Consultation on Public Health Management of Chronic Eye Diseases
Report of a WHO consultation

Geneva
19 September 2011
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Opening

Dr Ala Alwan, WHO Assistant Director-General for Noncommunicable Diseases and Mental Health sent a message of welcome to participants as he was unable to attend the consultation since he was attending the United Nations High Level Panel on the Action Plan for Chronic Diseases. Dr Alwan thanked participants for taking part in the consultation, which he described as “an important step in the development of the next decade of work of WHO in the prevention of visual impairment and blindness”. The work that starts today, he said, will continue in the months to come to shape a set of recommendations for countries at different stages of socioeconomic and health-system development. Successful control of avoidable visual impairment, Dr Alwan added, can be achieved by the inclusion of the most effective interventions in the broader framework of the control of chronic diseases.

The consultation was opened by Dr Silvio Mariotti, Senior Medical Officer of the WHO Unit for the Prevention of Blindness and Deafness, who stressed the importance of addressing chronic eye diseases within the context of the overall prevention and management of noncommunicable diseases (NCDs). Chronic eye diseases have been seen in this context for a number of years, but the situation is now becoming more urgent and more complex as emphasis is shifting from the management of the individual eye disease to comprehensive eye care.

Participants then introduced themselves.

The schedule of the meeting is attached as Annex 1. The list of participants is contained in Annex 2.

Overview of the WHO Action Plan

Dr S. P. Mariotti, Senior Medical Officer and Dr I. Kocur, Medical Officer, WHO Unit for the Prevention of Blindness and Deafness

The contents of the WHO Action plan for the prevention of avoidable blindness and visual impairment 2009–2013 (the Action Plan) adopted by the 62nd World Health Assembly in 2009 were introduced to consultation participants. Since most blinding conditions are classified as chronic, chiefly due to noncommunicable causes, the Action Plan is seen as a complement to the “Action plan for the global strategy for the prevention and control of noncommunicable diseases” adopted by the 61st World Health Assembly in 2008. The Action Plan has five objectives which relate to strengthening advocacy to increase Member States’ commitment, developing and strengthening national policies, increasing and expanding research, improving coordination between partnerships and stakeholders, and monitoring progress in the elimination of avoidable blindness. Each objective includes relevant actions for WHO Member States, the WHO secretariat and international partners.

Objective 2 (“Develop and strengthen national policies, plans and programmes for eye health and prevention of blindness and visual impairment”) was outlined and the actions allocated to Member States, the secretariat and partners were described. Within the context of this objective, the Action Plan states that “national policies, plans and programmes are essential instruments for coordinated, evidence-based, cost-effective, sustainable interventions”, that “integration of eye health into national health policies facilitates a coordinated multidisciplinary approach and development of comprehensive eye care with emphasis on primary eye care”, and that – while
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WHO strategies for the control of trachoma, onchocerciasis, vitamin A deficiency, diabetic retinopathy and cataract-related vision loss already exist – strategies for emerging causes of vision loss need to be developed.

Objective 2 proposes that WHO Member States should develop national strategies and guidelines, review existing policies and develop new ones for comprehensive eye-care services, incorporate the prevention of blindness into poverty-reduction strategies, and develop human resources for eye care, including a component on community eye health. The WHO secretariat is asked to focus on public health strategies for uncorrected refractive errors including presbyopia, glaucoma, age-related macular degeneration, corneal opacity, hereditary eye disease, and selected eye conditions in children. (Other requirements for the secretariat include facilitating the activities of national blindness prevention committees; supporting the implementation and evaluation of national plans; promoting a standardized approach both to the collection, analysis and dissemination of information; promoting the development of human resources for eye care; and strengthening the capacity of regional and country offices.)

Under the same objective, international partners are called on to promote WHO-recommended strategies and guidelines for prevention of blindness and visual impairment, and to contribute to the collection of national information on implementation. Additionally they should generate resources and coordinate support for the implementation of national blindness prevention plans, and provide continued support to programmes related to nutritional and communicable causes of blindness.

