an increase in myopia in both the developed and developing world - especially in urbanised East Asians, such as the Chinese populations in Hong Kong, Singapore and Taiwan (Dandona el (1/., 2002).

Refractive Error and VISION 2020

The impact and importance of uncorrected refractive error has now been recognised by VISION 2020. WHO established a Refractive Error Working Group (REWG) as part of global VISION 2020 activities, in recognition of this important facet of international eye care. The REWG is now developing international strategic plans and policies to eliminate uncorrected refractive error (WHO, 2000).

The Role of Optometry in VISION 2020

T Teaching eye care personnel, especially in refraction and low vision care.
I Providing screening and vision care services at secondary and tertiary levels.
I Detection and management of potentially blinding diseases such as cataract, diabetes and glaucoma.
I Research into the understanding of global eye care needs and solutions, especially in vision correction and vision care service delivery.
I Building economic and logistical models of self-sustainable eye care.

Optometry's Role in Correcting Refractive Error

The good news is that while refractive error is amongst the most common causes of blindness and visual impairment, it is also the easiest to 'cure'. Refractive error can be simply diagnosed, measured and corrected, and the provision of spectacles is r.n extremely cost-effective intervention, providing immediate correction of the problem. Throughout the world, optometry has been the major provider of vision correction, but usually from a private practice setting. Public health optometry has not reached the communities that are in most need, in any organised way. Despite this, on their own initiative, thousands of private optometrists worldwide have regularly visited communities in need, to provide vision care and dispense spectacles. The opportunity now is for optometry to develop a concerted effort to create local capacity in these communities through service delivery, in collaboration with its partners in VISION 2020, by creating human resources and by helping to develop the infrastructure needed - the three cornerstones of the VISION 2020 programme.

What is needed?

The way to eliminate uncorrected refractive error is through the development of all these aspects of a self-sustaining system, including personnel to provide cyccarc services; and spectacles, to correct vision. In most dev eloped countries the optometrist to population ratio is approximately 1:10,000. However, in developing count ries the ratio is 1:600,000 and much worse in many rural areas - up to millions of people per optometrist. This lack of practitioners is the main reason for high rates of vision problems due to uncorrected refractive error in developing countries. The 'blindness' rate in many developing countries, especially in Africa, is 7 times higher, than in developed countries at 1.4%. In order to deliver good quality eye care to countries where the nee d is greatest, there needs to be a steady but substantial increase in the number of eye care personnel trained in refraction and vision correction. The current desperate situation in many countries cannot wait for advanced optometry to develop, but require s optometry to take a major role in training mid-level personnel in refractive care.

Trained eye care personnel + Affordable spectacles = PEOPLE WHO CAN SEE!

Whether it is the world's newest country, East Timor, or Ethiopia with its 70 million people, both without any optometrists, interim measures using nurse-refractionists or ophthalmic technicians that are trained to screen for vision problems are essential. Many make the issue of refraction and vision correction too simple. Why not just use subjective trial and error? The main reason is that it does not work. Children accommodate, myopia is overcorrected, and hyperopia is under corrected. The second reason is that both adults and children will not wear spectacles that hurt their ears, look strange or 'strain their eyes' - even if they are free. It is a waste of time, resources and money to do it the wrong way!

Doing it the right way means an accurate refraction (by a licensed and registered optometrist using either a relinoscope or auto-refractor) and the correct ISO/ANSI standard spectacles that are comfortable and attractive. Affordable spectacles can be provided easily through mass-distribution of ready-made spectacles and the establishment of low-cost local laboratories for 'tailor-made' spectacles. International optometry and opticianry have important roles to play in this task. Traditionally, these groups have been primarily involved in the private sector, generally looking after wealthier people in the community. But progressive leadership in optometry sees an ever-increasing role in the development of training and continuing education programmes for all levels of available eye care personnel; in the establishment of infrastructure;- in the development of effective models and programmes; in the delivery of eye care services to meet community needs, and in the funding needed for the provision of training and low cost spectacles.

1.2 Optometry as Part of the Eye care Team

In the first Planning Meeting of the Informal Group on Refractive Error, the participants endorsed 'the inclusion of the correction of visually disabling refractive error as a component of the Global Initiative for the EHmination of Avoidable Blindness - VISION 2020: The Right to Sight', and 'emphasised the need to deliver refraction services as an integral part of general health care systems and comprehensive eye care'. The need for glasses is also a public eye health opportunity not to be missed. Refractive care provides excellent access to t he population for screening of more serious eye problems, such as cataract and diabetes. Primary care screening by optometrists and eye care workers, with optometrists taking care of the more immediate interventions required, and referral for more 'complicated' care, is 'classical' health care delivery. One effective current model, developed by the LV Prasad Eye Institute in Hyderabad, India, for the efficient and cost-effective deliver y of eye care is a community eye care 'team'. For every 1,000,000 people the team has: I 1 ophthalmologist. I 4 optometrists. 18 eye care workers. 18 ophthalmic assistants. 16 ophthalmic nurses.

1.3 The Role of Research

As the previous statistics show, there is a significant problem to be faced in addressing uncorrected refractive error. But understanding the scope of the problem, and most importantly, planning how to solve it, requires much more information than these simple numbers. Adequate prevalence data arc necessary to determine the regions, population groups and age cohorts most in need of intervention, and, also, to provide the basis from which interventions in the future can be evaluated.

As part of the front line of the eye care team, optometry has a role to play in research - as diverse as the etiology of the epidemic of myopia in East Asia, to collecting the data needed to design effective eye care interventions - both in refractive error and for other eye care needs. Optometry can significantly contribute to the understanding of: I Worldwide blindness and impaired vision - the burden and its effects.
1 Health care planning.
T Service delivery.
I Outcomes of intervention.

Refractive Error Study in Children

A series of studies around the world have begun to fill in the gaps in our knowledge of the burden of blindness and impaired vision in children caused by refractive error. The studies address the variation of refractive error with age, gender, race and geographic region, the extent to which it is being corrected, and how the prevalence is changing over time. The Refractive Error Studies in Children (RESC) have so far been conducted in Nepal, China, Chile and India, using population-based, cross sectional sampling, consistent definitions and a common methodology. ICEE is currently conducting the RESC study in KwaZulu Natal, South Africa, in conjunction with the National Eye Institute and WHO, and sponsored by CBM International, Sight Savers International and ICEE.

At the completion of the African study, data will have been collected on approximately 30,000 children worldwide (Murthy GVS, et al., 2002).

1.4 Self-Sustain ability, Refractive Error and Optometry

Two other important contributions that optometry and the optical industry can make to the worldwide fight to eliminate avoidable blindness and impaired vision due to refractive error are:

I Developing the logistics and economics of self-sustainingly care at the community and institutional levels. I Mobilising worldwide resources to develop models and create the educational and delivery infrastructure for refractive and general vision care. First, optometry and opticians need to pass on knowledge of the logistics, supply systems and economic management that is done so well in private practice, to public health programmes. Thus, spectacle supply can effectively fund more expensive or intensive needs, such as low vision and cataract surgery. An important part of practical and cost-effective eye care systems to communities in need is t he understanding that it does not make sense to bring 50% of the population that require refractive services in to a hospital setting for refractive care. It makes much more sense to screen, refract and supply spectacles and vision care (including the detection and treatment of minor problems and referral of those with more serious problems) at the community level. Optometry can make a major contribution in supporting eye care at this m ore convenient and cost-effective level. Second, the global spectacle industry and optometrists and ophthalmologists who serve the private sector probably generate total revenues of over $100 billion. It would be a powerful statement of professional and corporate responsibility if 0.1% of this amount found its way back to help those most in need.

Strategies for Correcting Uncorrected Refractive Errors: The Challenge of providing Spectacles in the Developing World Visually disabling refractive error (RE) affects a significant proportion of the global population, occurring in both genders and allages and ethnic groups. Yet we are only now beginning to realise the size and impact oft his global health problem. RE is one of the most common causes of visual impairment, and the second leading cause of treatable blindness. It has severe social and economic effects on individuals and communities, restricting the educational and employment opportunities of otherwise healthy people. The duration of the effect is also significant, as RE has been found to account for twice as many blind-person-years compared to cataract due to the earlier age of onset. The burden even reaches to developed countries, with uncorrected RE causing 25% of all blindness (<3/60) in an Australian adult population. In an eye with refractive error (or ammetropia), parallel rays of light fail to converge to a sharp focus on the retina. For the patient, this means that their vision is blurred. The error is 'correctable' if a sharp focus can be achieved with the aid of vision correction devices, such as spectacles or contact lenses. Yet many people with refractive error are not aware that there is a cure for their compromised vision, have no-one to provide treatment, or cannot afford the appliances they need. The way to eliminate global uncorrected refractive error is through the development of all-aspects of a se lf-sustaining system, including human resources to provide eye care services, and spectacles to correct vision.

1.5 VISION 2020 and the Refractive Error Working Group

VISION2020: The Right to Sight is a concerted worldwide effort designed to eliminate avoidable blindness b y the year 2020. Established by an alliance of the World Health Organization (WHO), the International Agency for the Prevention of Blindness (IAPB) and the Partnership Committee of the International Non-Governmental Development Organisations, the programme seeks to enable all parties and organisations involved in combating blindness to work in a focused and coordinated way. In February 2000, ICEE made a proposal to the WHO and the IAPB for the establishment of a Refractive Error Working Group (REWG), to be part of the global VISION 2020 activities, in recognition of this important aspect of international eye care. The REWG is now developing international strategic plans and policies to eliminate uncorrected RE.