Objective 3 (“Increase and expand research for the prevention of blindness and visual impairment”) also relates to public health in that it states that public-health action to prevent blindness and visual impairment should be both evidence-based and cost-effective, and that further research is needed on ways to utilize available evidence (including strategies for early detection and screening in different population groups). This objective urges WHO Member States to promote research by national research institutions in the area of community eye health, to assess the economic and socioeconomic impact of blindness, to examine the determinants of socioeconomic disparity in access to eye-care services, and to incorporate relevant epidemiological, behavioral and health-system research into national programmes for the prevention of blindness.

The WHO secretariat is requested by Objective 3 to: collate data on risk factors and coordinate the development of a prioritized research agenda related to the causes and prevention of blindness, especially in low- and middle-income countries; support Member States in assessing the impact of public-health policies and strategies on eye health; and facilitate the development of projection models on trends in the causes and extent of blindness and prioritize development of and target setting for eye-care systems. The objective asks international partners to support low- and middle-income countries in building capacity for epidemiological and health systems research, support collaboration between institutions in low- and middle-income countries and those in high-income countries, support research on eye diseases at global and regional levels in coordination with member states, and support WHO Collaborating Centres and national research institutions in research related to prevention of blindness and visual impairment.
Task 59 of Objective 2 of the Action Plan calls for a review of the experience of public health strategies for the control of chronic eye diseases, and participants were informed that the current consultation formed a part of this review. It was expected that the consultation would lead to the development of guidelines for approaches to the management of chronic eye diseases within public health in countries at different levels of development. It was also anticipated that a publication on the topic would be issued in the WHO Technical Report Series.

Efforts that had already been made to support the implementation of the Action Plan at national level were described. These included meetings for the sharing of experiences, gathering of information from WHO Member States through WHO offices and ministries of health, and ongoing work on a report on what it takes to secure political support for eye care. Political support exists in some countries, but more advocacy is needed from WHO in highlighting the need for investment in eye care.

In discussion, it was pointed out that the national coordinators for prevention of blindness have little influence on the allocation of financial resources in most countries. Participants concluded that there is a clear need for more advocacy at higher levels in countries in order that eye care may become a regular feature of the public health system. The integration of eye care with approaches to NCDs was considered to be of first importance.

**Global magnitude of visual impairment**

*Dr Donatella Pascolini, Technical Officer of the WHO Prevention of Blindness and Deafness Unit*

The 2010 global estimates of blindness and visual impairment indicate that 285 million people, 65% of them aged over 50 years, are visually impaired. Of these, 246 million are estimated to have low vision (63% of them over 50 years) and 39 million are estimated to be blind (82% of them over 50 years). The definitions of visual impairment are in agreement with the current definitions from the ICD-10 that include all levels of visual acuity of less than 6/18 in the better eye tested with the correction at presentation. The estimates, which were based on studies from 39 countries conducted since 2004 and on earlier studies that are still representative, show that the rates of blindness are 7.3 per million in the WHO African Region, 3.5 in the Americas, 8.5 in the Eastern Mediterranean, 3.0 in Europe, 6.9 in South-East Asia (excluding India), and 5.3 per million in the Western Pacific Region (excluding China). Because of their large population size, the figures for blindness in India and China were calculated separately, both 6.8 per million.

The extent of blindness per region does not necessarily correlate with the extent of low vision. Thus, while the Americas and European regions had the lowest rates of blindness per million population, their rates of low vision (25.6 and 28.7 per million respectively) are higher than in Africa (25.4 per million): the Eastern Mediterranean Region has 32 persons with low vision per 1 million population, South-East Asia (excluding India) has 43.3 and Western Pacific (excluding China) has 28.0. India and China are estimated to have rates of low vision per 1 million population of 46.2 and 49.3 respectively.

In summary, visual impairment is unequally distributed in the WHO regions with the lowest rates in the Americas and Europe with 29.1 and 31.7 cases per million population respectively; the WHO African and Western Pacific (without China) regions have 32.7 and 33.3 cases per million respectively, while the highest rates are found in the WHO Eastern Mediterranean Region, with
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40.5 per million, and South-East Asia Region (without India) with 48.2 per million. India has 53 cases of visual impairment per million population while China has 55.4 per million.

When analysed by country income groups (according to the World Bank’s classification), the 2010 estimates of blindness and visual impairment show that the highest percentage of global visual impairment (39%) is found in lower-middle-income countries. Upper-middle-income countries account for 34% of all visual impairment, while low-income countries account for 14% and high-income countries for 13%. However, with China and India having 20% and 17.5% of the world population respectively, the figures give a somewhat different picture when these two countries are treated separately from the other income groupings. Thus, with China and India listed as separate items among the country income groups, the estimates reveal that the percentage of visual impairment in low-income and high-income countries remains the same (14% and 13% respectively), but that the percentages in lower-middle-income and upper-middle-income countries become 17% and 10% respectively. This is because China is seen to account for 24% of all global visual impairment and India for 22%.

Globally the main causes of visual impairment are uncorrected refractive errors, accounting for an estimated 42% of all cases, and cataract which accounts for an estimated 33% of cases. Other causes of visual impairment include glaucoma (causing an estimated 2% of cases), with diabetic retinopathy, trachoma, age-related macular degeneration (AMD), corneal opacities and childhood blindness accounting for around 1% of cases each. Undetermined causes of visual impairment are 18%.

Countries in the middle-income groupings bear the brunt of uncorrected refractive errors and cataract. The consultation noted that AMD is more important as a cause of visual impairment in upper-middle-income and high-income countries. The lowest rates of glaucoma, AMD and diabetic retinopathy are in low-income countries, while the lowest rate of childhood blindness is in high-income countries.

Cataract is the cause of an estimated 51% of all cases of blindness, with glaucoma causing 8% of cases, AMD causing 5%, corneal opacities and childhood blindness 4% each, trachoma and uncorrected refractive errors 3% each, diabetic retinopathy 1%, and 21% of causes are undetermined. Of all blindness caused by cataract, 43% is in lower-middle-income countries, 29% in upper-middle-income countries, 21% in low-income countries and 7% in high-income countries. Blindness caused by glaucoma follows a similar pattern, with 38% in lower-middle-income countries, 29% in upper-middle-income countries, 20% in low-income countries and 13% in high-income countries.

Blindness caused by other conditions follows a different pattern, however. For instance, 42% of blindness caused by diabetic retinopathy is in upper-middle-income countries and 32% is in lower-middle-income countries, but a higher rate (23%) is found in high-income countries than in low-income ones (3%). With regard to blindness caused by AMD, upper-middle-income countries still have the highest burden of 42%, but the second-highest (33%) is in high-income countries, with lower-middle-income countries having 22% and low-income countries 3%. Childhood blindness is seen predominantly in lower-middle-income countries (47% of cases), with 23% in low-income countries, 22% in upper-middle-income countries and 8% in high-income countries. As for blindness caused by uncorrected refractive errors, the estimates show that 43% of cases are found in lower-
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middle-income countries, 42% in upper-middle-income countries, and 15% in low-income countries, with no significant percentage in countries with high incomes.

Overall, blindness is noticeably less common in high-income countries than in those with lower incomes. The details of the data on estimates of visual impairment are to be published in a peer reviewed journal.

**Background documents**

Dr Mariotti introduced the background documents for the consultation, how they were originated and who led their development.

These were:

- Action plan for the prevention of avoidable blindness and visual impairment 2009–2013;¹
- Public health approach to childhood blindness;²
- Strategies for prevention of blindness from primary glaucoma;³
- Prevention of blindness from diabetes mellitus;⁴
- WHO consultation on the public health approaches to the management of age-related macular degeneration;⁵
- Uncorrected refractive errors.⁶

Consultation participants were asked to refer to the documents in order to see what common elements there might be between them with regard to integration of visual impairment interventions into the general health systems.

**WHO framework for recommendations**

*Dr Margaret Harris, Technical Officer, WHO Department for Knowledge Management and Sharing*

WHO’s process and requirements for the approval of recommendations and guidelines was described. WHO established a Guidelines Review Committee in 2007 to implement procedures to ensure that WHO guidelines are transparent, appropriately based on evidence, and consistent with internationally accepted best practices. It was stressed that any recommendations approved by the

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¹ Action plan for the prevention of avoidable blindness and visual impairment 2009–2013 (WHO).
² Public health approach to childhood blindness (draft by the Centre for Eye Disease Research, Australia).
³ Strategies for prevention of blindness from primary glaucoma (WHO).
⁴ Prevention of blindness from diabetes mellitus (WHO).
⁵ WHO consultation on the public health approaches to the management of age-related macular degeneration (WHO).
⁶ Uncorrected refractive errors (draft by a series of authors associated with the Brien Holden Vision Institute, University of New South Wales, Sydney, Australia; the International Centre for Eyecare Education, Sydney, Australia and Durban, South Africa; the African Vision Research Institute, Durban, South Africa; and the Vision Cooperative Research Centre, Sydney, Australia).
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Organization, including any that may be developed as a result of the present consultation, must be evidence-based.