The group is also helping to decide what research is required and in which regions, in order to have adequate data to make anesti mate of blindness and impaired vision due to RE. As the previous statistics show, there is a significant problem to be faced in addressing uncorrected RE. But understanding the scope of the problem, and most importantly planning how to solve it, requires much more information than these simple numbers. A series of studies a round the world aim to provide information on the variation of RE-with age, gender, race and geographic region, the extent to which it is being corrected, and how the prevalence is changing over time. The Refractive Error Studies in Children (RESC) have so far been conducted in Nepal, China, Chile and India. 1 CHE is currently conducting the RESC study in KwaZulu Natal, South Africa in conjunction with the National Eye Institute and WHO.

The study investigates the prevalence of RE and visual impairment in children 5-15 years old. Approximately 6000 children will be targeted in the study, which will use a mobile eye care team and regional eye clinics t o reach communities. At the completion of the African study, data will have been collected on approximately 30,000 children worldwide. This data will be vital to determining the regions, population and age groups most in need of intervention, and will also form the basis from which interventions in the future can be evaluated.

Low or No Cost Spectacles

A crucial clement of the effective delivery of refractive eye care services is the provision of affordable vision correction devices. While there are a number of options for vision correction (e.g., contact lenses, refractive surgery, etc.), spectacles are the simplest and most inexpensive options. However, in many areas of the world, spectacles are either not available, or too expensive. While having adequately trained practitioners is essential to providing refraction and eye care to communities, this care must be supported with the devices needed to restore sight. The challenge now is to develop ways of supplying good quality spectacles to communities in need. While there are many schemes which involve spectacle supply (for example, collecting used glasses for distribution to developing countries), for any system to be truly effective, it must be sustainable and long term. The issues in the provision of spectacles are:

1 Quality.
I Supply (ready-made or prescription).
I Distribution.
I Cost.
I Acceptance

1. Quality

The spectacles need to be of the highest possible quality, including lenses which adhere to ISO standards of power, prism, and power variation; frames which arc sturdy and with a metal hinge; and a complete pair of spectacles which are lightweight and attractive. Quality of lenses and frames are critical for effective use, especially by children. In recent studies of spectacle wearers in India, comfort and attractiveness were significant factors in determining wear patterns.

2. Supply

In providing spectacles to patients, there is a choice between ready-made and prescription devices. Ready-ma des are convenient for the Optometrist and patient, and can be used for spherical distance prescription, and reading glasses - where the spherical power difference is less than 0.50D and the cylindrical powerless than 0. 75D. However, there are issues of cost, availability, quality, re-supply, and applicability. Prescription spectacles will be needed for approximately 30% of the patient population depending on the criteria used. Innovative ways of producing prescription spectacles are being investigated. It is anticipated that with a simple system, there will be minimal need for full laboratory set-up and highly trained technicians to provide custom-made prescription spectacles.

3. Distribution

While spectacles may be readily available in urban areas, the system must ensure that vision correction devices arc also available for patients living in rural and remote areas. It is, therefore, necessary to look at every level of distribution:
I National / Provincial.
I Regional.
I District.
I Community.

Ready-mades can be made available at the community level, while prescription lenses would require a dispensing laboratory within the district, and a technician within the community to fit lenses to frames.
Various delivery models have been devised for the delivery of eye care and vision correction, e.g., the 'Franchise Model', where potential practitioners are selected, training and provided with spectacle sets.
The franchise guidelines could include:
I Minimum number of eye examinations to be provided in schools and villages I Low cost spectacles .
I Upgrading of the franchisee's training and involvement.

4. Cost

It is anticipated that the establishment of a self-sustaining system of supply of low cost spectacles will provide funds that can be directed to other programmes, such as education or research. However, funds will be required from existing funding schemes, charities, industry and/or government subsidy particularly in the early stages of this scheme.

5. Acceptance

In some communities there are cultural issues regarding acceptance of spectacles, while in other communities wearing spectacles are considered attractive. Public education is the key to acceptance.
Vision Testing for Refractive Errors in Schools *'Screening' Programmes in Schools*
Uncorrected refractive errors are an important cause of visual impairment in many countries. In developing countries, however, it is often difficult to provide an efficient refraction service for a variety of reasons. The proportion of children, who are blind or visually impaired, due to refractive errors, can be used to assess the level of development of' eye care services in a country. Vision testing in children is the process of detecting vision problems, and is undertaken to improve prognosis and reduce disability. The word 'screening' has a very precise meaning in public health and there are clearly defined criteria which should apply before any screening programme is established. (When considering the detection of refractive errors and other causes of visual impairment in older children, the term' screening' does not really apply - 'vision testing' is perhaps a better term)

1.6 Assessment of Need

There are few data available on the prevalence and types of refractive errors in children in developing countries, but in the USA the prevalence of vision problems is estimated to be 5-10%, while the prevalence of amblyopia is 1-5% in children. In a study in India, 5.1% of children in schools had a visual acuity of < 6/12 in the better eye. In Botswana, a survey of children in schools and in the community showed that 1.5% of children aged 5-15 years had a visual acuity of <6/18 in the better eye due to refractive errors, 78% of whom had are fractive error of less than +/- 2.00D (dioptre sphere) spherical equivalent. At least 2000 children / million populations have refractive errors greater than - 1.00D in both eyes. These are the children who should be the foe us of attention in any school vision testing programme.
Different age groups of children have different problems and needs.

Planning a Vision Testing Programme for Children

There are several questions which need to be addressed and answered when planning a vision testing programme for children. The most important is to decide the aim of the programme. Others include:
1 At what age will children be tested?
T Where will vision testing be done?
I What method of visual acuity measurement will be used?

Age Groups and Specific Needs

I What level of visual acuity will be used to identify children who need further examination/refraction?
T Who will measure the vision?
T Where will the follow up examinations and refraction be performed?
I Who will do this?
I How will services be provided for children who need them?
T How will the programme be monitored and evaluated?

1.7 Aim of Vision Testing Programme

Before establishing a vision testing programme, it is important to consider the aim of the programme. If the aim is to detect and treat conditions that may lead to amblyopia (i.e., refractive errors, eye disease causing visual impairment, and strabismus) the programme must focus on pre-school age children. This approach present s considerable challenges, as examining young children and measuring their visual acuity or refractive errors is difficult, particularly in a non-clinical setting. Another difficulty is that in many countries there is no readily identifiable 'catchment' population of pre-school age children, which adds logistical difficulties. For all these reasons, formal preschool screening programmes are not established in many industrialised countries. If the aim is to detect and treat 'significant' uncorrected refractive errors and eye conditions causing visual impairment, older children can be targeted. Again, consideration has to be given to the age at testing - testing only 6-7 year olds in primary school will increase the proportion of children examined (as school attendance rates at this age are high in most countries), but will be too young to deteetmyopia of puberty. If vision testing is undertaken to detect myopia in 12-14 year olds, those with early onset refractive errors will have many years of poor vision, and may have dropped out of school for this reason.

The frequency of vision testing needs to be linked to the availability of resources. If conditions are favourable, children should be screened once during the primary school years (6--11 years) and once during early adolescence (12-14 years). This is the ideal for developing countries. However, if resources are limited, it is best t o start in early adolescence - because most children would have manifested their myopia by that time, childre n of this age readily comply with vision testing, and because more are likely to wear spectacles when prescribed.

Testing Vision: How and Who?

The initial test of visual acuity identifies children who are 'abnormal' and who need to be refracted and examined in more detail. Decisions need to be made whether to measure vision in each eye separately, or with hot h eyes open. The level of acuity that denotes 'failure' also has to be decided. If the level of acuity is too high (i.e., less than 6/9 in one or both eyes), a very high proportion of children will 'fail', many of who would not need or benefit from glasses. If the level is set too low (i.e.<6/60 in the better eye), only those with severe visual impairment will be detected. In India, a cut off of < 6/9 in either eye is used to define abnormal vision. Children failing this test are referred to an ophthalmic assistant for refraction. In this programme more than 60% of the prescriptions were < 1.00D (dioptre sphere) and it is not known how many of these children continue t o use spectacles in the long term. To increase the cost effectiveness of a school vision testing programme, it is probably wise to use <6/12 in the better eye to determine 'abnormal vision'. The visual cut off level is also dictated by the compliance of populations with spectacle use.

The method of vision testing needs to be valid. I n other words, the test should identify those children who will benefit from treatment (i.e., spectacles). The test should not refer too many children who cannot benefit from treatment (false positives), as this will cause anxiety in the families and overload the available services. Also, the test should not miss children who need spectacles (false negatives).The balance between sensitivity and specificity is important. If a programme uses a visual acuity cut off < 6/6 in either eye, the test would have a very high sensitivity, as all the 'visually impaired' would be identified by the test. However, there would be many false positives, and a large number of nor mal children would be referred for diagnostic work up.

If < 6/12 in the better eye is used as the cut off for normal vision, the sensitivity would be lower than if <6/6 was the cut off, as some children who may need spectacles would pass the vision test. The positive predictive value would be higher, indicating that most of the children referred would indeed be found to have refractive errors, with some having loss of vision from other causes. Trained eye workers (i.e., optometrist or ophthalmologists) may not undertake the initial testing, as it is not a good use of their time. Whoever does the vision testing in schools needs to be trained. In India, school teachers have been identified for this purpose - in other programmes community volunteers have been used successfully. In India, preference is given to female teachers who wear spectacles themselves, as they have heightened awareness of the problems of refractive errors. After one day's training, the teachers are provided with a vision testing kit.