The development of guidelines usually involves a series of stages, and the next step in the development of guidelines on chronic eye diseases would be to collate supporting evidence. WHO has adopted the system Grading of Recommendations Assessment, Development and Evaluation (GRADE) for reviews of evidence when developing guidelines. In GRADE, quality of evidence is defined as the “extent to which one can be confident that an estimate of effect or association is correct”. GRADE is focused on randomized clinical trials but it is acknowledged that it is not possible to base evidence exclusively on such trials in all cases. The Guidelines Review Committee accepts that it is possible to make a strong recommendation based on weak evidence.

It was explained that conflict of interest relates not only to financial interest but also to academic interest if the validity of one’s own studies is being assessed. An expert who has made a public statement on an issue, and thus may need to defend that statement, should not participate in decision-making on the strength of evidence in that area.

The population-indicator/intervention-comparator-outcome-time (PICOT) framework is used to formulate the questions that should be asked and the choice of relevant intended outcomes. Since every decision results in both desirable and undesirable outcomes, it was stressed that the development of recommendations must include a consideration of both. The relative importance of outcomes needs to be balanced, while bearing in mind that an outcome may vary not only between populations but also between patients within the same population.

**Diabetic retinopathy**

*Professor Barbara Klein, Ocular Epidemiology, University of Wisconsin-Madison, Madison, USA*

*Dr Gojca Roglic, Medical Officer in the WHO Programme for Chronic Diseases Prevention and Management*

The trends in the extent of diabetic retinopathy, the strategies to address the problem and options for management from a public health perspective were presented. Diabetes is not only a cause of diabetic retinopathy but also a cause, or at least a correlate, of other eye conditions. Of all blind persons worldwide, around 1% have diabetic retinopathy. A number of potential sources of error in the estimates of prevalence (such as heterogeneity of survey methods, different estimates of population structure, and non-standard definitions of eye diseases) were mentioned.

The annual incidence of diabetic retinopathy seems to be declining in some developed countries as a result of improvements in patterns of care. In studies from Denmark, Sweden and the United States, it appears that persons diagnosed with diabetes in recent years are less affected by retinopathy than those diagnosed several decades ago.7,8,9

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However, globally there are large populations that may be at risk of diabetic retinopathy: recent studies indicate that in China 9.7% of people have diabetes, and that in sub-Saharan Africa the prevalence may be as high as 10.4%. (There is some evidence that an increased incidence of diabetes in sub-Saharan Africa may be linked to the use of antiretroviral drugs for HIV). At the same time, it was noted that diabetes prevalence rates worldwide are in flux and that the control of glycaemia is improving in many countries. For the control of diabetic retinopathy in persons with diabetes type 1, the first eye examination should take place 3–5 years after diagnosis of diabetes and should be followed afterwards by examinations every year. For type 2 diabetes the first eye examination should take place at diagnosis and then yearly afterwards. At the initial examination, the history to be taken should include the duration of diabetes, past glycemic control (HbA1C), medications taken, systemic history (such as obesity, renal disease, high blood pressure, serum lipids, pregnancy), and ocular history. The initial physical examination should include visual acuity, intraocular pressure, gonioscopy when indicated (for neovascularization of iris, increased intraocular pressure), dilated fundus examination with stereo examination of the posterior pole, and examination of the peripheral retina.

Patient education at the time of diagnosis of diabetes should include discussion of the eye examination results, encouragement to attend yearly dilated examinations if there is no diabetic retinopathy, advice that effective treatment depends on timely intervention, and information on the importance of glycaemic control. A Danish study based on data found at first examination showed that there is no conclusive evidence on the optimal screening intervals for eyes.\(^7\)

Telemedicine such as computer grading of photographs of the retina for diabetic retinopathy is very effective and studies have shown it to be more cost-effective than other types of examination. One study estimated that 36% of patients could be effectively screened by automated computer-based systems.\(^10\) However, computers are more successful in identifying severe lesions than non-severe ones.

In discussion it was proposed that grading should be done by the appropriate level of personnel, with the best skilled personnel performing the more complex procedures. It was suggested that the existing health care system might be used to identify cases, though this was not successful when tried in the United States some 25 years ago since health workers – even optometrists – do not see enough diabetic eyes to become familiar with the presentation of the disease. A cheaper (and more powerful) camera (to be used with the computer) is being developed, but the same concern remains that only severe cases and not the disease in the early stages can be detected by this type of technology.

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The difficulties of screening for diabetes itself in developing countries were highlighted: these rest among other on ethical issues since people diagnosed with diabetes do not have insulin available and a month’s supply of cheaper drugs could cost the equivalent of eight days’ wages. Many developing countries also do not have laser treatment available. Additionally, it is unclear whether a mobile screening unit at primary care level can identify diabetic retinopathy effectively. In some places, screening is becoming more efficient, but treatment is not keeping pace with this and it was felt that screening is inappropriate if treatment cannot be offered. It was agreed that the improvement and expansion of treatment must keep pace with case detection.

The case of China was discussed since China is estimated to have a large population of diabetics, 92 million people; among the blind, diabetics are estimated to be 1% – a likely underestimation. It was reported that China’s government is currently paying increased attention to blindness from all causes, providing more treatment facilities and a health insurance system in rural areas: this will benefit the detection and management of diabetic retinopathy.

In summary, the importance of comprehensive eye care was stressed but evidence of its effectiveness is needed. Training of health workers is important, as is screening, but treatment availability must follow screening: this implies the need for more trained human resources. Cases of diabetes today are more likely to be identified than in the past, but this is not true for diabetic retinopathy. Education of the patient on the risks of not following the treatment is important, as is improvement in the follow-up with patients (in some places SMS messages are being used to remind patients of their treatments or for follow up tests). The comment was made that it is of concern that some ophthalmologists even today cannot identify the signs of sight-threatening diseases and that some ophthalmology clinics or departments in hospitals may not be compliant with the basic need of identification of signs of diabetic retinopathy.

**Glaucoma**

*Dr David Friedman, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA*

The nature of primary glaucoma, the stages of the damage it causes, the main types of glaucoma (open angle glaucoma, angle closure glaucoma) and estimates of the number of persons affected were presented. With an estimated 45 million persons currently having open angle glaucoma and 16 million having angle closure glaucoma, these figures are projected to rise to 59 and 21 million respectively by 2020. The number of persons currently blind from glaucoma is 4.5 million from the open angle form and 3.9 million from the angle closure form of the disease.

A large number of glaucoma cases go undetected – up to 50% in some parts of North America and as many as 95% in some developing countries. Screening is only 85% specific and 85% sensitive and is not very effective in the general population. Screening older people may not be as effective at preventing blindness since glaucoma may not develop to blindness within the lifespan of older persons, while in the younger population screening is not appropriate given the low prevalence of the disease and limitations of current screening tests. However, since glaucoma appears to have a familiar origin, one way to detect cases is to target family members of persons with glaucoma. The prevalence of open angle glaucoma over the age of 40 among Whites is 2% but the risk for a sibling of someone with glaucoma is nearly ten times higher. As an example, in the USA for adults of
European origin with open angle glaucoma there is roughly a 10% chance that a 65-year-old sibling also has glaucoma, and for adults of African origin the risk is 20%.

Because of variability in the appearance of the optic nerve, it is often difficult to identify glaucoma by simple direct ophthalmoscope examination. Examples of glaucomatous damage of the optic nerve were shown. While increased intraocular pressure is an important risk factor, it is not a direct diagnosis; however, the higher the eye pressure, the greater the risk of glaucoma. Lowering the eye pressure has been shown to be preventive in clinical trials but there is no evidence of a threshold level: 50% of persons with glaucoma have eye pressure levels that fall in the normal range. Eye pressure is measured by a tonometer, and there are battery-operated hand-held models available that could be used in low-resource settings by less well-trained personnel.