Vision Testing in Schools

Once the training is complete, the vision testing can start. It is preferable to complete the screening during the period when children do not have any examinations. The procedure for testing should be explained- a big cu t-out of an E can be shown to the child, and the directions of the limbs of the E explained. If the child already wears glasses, vision should be recorded with the spectacles. As children can memorise the Suellen chart quickly, a card with Eoptotypcs of the same size is preferable. Children should not stand too close together, as t hey also tend to 'help' each other!

Good lighting is important and testing can be done outdoors. The vision should be immediately recorded for each child, and a list made of all the children who fail vision testing, to ensure that all those who need further assessment are correctly referred.

Examination and Refraction

All children who 'fair the initial vision test must be examined and refracted, and the cause of their problem identified. This can either be done by ophthalmic staff who go to the school and set up a temporary dark room , or by referring children to a nearby eye clinic with a registered optometrist. Mechanisms for refraction and examination must be set up before embarking on vision testing, as the programme will fail if children are tested and there is no referral system. Parents should be involved so they can participate in the process. ,

Service Provision

Services should be provided for all children who need spectacles or eye treatment. Good quality, low cost spectacles should be available for the parents to buy. Many families are happy to purchase a pair of spectacles if they consider it to be important. In India, a contract is drawn up with a local optician who is willing to provide spectacles at a competitive price. The students do not pay anything to the optician, as the costs are covered b y the programme. In some instances arrangements are also made for the optician to deliver spectacles to the schools.

1.2 Magnitude of refractive error in the community

According to a release by World Health Organization (WHO) 2006. It has been estimated that, of the 153 million people worldwide affected by uncorrected distance refractive error, 8 million are blind and 145 million have significant distance visual impairment. This figure does not include the people living with uncorrected presbyopia.

At least l3rnillion of them are children (aged 5 to 15) and 45 million working-age adults (aged 16 to 49) are affected globally. Nearly 90 percent of all people with uncorrected refractive errors live in low and middle income countries. In addition to the 153 million people with vision loss due to distance refractive error, there are hundreds of millions who have severe near vision impairment (near vision equivalent to <6/18 in the better eye) due to uncorrected presbyopia.

Though no definitive data are yet available from (WHO) on global uncorrected presbyopia, estimates can be mad e of the range and magnitude of the problem. For example, papers published on uncorrected presbyopia in Africa by Patel (2006) and Asia by Bourne et al (2005) show that in some countries up to 94 per cent of people with presbyopia have no vision corrections at all. Those who cannot access an eye examination and receive speetacles m ay therefore number well over 500 million people. In many low- and middle-income countries, there is inadequate refractive error services for the many people who are currently cither blind or visually impaired because they lack a pair of spectacles (Kovin and Dhivya, 2007). Pointer J S (1995) in his clinic -- based study, observed that presbyopia affected women than men. In addition, several studies have corrected geographical variations in the age at onset of presbyopia with latitude and climate; h otter climate are associated with earlier onset of presbyopia, (Weale R A 2003; Miranda MN 1979; Rambo V C 1953).

The prioritization of refractive error and low vision services within VISION 2020: The Right to Sight has provided an impetus and framework for the development of refractive error programmes to meet this need for services. The commitments needed to achieve the ultimate objective of VISION 2020: The Right to Sight for those with un corrected refractive error, as outlined in the Durban Declaration (2007) include: quantifying vision loss due to un corrected presbyopia; undertaking the necessary advocacy, knowledge base development, and research needed to deliver best practice service in line with cultural needs; coordination and cooperation to develop a supply of affordable spectacles and the necessary human resources and infrastructure.

The strategy of VISION 2020 is built upon the foundation of community participation, with three essential components: cost effective disease control interventions; human resource development (training and motivation); and infrastructure development (facilities, appropriate technology, consumables, funds). According to WHO (2004), If this strategy is successfully implemented, blindness due to cataract, refractive errors, trachoma, vitamin A deficiency and onchocerciasis, and some due to diabetic retmopathy and glaucoma, should be eliminated. This would mean that the projected increase in global blindness to 76 million by 2020 could be reduced to, approximately 24 million.

In Nigeria, according to the resent population based survey (2006), refractive error is responsible for 2/3 of the cause of visual impairment, which is a huge burden that has to be addressed. The operational plan mapped out in Nigeria for the management of refractive error services in the country as stated in the Operational Plan Vision 2020; The Right to Sight for Nigeria (2007- 2011) document, includes; Development and production of IEC materials for health education, awareness creation via electronic/print media and posters, Advocacy visit to all levels of Government stakeholders, communities, school eye health programmes including training of teacher to conduct vision screening, training of Optometrist on Community Eye Health, establishment of optical resource center in each of the zonal v2020 resource centers, integrate primary Eye Care (PEC) into Primary Health Care (PHC) establishment of Optometry schools in the North part of Nigeria, establishment of 3 optical labs to produce ophthalmic lenses, Develop operational research programmes for monitoring and evaluation, employment and deployment of optometrists to v2020 centers, identify and train optical technicians for optical centers.

A plan is therefore necessary because it gives objectives, targets, strategies, a time frame, and a budget, one can measure its effectiveness in reducing the problem and its efficiency in terms of cost.

2. INTRODUCTION TO PLANNING

2.1 What arc the basic planning concepts?

Planning is the process of identifying a problem, analyzing it, and then planning a scries of actions to deal with it , the end result of the project planning process is a cost plan, in which the main purpose of the project is set out and the actions required to deliver against this purpose are clearly identified

The planning process can be condensed to five essential questions, which constitute the "Health Planning and Implementation Cycle" (2004). This cycle is shown in figure 1.

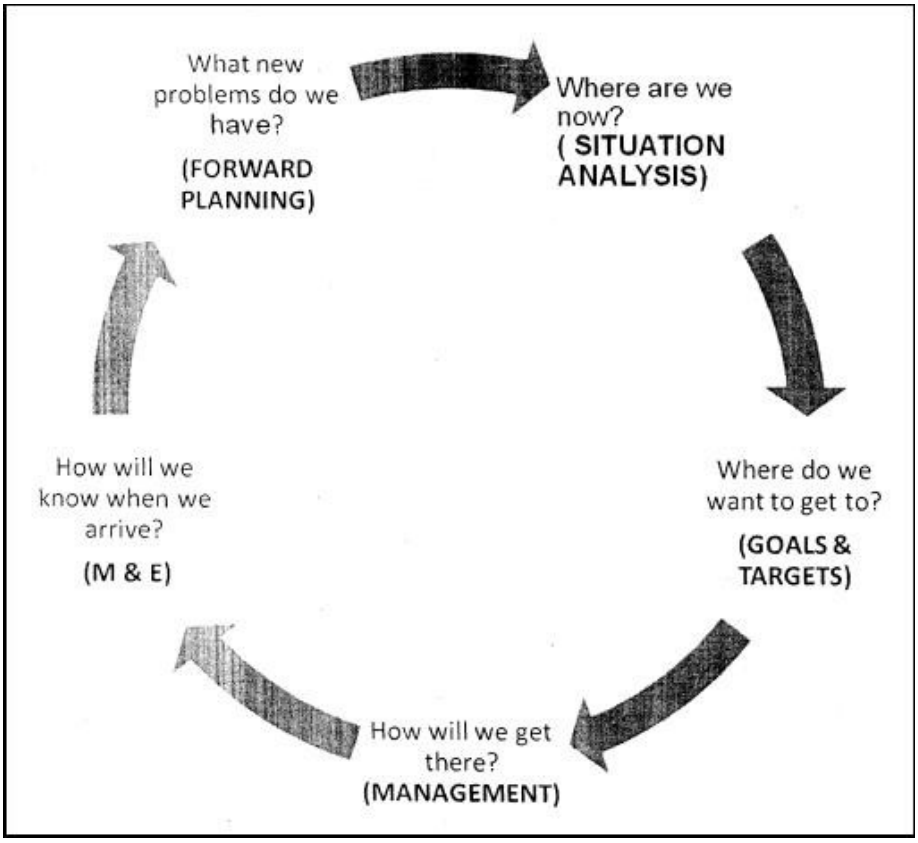

Figure 1. Health Planning and implementation

We plan services to make sure that they are effective and efficient, have an adequate sense of participation and ownership, adopt a logical approach, are adequately funded, and can be replicated. In planning for eye care programines, we put into consideration the concept of VISION 2020: The Right to Sight, which is built upon the foundation of community participation. A well-formulated action plan is an important tool for convincing governments and funding agencies to invest money in eye care, thus ensuring optimal use of funds which will always remain limited. Even when funds are available, a good action plan is generally required before money will be released. During the planning process, it will become clear that considerable increases in output can be achieved by improving the efficiency of existing facilities and eye-care personnel with little or no new monetary investment.

2.2 How to organize a planning meeting

There is no standard procedure. In some cases, the ministry of health has signed the VISION 2020 Declaration of Support and initiates planning workshops. In other cases, one or a few enthusiastic groups or individuals involve d in combating blindness begin promoting VISION 2020. It is essential to involve all parties that participate in the delivery of eye care in the preparations and in the actual planning process for the programme. A number of countries like Nigeria already have national prevention of blindness programmes and action plans. I n this case, it may not be necessary to write an entirely new plan, hut to build on the existing plan.
Who should be involved?

The initiating group identifies the other parties contributing to eye-care in the country or stale, the government, national and international NGOs, and professional groups, as well as the private sector and attempts to persuade them to join this initiative. The government should have a coordinating role in the planning process. Reliable and valid indicators are needed to describe the situation at the start of the action plan and to measure the impact of the programme. These are very useful in the monitoring and evaluation of the programme.

Planning should concentrate on the operational aspects to improve the output of refractive error services in the community, and on who should do what, where, and when. It should focus on creating the necessary facilities, infra structure, and human resources for successful implementation of the community level plans. The national plan should address constraints common to all community (e.g. procurement of essential eye medicines and supplies) or those related to policy or structure or the lack thereof, including monitoring and evaluation, publicity, and promotion of VISION 2020 activities.

The action plan frame can be in a spreadsheet or using the Logical Framework Approach (LFA), which is a systematic approach to analyses the current situation, formulate objectives in a logical hierarchy, identify potential risks, establish how outputs and outcomes might best be monitored and evaluated, present a summary of the project in a standard format, and monitor and review the action plan during implementation. At the end of each frame, a checklist indicates activities that should be completed before the next step is begun.

3. SITUATION ANALYSIS - WHERE ARE WE NOW?

First, we need to know the problem. What is its magnitude? Which people are affected? Where are these people living? We need to know the available resources in terms of personnel, infrastructure, and funds to deal with this problem. What are the present and past outputs of eye-care services in the area? How arc resources utilized? If these resources were not utilized optimally, what were the constraints? How can those constraints be overcome? A re there enough resources to deal with the problems? If not, what extra resources would be required?
Data on needs, present and past output, available human resources, and available facilities, equipment and supplies, can be collected by one person or by one or more small subcommittees.

3.1 How to assess needs - What problems are we facing?

The first step in the planning process is the assessment of the total magnitude of blindness and low vision in the country or community, the identification of the main causes of blindness, and the assessment of their magnitude. Such data can be available from population-based blindness surveys (the best option), or from Rapid Assessment s of Cataract Surgical Services (RACSS),Trachoma Rapid Assessments, Rapid Epidemiological Assessments for Onchocerciasis, Rapid Assessment for refractive error(RARE) etc. The second option will be to check with all partners providing eye-care services to determine what data they have.

It is important to check whether these data were collected using standardized population-based survey methodology and whether the findings are current or outdated. If data are not available or no longer valid, population based surveys can be undertaken - provided adequate resources arc available to conduct such surveys.

When no reliable data are available and new surveys are not an option, the magnitude of blindness and its various causes can be estimated by selecting a Neighboring country with a similar socioeconomic situation and health-care system, and using their data, that becomes the third option. The last (fourth) option is to estimate the magnitude of blindness either through extrapolation from a reference table or the world blindness prevalence map, provided as a link. Select the region in which your country is located and use the prevalence estimates of that region. It is appropriate to review data on all major causes of blindness.

3.2 How to assess magnitude-of refractive error in the community

Data on refractive error blindness can be collected from earlier population based surveys or rapid assessment. If these sources are not available consider conducting a survey or a rapid assessment for refractive, error.

Rapid assessment methods

Rapid assessment methods are. a means to undertake a comprehensive assessment of a public health issue using minimum resources within a limited amount of time. Such methods help plan, develop and implement interventions and monitor service delivery. These methods are typically useful in situations where data are needed quickly and time and cost factors prohibit the use of classical research studies.

Principles of rapid assessments

The basic issues involved in rapid assessments include the following: The problem should be of public health importance with high prevalence in the affected groups. A reliable and valid methodology for examination should be available, (which can be applied to cover a large number of individuals in a limited time, using personnel with minimum training the data analysis should be simple and straight forward.

Rapid Assessment of Refractive Errors (RARE)

Rationale

Data on magnitude of uncorrected refractive errors and spectacle coverage are essential to plan service delivery. Data can be obtained by various means like school screening programmes, community outreach services, needs assessment surveys, secondary data from hospitals and other service providers. But this information is not truly representative of the general population and depends on various factors like enrollment in schools, documentation, etc. Classical population-based epidemiological surveys can provide the vital information on the prevalence of refractive errors in the population, which can be truly representative of the population, if the sample size is adequate. But surveys are expensive, need intensive specialized training of personnel, standardization of techniques and expertise to collect and analyze the data.

Most developing countries are inadequately equipped in terms of personnel and resources and consequently, cannot undertake large scale surveys. Refractive errors are common across all age groups. However, assessing the refractive status in children can be difficult in field settings. RAAB is already available for avoidable blindness in the population of 50 years and older. Hence there is a need to develop a rapid assessment for refractive errors and (presbyopia) in the age group of 15 -50 years. Uncorrected refracted errors and presbyopia are also of public health importance in this age group. However a simple examination protocol that can be administrated by personnel with minimal training, using simple equipment has been developed to detect vision loss from refractive errors.

The combination of pinhole and a visual acuity test are the instruments needed for RARE. These instruments can be used by persons with minimal training in eye care. Sampling methods similar to RACSS can be use d. The pinhole is used as a screening device and a hand-held auto-refractor can also be used.

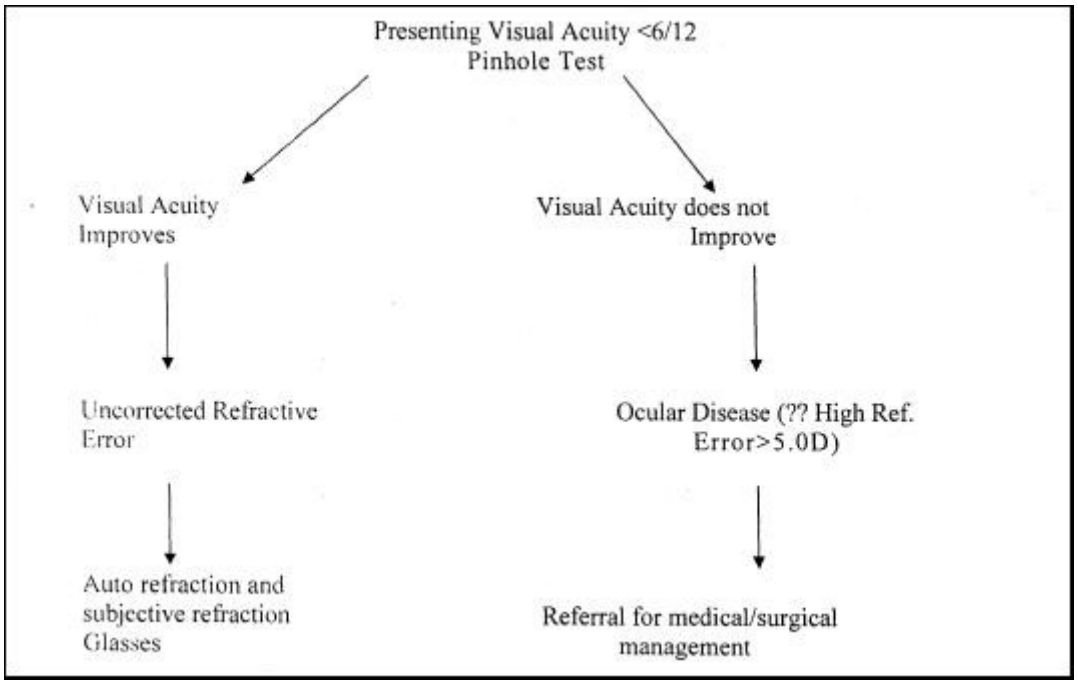

Fig 2: Flow chart illustrating the procedures for testing vision for detection of uncorrected refractive errors

How to Assess present and past refractive error output

Data on annual refractive error output from all the centers/ clinics offering refractive error services in the community should be collected. This will reveal capacity and contributions of each unit, constraints should be identified and strategies designed to overcome them.

Estimation of refractive services coverage

The RESC studies also report the prevalence of uncorrected visual acuity in the age group 5-15 years: the prevalence of uncorrected, presenting and best-corrected visual acuity (VA < 6/18) provides an estimate of the percentage coverage of refractive services using the formula:

$$\frac{\text{(Presenting VA-best corrected VA)}}{\text{(Uncorrected VA -best corrected VA)}}$$

Since percentage coverage is based on presenting visual acuity, it is an estimate of both the provision of refractive services and the compliance to prescription.

3.3 How to assess Human resources and infrastructure

Depending on their availability in different parts of the world, refractive services are provided by various categories of eye care providers, including optometrists ophthalmic Nurses, ophthalmic technicians, opticians, and ophthalmologists. According to WHO (1997), adequate numbers of trained personnel for carrying out refraction are currently not available in many developing countries.$ It is therefore necessary to collect

information on all human resources involved in refractive error intervention in the community. If the total number of refractions done per year is divided by the number of human resources, it gives the average annual output, which is necessary indicator for refractive error services. Information on the distribution and level of training of identified personnel, what facilities and equipment are available for refractive error services should be collected, and constraints identified. This is because eye care staff can only perform optimally when they have the necessary facilities including buildings, refraction room, diagnostic equipments, adequate supplies and other infrastructure.

3.4 How to assess community participation

The present level of community participation should be assessed in order to determine whether the current involvement is adequate in view of the identified needs for control of disease.. Community participation should he assessed at both the primary and secondary eye-care levels (i.e. whether it exists and its functionality).Community participation should be analysed from the following two perspectives.