In deciding the approaches to take with regard to glaucoma, a number of issues were put forward for consideration. For instance, glaucoma is an illness that progresses slowly with an average loss of 1.0 dB per year (which would mean some 20 years would be required to go from normal to moderate/severe vision loss), and most people with glaucoma will not go blind. Eye drops, laser and surgery are all good treatments for lowering eye pressure according to the American Academy of Ophthalmologists, but it is unclear how practical these options are in developing countries as they are not always ideal even in developed countries. Laser treatment is effective and appears to be underused worldwide. Eye drops are often not taken according to protocol, and surgery may lead to more harm than benefit if applied indiscriminately and can lead to cataracts in five years after the operation in 25% of cases. Surgery also requires intensive post-operative care. Surgical interventions for glaucoma must be considered with caution.

The biggest need in developing countries is for well-trained ophthalmologists who can properly diagnose glaucoma. Other resources required are visual field testing machines, slit lamps with tonometers, lenses for viewing the optic nerve head, and medications and lasers.

Different approaches for the detection and treatment of glaucoma could be used in countries at different levels of development. Resource-poor countries could establish a glaucoma department in the main hospital so that staff can be trained and skills learned over time, and cases could be identified as people come to the hospital for care. However, this would detect and treat only moderate-to-severe cases of the disease. Middle-income countries could develop training programmes to enable all ophthalmologists to identify glaucoma, and could consider providing screening in appropriate settings, such as optometric offices or other large healthcare facilities. Public campaigns are not appropriate for glaucoma in any development setting at this time.

It was emphasized that glaucoma is an illness that requires ongoing monitoring and care, and currently no single procedure can be offered that will cure it. It was suggested that future research should address how persons with glaucoma (especially at the moderate or advanced stages) could be identified more efficiently, how practicable it is to distribute eye drops in low-resource settings, and how monitoring and follow-up can be conducted effectively in such settings.

In discussion participants raised the issue of voluntary groups that perform glaucoma screening at public events. It was felt that this is inappropriate especially because these screenings do not propose effective follow-up; given the complexity of glaucoma the risk of making wrong diagnoses in these settings is also a serious problem: any cases detected this way requires further
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Investigation before treatment is given, first of all to rule out false positives and in the event of a true diagnosis to determine the stage of the disease. Supplying indiscriminately expensive equipment that requires maintenance is of little impact. For case detection, it is more advantageous to use an integrated approach targeting persons over 40 years of age who have a family history of glaucoma and making sure that those who present for care are assessed for glaucoma.

The major focus of the discussion was on the necessity of training of human resources both in the detection and in the management of glaucoma needed in all development settings.

There was concern in fact that in many countries recently qualified ophthalmologists cannot correctly diagnose glaucoma. In developing countries, glaucoma is a part of tertiary care, so there is a challenge to move it to secondary or primary levels. It was also predicted that more information will become available from major ongoing research projects (particularly in the area of angle closure glaucoma) in the next five years to guide a public health response more effectively.

In summary, the glaucoma discussion emphasized the need for education and training in this area, including high-quality (but not necessarily high cost) instrumentation, and the need to focus detection efforts on the groups most likely at risk. Ethical issues must be considered when diagnosing if there is no possibility of treatment. Not only is the training of new students in ophthalmology a priority, but also the training or retraining of those who are already qualified. The cost of medicines, including eye drops, is a concern in all settings. Follow-up is essential to assure compliance from the part of the patient possibly over many years; optical coherence tomography (OCT) instruments may become very useful tools for future eye-care systems in general and for glaucoma in particular.

### Age-related macular degeneration

**Dr S. P. Mariotti, Senior Medical Officer, WHO Unit for the Prevention of Blindness and Deafness**

Age-related macular degeneration is the fourth leading cause of blindness (5% of cases) and is the cause of 1% of all visual impairment. It is the leading cause of blindness in the most developed countries. As populations age worldwide and cataract-related blindness is reduced, AMD is expected to become more important. Studies have shown that older age, tobacco use and a family history of AMD are factors for increased risk.

There are multiple systems to standardize the grading of AMD that affects the central retina: stereo fundus examination, fluorescein angiography (FA) and OCT are the most commonly used. Interventions to prevent, identify and manage AMD include smoking cessation, antioxidant supplementation, assessment of family history, and early rehabilitation. Advocacy, patient education and the support of civil society are all important elements in these approaches.