- Access to and uptake by existing eye-care services

Are there barriers or other constraints to the use of services at the eye unit itself? How developed are the outreach services? Do they operate as intended? Assess the number of staff working in primary eye care and in outreach facilities. Measure their output in terms of number of people screen in the community and school children identified with refractive errors and provided with spectacles.

- Community involvement and use of services by the community

Do community members seek out eye-care services when needed? To what extent do they support activities designed for their benefit? Is the community actively involved in eye-screening in schools, and villages, community-directed treatment with ivermectin, or other eye-care activities? Identify possible constraints and indicate where and how increased community participation could be of further help. Representatives of the community should be involved in the planning and implementation of the programme. This involvement will help eye-care providers to take into account the priorities of the community and thereby increase the use of these services.

Good examples of community participation involve the field workers of Community -based rehabilitation (CBR) programmes. CBR and CDD volunteers identify visually impaired people in the community. These people are then examined by an eye doctor to determine those who require refraction, clinical treatment and those who need `rehabilitation and low-vision care. etc. When the data collection is complete, all data are reviewed and approved by the planning committee, usually during a review meeting where all involved parties are represented. In the same forum, all identified constraints in disease intervention, human resources, and facilities and equipment are reviewed.

An analysis, or comparison, of data and constraints is made, gap established and possible solutions proposed. The analysis can be done either in a plenary meeting, or by various subgroups.

4. WHERE DO WE WANT TO GO? (PRIORITIES, GOALS, TARGETS)

4.1 Setting priorities - What factors should be considered?

The constraints and the proposed actions to overcome them as identified in the situation analysis become the bail ding blocks for the action plan. Refractive errors can be divided into three major groups for effective planning:

- People over 40 years of age with presbyopia (difficulty in near vision and reading). Myopia (10- 15) years and uncorrected aphakia (eyes with lenses removed and not replaced by IOL or spectacles). Correction of significant refractive errors requires a well-trained personnel and access to affordable and good-quality spectacles. Presbyopia may be easiest to solve through bulk purchase of standard spherical reading spectacles. The costs of such spectacles are low and in most cases full refraction is not required. *Myopia* usually develops at the age of 10 15 years.
- Intervention should focus on screening children in this age group using a simple test for refractive errors. Those who fail the test should be referred for refraction and provide d with spectacles. Large-scale screening may increase awareness of refractive errors and motivate parents and grandparents to come forward for testing as well. Increasing demand for spectacles may also promote the development of more optical services.
- *Uncorrected aphakia* is unfortunately still a frequent cause of blindness or low vision. Provision of aphakic glasses is an essential component of cataract intervention.
- Provision of refractive services and the development of affordable and good quality optical services should be an essential component in most VISION 2020 action plans.

4.2 Determining Objective and Targets

In a VISION 2020 action plan, an "objective" is the action that is proposed to overcome a constraint or problem that has been identified during a situation analysis. As much as possible, objectives should be stated in ways that will make them SMART i.e., Specific, Measurable, Attainable, Relevant, Time-bound For example, assume that the needs assessment showed a high prevalence of impaired vision due to refractive errors. There are only a few optometrists or refractionists as the case may be in the- community. They screen school children, but can cover only a few schools. The constraint is, "Less than 10% of all school children aged 10-15 years are screened for refractive errors". The objective is, "Screen all school children aged 10-15 years in the community for refractive errors before the end of 2009". It may not be possible to address all constraints, and therefore priorities must be set as to what to tackle first and what later. Aims, objectives and targets must be realistic, keeping in mind the available human, infrastructure, and Financial resources. Over ambitious programmes often result in activities not being completed in time or at all, targets not being met, and objectives not being achieved. If the ideal is not feasible, make what's feasible the ideal. Another example

Aim

- To eliminate avoidable visual impairment due to uncorrected refractive errors and reduce the magnitude o f uncorrected presbyopia to at least 50% Of the population by 20l 1 Objective
- To provide refraction and optical services that have a high success rate in terms of visual acuity and improved quality of life and are affordable, of good quality and culturally acceptable, to at least 50% of the Communities in Uyo Local Government Area in two (2) years

Strategies

Establish comprehensive refraction services and school eye health with provision of suitable correction tools that are available at the communities, including during outreach activities.

- Train human resources to ensure that high-quality refraction and optical services are available where needed.
- Improve public awareness and generate demand for services through community-based outreach, primary eye care and school eye-health programmes.
- provide spectacles that are new, of good quality, accessible and affordable.
- Assess the prevalence of refractive errors where data are lacking, and explore the optimal means of delivering services that are acceptable and cost effective.

Targets

- Each national VISION 2020 plan shall incorporate measures to address vision impairment due to uncorrected refractive errors.
- Achieve a ratio of one trained functional Optomctrisl per 50 000 population by 2013 and 1:25 000 by 2020.
- Comprehensive eye care services should ensure that refraction services with provision or suitable correction tools are available at all levels of service delivery, including during outreach.
- Particular attention should be paid to children of primary and secondary school age, the working poor and adults over the age of 50 years. The correction provided should be affordable, of good quality and culturally acceptable.
- Epidemiological research should be conducted on the prevalence of unconnected refractive errors and its trends.

5. HOW TO GET THERE? (STRATEGY, ORGANIZATION, AND MANAGEMENT-SOM)

Activities and sub-activities are directed towards the achievement of the objectives in the VISION 2020 action pi an. Taken together, the activities and sub-activities are called the "strategy", i.e. the best way to achieve an objective. To ensure the success of a refractive error programme, there have to be enough people with the right skills in order to provide refraction services throughout the programme. Therefore, careful thought should be given to setting up an appropriate training programme that will support the human resource needs of a refractive error programme. Human resources are the most valuable asset of any eye care programme. Team building, continuous training and motivation are essential aspects of human resource management (Sivakumar 2006). Quresh and Hannah (2007), suggested that to plan for training of human resources necessary for a refractive error programme, it is advisable to first of all, Estimate the need for services, Analyse existing resources and service s, Determine the tasks, skills, and human resources needed for refractive error services, Devise a training plan

5.1 How lo formulate strategies to achieve objectives and targets

Strategies must be clearly defined. In the example above, the proposed strategy is to train 1-2 school teachers per school in the use of a simple screening method, to identify children who can see, or not see, an "E" of size 6/9 (20/30, 0.66) at 6 meters (20 feet) with each eye. Those who can see the "E" at this distance are considered to have good vision. Those who cannot are referred to an Optometrist for refraction.

The sub-activities in this example could be:

- To get support of the state commissioner for Education and area education
- Development of simple screening methodology that can be used by teachers
- Development of training materials

- Development of school eye-screening kit
- Development of monitoring and evaluation system
- Training of teachers in the use of the screening method
- Organization of referral system to Optometrist or ophthalmic assistants
- Arrangement for a regular supply of spectacles.

A critical assumption in this strategy is that the Area education secretary would agree with the proposal to use teachers to screen school children. If the Area education secretary does not agree, the entire strategy will have to b e revised. For each sub-activity, the person(s) responsible, the start and completion time, and the costs are indicated. Care should be taken so that the people identified are able to perform the assigned tasks, that tasks are distributed evenly, and that particular individuals are not overloaded. Training programmes that may be required arc in eluded in the plan. Time schedules are defined, and Organizational structures established. When all objectives, activities and sub-activities have been described, the cost of each individual activity and sub-activity is estimated t o provide a budget.

Budgeting

This is a complicated but also crucial step in the planning process. Budgeting should be pragmatic and realistic, in view of the socioeconomic situation of the area and the country. The Logical Framework Analysis (LFA) form at for an action plan provided under "Templates" contains a cost column for each (sub) activity. In the descriptive plans, budgeting is usually calculated on a separate spreadsheet.

5.2 How to provide patient and community education

Lack of awareness, as well as traditional customs and beliefs, often cause anxiety and misplaced apprehension in patients. Doctors usually do not have enough time to explain all details to them. Ophthalmic nurses or specially trained counselors have more time and arc closer to patients, and can therefore answer their questions about the surgical procedure, costs, medication, etc. Reports indicate that counseling can effectively remove anxiety and apprehension and increase the uptake of services. Feedback from counselors may also lead to modifications in procedures to increase patient satisfaction. Other measures worth considering are the use of well-designed, culturally appropriate and field-tested information, education, and communication (IEC) material
and the use of mass media (in particular the radio - - often the only mass medium available to rural populations).

5.3 How to manage a community-level refractive error action plan

Once the community level refractive error action plan has been formulated, copies of the plan should be provided to all stakeholders and allied parties. Medical and administrative staff' who will manage the programme should be appointed and briefed on their responsibilities. A workshop with the entire team would be useful, to discuss the tasks and responsibilities of each team member and lines of communication. The team leader plays a vital role in keeping the staff motivated. Motivation involves the development and maintenance of a shared vision, appropriate training and acquisition of skills, the recognition of individual contribution and a careful use of incentives (Kolawole 2008). Performance - linked financial incentives alone are usually not very good motivators and may lead to service or project failure if the incentives dry up. Activities should be initiated according to the timetable or Gantt chart in the action plan, and be completed within the given time frame. Deviations from the action plan should be kept to a minimum. The executive committee should meet once weekly to discuss ongoing activities and incoming reports. Timely reporting on activities and monthly performance is essential to assess whether or not the achievements are according to plan. Any deviation s from the plan should be reported to the community refractive error committee and remedial action should be taken.

The development of a management information system for eye care should be initialed at the outset of the programme, to facilitate adequate monitoring and evaluation of programme activities. During the initial phase, the programme must rely on resources available in the community, making it essential that these resources are used optimally. Training programmes for primary eye care and community-oriented activities should be started at an early stage, in order to ensure participation and involvement of the community. Training o f mid-level eye-care staff should commence only when adequate resources such as training facilities, training materials, and ophthalmic equipment are available. Special training, such as computer training for individual team members, may also be required. Bingiganavale et al (2005) advocate that training should be targeted at building appropriate teams with the correct mix of professionals and support staff.

For effective management of infrastructure and technology, it is recommended that adequate high quality technology, consumables and equipment for service delivery is procured with an effective preventive maintenance mechanism instituted (Kolawole 2008). A reliable system for the supply of drugs and other ophthalmic supplies should be developed and implemented for each level of eye-care delivery. Extra care should be taken to ensure that these supplies also reach units in underserved areas. Proper inventory and documentation of items is very necessary as well as training staff to do these properly. It is very important to establish concept of ensuring quality service at every step of the project. At the end of the first year, the community refractive error committee should evaluate progress, and decide whet her to continue with the existing plan or to include minor modifications. An annual report with details concerning output, output against targets, human resources, infrastructure and equipment, and expenditure should be prepared.

6. MONITORING AND EVALUATION PLAN

6.1. What is Monitoring and Evaluation?

Monitoring and evaluation are essential feedback mechanisms within the adaptive management framework to keep the programme Plan dynamic and responsive to changing conditions. Monitoring and evaluation provide the public, the providers, and other concerned resource agencies and partners with information on the progress and results of Plan implementation. The evaluation process provides the feedback that triggers adjustments to actions, plans and budgets, to ensure that they arc realistic and are being adhered to. The Plan provides management direction for terms of goals, objectives, standards and guidelines. Monitoring may include simple observation of the results of management activities, or more rigorous and systematic data collection, to provide a basis for periodic evaluation of the Plan.

There are three levels of monitoring:

- Implementation Monitoring -Was the project accomplished? This determines if plans, prescriptions, projects and activities are implemented as designed and in compliance with Plan goals.
- Effectiveness Monitoring- Did the project work? This determines it plans, prescriptions, projects and activities are effective in meeting management goals and direction.
- Validation Monitoring - Is the guidance okay? Here a determination is made if the initial data and assumptions used in developing the Plan were correct, or if there is a better way to meet planning regulations, policies or goals.

Evaluation includes analysis of the information and data collected during the monitoring phase. A review and evaluation of monitoring results will be conducted annually and summarized in an annual report. The Program manager will also review the conditions in the 5th year of the Plan implementation to determine whether conditions have changed significantly. Monitoring is most effective when driven by specific questions, and monitoring evaluation will determine the need to revise management plans or how they are implemented. Monitoring and evaluation thus form the basis for adaptively managing all other services.

It also provides critical information for developing amendments* (legal modifications) to the management plan. Monitoring and evaluation implementation cost should be factored into the planning before project starts and should not be underestimated. Approximately 5 to 10% of total project cost be set aside as a reasonable target form onitoring and evaluation of programme. (Tina and Jonathan 2005)

6.2. Monitoring And Evaluation Of Communily Refractive Error Program

There are two main purposes to monitoring and evaluation in the VISION 2020 context. The first is to help al! partners, governments, IAPB, WHO, and other stakeholders, to track progress towards the st rategic objectives and the principal intermediate objectives that are outlined in national and community VISION 2 020 plans. These objectives are established and quantified on the basis of four five-year plans and updates. Regular monitoring will guide national and community planners in their evaluation and fine tuning of the plan and its implementation, so that they can remain directed towards achieving t heir objectives.

The second purpose is to raise awareness at an international level of the problem of global blindness. By presenting to the international community data concerning the work and progress in the field of eye care, the burden of and solutions to this health problem become more obvious. Additionally, successes in one country can be used as mode is by another. The two processes are management tools but are different in nature and happen at different stages in the project cycle. Monitoring systems in a community refractive error programme provide the programme manager with enough information to verity whether the project activities are happening according to plan and whether means are used in a correct and efficient manner, while the evaluation tries to describe the changes in life and wellbeing of the community members who are the final users. Often an evaluation contributes to the decision to stop certain activities or to ad d others. Appropriate, realistic and measurable indicators should be selected to monitor output and outcome of retractive error services, for example , no of people receiving services, no of glasses prescribed and dispensed, presenting and corrected VA etc.

The Programme Manager is responsible for coordinating the preparation of an annual monitoring and evaluation re port. This report will summarize the monitoring activities conducted during the year covered and the results obtain ed, address each of the monitoring questions listed in the monitoring plan, and evaluation of the implementation PI an. The annual monitoring and evaluation report should include recommendations for remedial action, if necessary, to make management activities and their effects consistent with the Plan. Finally, it may be necessary to set up a leadership team to assist in prioritizing what will be monitored in any given year. In order to effectively monitor trends and progress towards the achievement of established objectives, it is necessary to have a set of comm on core indicators for use at the community level.

To standardize data collection and make monitoring more effective, a WHO framework and indicators for monitoring VISION 2020 should be used. This document has now become the basis for a series of data collection tools which are available to regional, national, and community eye-health officers. Ultimately, data collected through the use of these tools will be made available through internet facilities for public nation of results.

6.3 What new problems do we have? (Forward planning)

At the beginning of the planning process, we may have started with some assumptions. In the above example of school eye health progamme, lets assume that the annual monitoring and evaluation report revealed that initially the number of spectacles provided in the school eye-screening programme was small, but that number increased as the programme expanded, thereby increasing the costs. The high expenditure on spectacles may pose a new problem. This problem could be solved by identifying donors of spectacles or by requesting parents to pay (part of) the cost.

Planning is a continuously evolving process, with much emphasis on learning. Initially, we may start with a lot of assumptions, but gradually during the process, we will learn more and rno re detail which will yield better insight and understanding and therefore enable better planning. Regular meetings and visits with colleagues from other community or State will encourage additional learning from the experiences of others.

6.4. How to ensure sustainability

Sustainability implies the ongoing availability of adequate resources, people and funds and is dependent on the following elements:

- organizational structure which is able to make decisions when indicated -culture of cost-consciousness
- optimal utilization of staff, infrastructure, and equipment -utilization of community resources - disciplined purchase policies -cost-sharing programmes. Some form of income generation or cost recovery is essential to sustain a refractive error project just like other e ye care projects.

The cost of refractive intervention is made up of various components such as the cost of consumables, salaries, overheads, and depreciation of the infrastructure, equipment, and instruments. In addition, indirect costs incurred by the patient include transport, time lost from work, etc. To achieve sustainability, the costs of refractive service s should be kept as low as possible without jeopardizing the outcome of the refractive services. Approaches to keeping costs low include the following.

Bulk purchase of consumables

Consumables such as lenses, frames, refraction instruments, and ophthalmic drugs can be purchased at the nation al level to reduce costs and administrative work for communities. Possibilities for local production of eye drops, drugs, spectacles, lenses should also be explored.

Optimal utilization

The best possible Use of human resources and facilities can minimize costs of salaries, overheads, and depreciation. Recognize people who perform well. If things go wrong, analyse the reasons why and determine the lessons that can be learnt.

Essential factors for successful programme implementation are:

- Development of a skilled and efficient technical team
- Creating a small and efficient management team
- Creating a transparent and clear management structure that facilitates coordination between all partners.
- Ensuring timely procurement, distribution, and delivery of medical and optical supplies and equipment
- Ensuring timely disbursement of funds to various project areas meeting regularly and always be approachable
- Enabling e(Tective communication - poor communication leads to
- Misunderstanding and mistrust which can disrupt the team.

6.5 Creating a Community Refractive error plan, a case study of Uyo Local Government Area Akwa Ibom State.

1. Background

Akwa Ibom State is one of the thirty-six States in the country. It has a population of 3.9 million (2006 census). It is in the South-South geopolitical zone, which accounts for 90% of the national income especially from petroleum resources but paradoxically remains one of the States with extreme poverty among its peoplefespe daily inhabitants outside Uyo city, the State capital. It is home to the Ibibios who form the majority and ethnic minorities such as Annangs, Orons, Ekct and Eastern Obolo who are relatively politically powerless and cannot influence national policies. The state is divided into three senatorial districts (zones).

The senatorial districts are Uyo, Eket and Ikot Ekpene zones. The Uyo senatorial district is made up of 13 LGAs, the Eket senatorial district 10 LGAs and Ikot Ekpene senatorial district 8 LGAs. Uyo Local Government Area is one of the 31 Local Government Area in Akwa Ibom State, located in the Uyo senatorial Zone. It is made up of 4 clans namely Offot, Oku, Etoi and Ikono with several Communities with Uyo as the headquarters and has a population of about 30,573 people (153 113 males and 156 460 females).

The people of Uyo are predominantly civil servants, fanners and fishermen with a few petty traders and business men. In most situations, one can expect about 20% of the population in total to require refractive error services. (Kovin N and Dhivya R 2007). The project is expected to reduce the huge unmet need for refractive error services by 50% through the work of mobile refraction teams who will provide refractive services and spectacles to presbyopic patients.

The target communities will also have been sensitized on refractive error and ways of ensuring early correction. Correction of these errors will increase the productivity and capacity of the economically active age groups of 40 years and above particularly for those who depend on near vision for work. It will also be absolutely crucial for any adult literacy programmes aimed at poverty reduction. It is usually estimated that 100% of those within this age group will have refractive error (presbyopia)

Children

School Children

The project will put in place a system of regular screening of school children to ensure a vision of 6/6 for all school children and the availability of glasses for all children with binocular vision of <6/12. Good vision would reduce amblyopia and low vision, thus ensuring that they have access to educational opportunities. This intervention will also help to mitigate the psychological effect childhood blindness at an early age usually has on the community Overall, it will improve the children's visual function and so their ability to pursue their education.

Childhood Blindness: The project will ensure that there are teachers trained in eye care to test vision and refer cases of childhood blindness. This is expected to reduce childhood blindness and in pre-school children through establishing a very local, familiar, and therefore effective system of identification. Strategies for early and appropriate intervention for the causes of eye disease in children will be implemented to avoid years of chronic or even permanent disability. Children will also grow up sensitized to eye health issues and they might access health services should they need then. It will also remove the immense pressure placed on parents w hose children have poor eye health or are going blind.

Community

It is expected that by the end of the project, the communities would have been well sensitized on community eye health with special emphasis on

- Developing good eye health seeking behaviour,
- Avoiding harmful traditional practices and,
- Coming forward for accessible, available and affordable eye care services.

The project is also expected to develop and empower the communities to have a community eye health programme of the people, by the people and for the people. This will improve uptake of eye care services and thus improve the socio-economic status of the community in terms of improved family income and economic stat us of the entire State.

Aim

- To eliminate avoidable visual impairment due to uncorrected refractive errors and reduce the magnitude of uncorrected presbyopia to at least 50% Of the population by 2014

Objective

- To provide refraction and optical services that have a high success rate in terms of visual acuity and improved quality of life and arc affordable, of good quality and culturally acceptable, to at least 50% of the Communities in Uyo LGA in 2 years

Strategies

Establish comprehensive refraction services and school eye health with provision of suitable correction tools that are available at the communities, including during outreach activities.

- Train human resources to ensure that high-quality refraction and optical services are available where needed.
- Improve public awareness and generate demand for services through community-based outreach, primary eye care and school eye-health programmes.
- Provide spectacles that are new, of good quality, accessible and affordable.
- Assess the l)revalence of refractive errors where data are lacking, and explore the optimal means of delivering services that are acceptable and cost effective.

Targets

- Each national VISION 2020 plan shall incorporate measures to address vision impairment due to uncorrected refractive errors.
- Achieve a ratio of one trained functional Optometrist per 100 000 population by 2012.
- Comprehensive eye care services should ensure that refraction services with provision of suitable correction tools are available at all levels of service delivery, including during outreach.
- Particular attention should be paid to children of primary and secondary school age, the working poor and adults over the age of 50 years. The correction provided should be affordable, of good quality and, culturally acceptable.
- Epidemiological research should be conducted on the prevalence of uncorrected refractive errors and its t rends.

Sub activities

Service Delivery

1. Review of existing information in the LGA by first Quarter 2013
2. Conduct Rapid assessment for Refractive Error in the LGA first Quarter 2013
3. Conduct 2 weekly outreach to the communities to provide refractive error services by second quarter 2013 to 2014
4. Carry out school eye screening in the primary and post primary schools in the LGA by trained teachers by second quarter 2013
5. Set up a vision center at the Uyo comprehensive health center and construct vision corridor in four communities for self examination and annual check up by second quarter.

Hunan Resource Development

1. Train 102 Teachers in 32 primary and 9 post primary schools to conduct school eye health by first quarter 2013
2. Train 31 Community Based Workers to carry out vision screening in the communities by first quarter 2010
3. Identity and train a Community Ophthalmic Nurse by second quarter 2013
4. Identify and train an Optical Technician for the Optical Workshop by second quarter 2013
5. Employ an Optometrist to man the vision center by first quarter 2014

Infrastructure and Technology

1. Establish and equip a vision center by second quarter 2013
2. Establish and construct vision corridors as screening centers
3. Establish and equip school eye health kit

Health Education/ community Participation

1. Develop and produce IEC materials for sensitizing and creating awareness?.
2. Distribution of IEC Materials to communities and health facilities
3. Carry out media health Education on Refractive Error

Programme management

1. Set up a programme management team
2. Establishment of quarterly monitoring team by first quarter 2013
3. Establish a programme implementation committee at the community
4. Carry out midterm and end of term evaluation

Table 1: DETAILED BUDGET

SERVICE DELIVERY YEAR January 2013 ĭ December 2015

Implementation Step	Who	When	Where	What Will It Cost	N K	Source Of Funding	Who Will Coordinate
1ST QUARTER YEAR 1. Review of existing in formation 2. Rapid Assessment for Refractive error	Pmt A team of 4 persons Optometrist Ophthalmologist ON Statistician	Jan ĭ Feb. Jan ĭ Feb 94 communities a day (8 days)	Libraries of Institutions Internet existing health facilities 4 communities each in a day	Stationery 2 Reams A4 – N7 50 x 2 N1,500 Transportation N5,00 Data Analysis n12,000 **Sub total ĭN18,500** Fuel n6,500 x ĭ n26,000 Drivers Allowances N1,200 x 8 dys ĭ N9,600 allowances for n5,000 x 4 teams x 8dys ĭN160,000 supplies	Ream of A4 (4) ĭ N750 N3000 1 Pkt Bics N650 4 pcs Pencils N500 4 pcs Erasers N350 4 pcs Sharpeners N300 4 pcs File jackets N800 Data Analysis n12,000 **Sub total – N17,600** **Grand Total N196,100**	Govt. State Govt. LGA. Community Partners	State Eye Care Coordinator State Eye Care Coordinator and PM
2ND QUARTER **Primary levels** Two weekly refractive error Outreach 1. Eye Care Team consisting of 1 Optometrist 2 Ophthalmic Nurses 1 optician and 1 Driver	Outreach Team mentioned in implementation step	April 2013 June 2015 2 weekly	At Communities in Uyo	Fuel n5,000trip x 40 trips N200,000.00 1. Nurses 5,500 x 40Trips N220,000.00 2. optometrist N10,000 x 40 trips N800,000 1 Driver 1,000 x 40Trips N40,000 **Total n1.260,000**			PHC Diplomats "ONs

Table 2: HUMAN RESOURCE DEVELOPMENT January 2013 ĭ December 2014

Implementation Step				Who	When	Where	What Will It Cost		Source Of Funding	Who Will Coordinate
	YR. 2 013	DRT	Nom. DL				N			
1. Ophthalmic Nurse	1	612	1	NEC	2nd Quarter 2013	Bimin-Kebbi	Tuition, trans, Accom N350,000		Govt. State Govt., LGA, Community Partners	PM Partners
2. Optical. Tech	1	6/52	1	NEC	2nd Quarter 2013	Bimin-Kebbi	Tuition, acc, Accom N250,000			PM Partners
3. CHEWS.		1/7	32 for The 32 Comm..	PMC	2nd Quarter 2013	PHC	N5,500 x 32 N176,000			PM Partners
4. Teachers		2/7	102 for the 5 1 sch, 2 each	PMC	2nd Quarter 2013	School	N5,500 x 102 N561,00			
5. Employ Optometrist				MOH	2nd Quarter 2013	General Hospital				
							Total N1,337,000.00			PM Partners

Table 3: INFRASTRUCTURE AND TECHNOLOGY

INFRASTRUCTURE AND TECHNOLOGY	Determining the type and quality of infrastructure requirements for the LGA and PHC					
Implementation Step	Who	When	Where	What Will It Cost	Source Of Funding	Who Will Coordinate
3RD QUARTER 2004 1. Identification of existing facilities by enume ration of Data 2. Identify needs of facilities 3. identify appropriate technology 4. Provision of Secondary Eye Care facilities for the General Hospital	Program Manager ĭ ĭ ĭ	Week 1 Week 1 Week 1 Quarter I Yr1	MOH NPPB ĭ	N 1,500 1,500 1,500	GOVT. State Govt., LGA, Community Partners	State Eye Care Coordinator
						Prog. Mgr.
6. Project Vehicle	Pro Manager					PM
9. Equipment for Primary Centres x 32 i 500	Program Manager					PM
10. Equipment for secondary centre I N150,000	Program Manager					PM
11. Equipment for School eye health (kit) I 500 x 51	Program Manager					PM
8. 1 motor Cycles at n250,000 each including insurance cover	Program Manager					PM
12. Spectacles Reading Spectacles x 500 ĭ N500	Program Manager	Quarter 4 2010	For all Communities	350,000		PM
10. Equipment for Opticall centre ĭ N100,000	Program Manager	Quarter 4 2010	For Gen hosp	150,000		PM
				Total N5,475,500		PM
						PM
						PM
						PM

Table 4: PROGRAMME MANAGEMENT January 2013 ĭ December 2015

Implementation Step	Who	When	Where	What Will It Cost	Source Of Funding	Who Will Coordinate
1st QUARTER 07 1. Review budget of 1st year	Program Manager All Partners	Jan. 2014	Prog. Secretariat	Snacks 6 x 700 ĭ N4,200 Stationery ĭN2000 Sub total N6,200	Min Of Health Partner	Director
1. meeting of Stakeholders x 2	Program Manager	Annually	Prog. Secretariat	Snacks ĭ N7,, x 40 person N28,000 - Stationery N2,00 - Trans N550 x 40 - N22,000 TOTAL N52,000 X 2 N104,000		PM
2. Metting of Prog Implementation Committee x 8	Program Manager	quarterly	Gen hosp ĭ	- Snacks ĭ N700 x 6 person N4,200 - Trans. For Stakeholders N550 x 6 persons N3,300 - Stationery – N2,000 - TOTAL N9,500 X 8 ĭ N76,000		PM PM
5. Monitoring Supervision x 8	Program Manager	Quarterly	Communities	Fuel ĭ 2500 x 8 N20,000 Allow, 2500 x 2 x 8 N40,000 TOTAL n60,000		PM PM PM PM PA PM PM
10. Programme Manage	Prog manager	January 2013 – dec 2014 monthly		Allowance N12,500 x 24 months N300,000		PM PM
12. Accountant	Prog manager Prog manager			N5,500 x 24 months N132,000 Total N839,700.00		PM PM PM

Table 5: HEALTH EDUCATION Jan 2013 ĭ December 2015

Implementation Step	Who	When	Where	What Will It Cost	Source Of Funding	Who Will Coordinate
1. Develop and test IEC materials	Artist, Hlth Educator Optometrist 1wks	1st Quarter 2013	Community	a. Transportation N5,500 b. Allowances – 3 x 7dys x N4,000 ĭ N84,000 c. Consultancy for artist N26,000 Sub total **N115,500**		
3. Print developed I.E.C. materials for adequate information dissemination	PM Optometrist	1wk	Uyo 32 Communities Uyo	Printing of I.E.C. mats a. Posters for all communities 1200 x N80 N96,000 c. Handbills 110 ĭ N25 each N27,500 sub total 123,500		
5. To health-educate policy makers, traditional rulers and healers on prevailing eye condition and their treatment	PM HE	2nd Quarter 2013 ĭ 3rd Quarter 2015		transportation for HE N600 x 3 N1,800 lunch Snacks for all N700 x 11 7,700 sub total N9,500 x 32 communities N304,000.00 (6 policy makers, 2 T. Rulers and 3T H ealers)		
6. Media health Education on Refractive error		2nd Quarter 2013 ĭ 3rd Quarter 2015		Radio N1000 x 5 dys in a month x 12 months Sub total ĭ N60,000 **Grand Total N6,682,700.00**		

7. CONCLUSION

It should not be necessary for any child to struggle in school, to learn with an uncorrected refractive error. Nor should any older person be called upon to spend thirty or forty years without glasses - reading or sewing or managing a job. Furthermore, school vision testing programmes are simple to conduct, need minimal resources, greatly benefit children with significant refractive errors, and have an impact on concerned communities by increasing their knowledge of vision disorders and how to manage them. However, they need careful planning and resourcing. More information is required from different populations as to what level of visual acuity should be considered as abnormal.

This will result in appropriate identification of children who will wear and benefit from spectacles. There are several questions that need to be addressed when planning such programmes, the most important of which arc what age groups should be targeted for screening and how the services would be provided to those who need them. Reliable data on the prevalence of blindness due to refractive error and the distribution of refractive err or obtained from population-based surveys would indicate the groups that need to be targeted for vision screening to reduce refractive error blindness. In developing countries, there is a need to include all school-aged children in the screening rather than only school-going children, since many do not attend school. Provision of services to individuals who need them after being identified through vision screening is as important as the vision screening itself.

Vision testing programmes in schools not only help the children but also help communities, as awareness about good vision is increased amongst teachers and parents. Teachers and parents should be taught to look for symptoms and signs which indicate refractive errors. They can observe if children hold books unusually close to their eyes, sit close to the TV, rub their eyes frequently, or twist or tilt their heads to favour one eye. School vision testing programmes are simple to conduct, need minimal resources, greatly benefit children with significant refractive errors, and have an impact on concerned communities by increasing their knowledge of vision disorders an d how to manage them. However, they need careful planning and resourcing. More information is required from different populations as to what level of visual acuity should be considered as 'abnormal'. This will result in appropriate identification of children who will wear and benefit from spectacles.

Finally, preventable blindness is one of our most tragic and wasteful global problems. Optometry is an essential part of the team that will eliminate this tragedy, by understanding global eye care needs and delivering effective and sustainable vision care to people in need, thereby ensuring their fundamental right to sight.

REFERENCE

1. Bingiganavale RS, Praveen KN, Saibaba S. 2005 Roles and responsibilities in the secondary level eye care model, community eye health j.;18(56); 120-121
2. Bourne RR et al. 2005 The Pakistan national blindness and visual impairment survey: research design, eye examination methodology and results of the pilot study. Ophthalmic £pidemiol; 12 (5): 321-33.
3. Brien holden2007 Uncorrected refractive error: the major and most easily avoidable cause of vision loss Community Eye Health J; 20(63): 37-39
4. Community Pediatrics Committee (1998). Vision Screening in infants and children. *Pediatr Child Health; 3:* 261-262.
5. Dandona, L., Dandona, R. (2001). Blindness in the Indian State Of Andhra Pradesh. *Invest Ophthalmal Vis Sci;* 42(5): 908-916.
6. Dandona, R., Dandona, L. (2000). Refractive error blindness. *Bull World Health Organ;* 79: 23-7-243.
7. Dandona, R., Dandona, L. (2002). Refractive errors in Children in a Rural Population in *India./invest Ophthalmol Vis Sci;* 43(3): 615-622.
8. Gilbert, C. (1995). A pilot study to evaluate the methods and logistics for a prevalence and cases survey of visual impairment and hearing impairment in children. Dissertation for MS c, London School of Hygiene and Tropical Medicine.
9. Hulme, C. (1988). The implausibility of low level visual deficits as a cause of children's reading *difficulties. CognNeuropsychol;5:* 369-374.
10. Kolawole 00, 2008 Case study; improving the management of eye care programmes, community eye health j; 21(68); 60-61.
11. Kovin Naidoo and Dhivya Ravilla 2007 delivering refractive error services: Primary eye cares centres and outreach Community Eye Health. September; 20(63): 42-44.
12. Limburg, H., Vaidyanathan.K., Dalai, H. P.(1995). Cost effective screening of school children for refractive errors. *World Health Forum;* 16:173-178.
13. Lin, LL-K. (1999). Epidcmiologic study of ocular refraction among school children in Taiwan in *1995.Optometryand Vision Science;* 76(5): 275-281.
14. Lin, LL-K., Shih, Y.F. (2001).Epidcmiological study of the prevalence and severity of myopia among school children in Taiwan in 2000../ *Fortnos MedAssoc;* 100(10): 684-691.
15. Maul, E. (2000). Refractive error study in children: results from La Florida, Chile. *Am J Ophthalmo/2000;* 129(4): 445-454.
16. Miranda MN. 1979 ;The geographic factor in the onset of presbyopia. Trans Am Ophthalmol soc. 77; 603-621.
17. Murthy, G.V. (2002). Refractive Error in Children in an Urban Population in New Delhi. *Invest Ophthalmot Vis Sci;* 43(3):623-631.
18. Negrel, A. D., Maul, E., Pokharel, G. P. (2000). Refractive error study in children: sampling and measurement methods for a multi-country survey. *Am J Ophthalmol; 129: 421-426.*
19. Patel I 2006; Impact of presbyopia on quality of life in a rural African setting Ophthalmol 113(5): 728 -734.
20. Pokharel, G. P. (2000). Refractive Error Study in Children: Results from Mechi Zone, Nepal. *Ain J Ophthalmol;* 129(4): 436^44.
21. Pokharel, G. P., Negrel, A. D., Munoz, S. R., Ellwein, L. B. (2000). Refractive error study in children: results from Mechi Zone, Nepal. *Am J Ophthalmol;* 129: 436444.
22. Quresh BM, Hannah F, 2007 Training to meet the need for refractive error services, Community eye healthj;20(63);48-

23. Rambo VC. 1953 ; Further notes on the varying ages at which different people develop presbyopia. Am J Ophthalmol 36; 709-710
24. Sivakumar AK, 2006 professional management of eye care.community eye health j; 19(59); 50-51.
25. Taylor, H. R. (1997). Visual impairment in Australia: distance visual acuity, near vision and visua I field findings of the Melbourne Vision Impairment Unit. *Am J Ophthalmol;* 123: 328-3 37.
26. The Durban Declaration (2007) www.iccc.org/pdf/Final
27. The Strategic Plan Vision 2020 The Right to Sight for Nigeria 2007 - 2011
28. Tina J and Jonathan M, 2005 Monitoring and Evaluation of ICT in education projects; A hand book for developing Countries, publisher, info Dev. Publication
29. Vision Impairment Unit^m *J Ophthalmol* 1997; 123: 328-337
30. Weale R A, 2003; Epidemiology of refractive errors and presbyopia. Sury Ophthalmol 48; 515-543.
31. WHO press release 2006 Sight test and glasses could dramatically improve the lives of 150 million people with poor vision. Geneva. September 11.
32. Wissmann, D. A. (1980). The Epidemiology of Myopia. *Amer J Epidemiology; 111:* 220-228.
33. World Health Organization (2000). *Elimination of avoidable visual disability due to refractive errors.* (WHO/PBL/00.79). Geneva.
34. World Health Organization and International Agency for the Prevention of Blindness, 2004 Developing an Action Plan, to prevent blindness at national, provincial, and district level.
35. World Health Organization. 1997 Global initiative for the elimination of avoidable blindness. Geneva, World Health Organization, (unpublished document WHO/PBL/97.61 Rev.l).
36. Wormald, R. (1997). Screening for Eye Disease J Comm *Eye Health;* 12:29-30.