Diagnosis must be necessarily accompanied by treatment. Treatment itself depends on regular follow-up. Compounds blocking vascular endothelial growth factor (VEGF) may halt the loss of vision but require repeated invasive treatments and are expensive. Antioxidants may be given under the supervision of the physician. Detection of depression is important in the elderly, and is even more important in the elderly who have been told they have an eye disease that could
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potentially lead to blindness. Rehabilitation must start early, and should include psychological support to compensate for increasing loss of vision.

From a public health perspective, countries have to decide if they have enough resources to detect and treat AMD. For countries with large numbers of unoperated cataracts and communicable eye diseases, AMD is not a public health priority. The decision whether to take action depends on the country and its resources and social expectations but, if it is decided to engage in AMD management, a patient-centered approach by a multidisciplinary team is the best approach. Community groups and patients’ associations are important for political advocacy to make services available to the public and known to those who need them.

Research needs include the need for more data, especially from Asia and the Eastern Mediterranean Region. Research is also needed on detection techniques, improved classification, the delivery and outcome of rehabilitation, the cost-effectiveness of interventions, and the characterization of visual disabilities from AMD in different populations.

In discussion it was pointed out that cataract surgery increases the risk of late-stage AMD. The comment was made that many persons with cataract can be improved with a good refraction, although there are limitations with regard to AMD since the person is old. It was reported that in China it was found that one in 1000 persons over 50 years had AMD. Unless there is a functioning eye care system, AMD cannot be managed and it is not suited to any kind of campaign or project. Again, participants stressed that training is needed and again they questioned the rationale for diagnosis if treatment is not available. Even without treatment, however, rehabilitation is an option for the younger patient with AMD.

Refractive errors

Professor Brien Holden of, the University of New South Wales, Sydney, Australia (Vision Institute in Sydney, Australia)

An update on refractive errors was presented. Some 670 million people are estimated to be visually impaired because of uncorrected refractive errors if impairment from presbyopia is included (distance vision: 153 million; near vision: 517 million). It was pointed out that 12% of blindness and 55% of vision impairment is due to uncorrected refractive error. It has an educational impact on children, on the income of adults with direct consequences on families and ultimately on society. Globally, according to WHO, more than 90% of people with uncorrected refractive error live in rural areas and in low-income countries.

Estimates of the prevalence of myopia in different regions were presented and reference was made to a study showing the increasing prevalence of myopia in the United States.\textsuperscript{11} That study showed that the percentage of myopia had increased noticeably in persons aged 12–54 years between the early 1970s and the late 1990s/early 2000s. The percentage of myopic 12–17-year-olds, for instance, rose from 24% in 1971–1972 to 33.9% in 1999–2004. Among those aged 18–24 years, the rise was from 27.7% to 38.1%, in the 25–34 years age group the rise was from 24.2% to 44%, and in

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those aged 35–44 years it was from 24.5% to 42.9%. In persons aged 45–54 years, the prevalence of myopia rose from 24.8% in 1971–1972 to 44.8% in 1999–2004. It was noted that 30% of myopes become myopic after the age of 17 years.

Factors adding to the lack of correction include the poor coverage of services in rural areas and disadvantaged communities, the cost of spectacles, the lack of perceived need, social stigma related to wearing spectacles, and even the belief that wearing spectacles is harmful to vision.

The main recommendations of the background document on this topic were presented to the consultation. These included the recommendation that binocular vision of less than 6/18 for adults (at distance or near) and 6/12 for children should be considered as a public health priority, that the correction of refractive errors of over certain thresholds (myopia of greater than -0.50D, hyperopia of more than 2.00D, and astigmatism of more than 0.75D, and mild presbyopia) is potentially of benefit to the individual and the community, and that the time for screening children for uncorrected refractive errors should be when they enter secondary school (except in countries where evidence indicates that the prevalence of refractive errors is high in young children, in which case screening should be conducted on entry to primary school and each year afterwards). Other recommendations related to the need for training and the provision of refractive services, including spectacles.

It was pointed out that approaches to the management of refractive errors should be flexible and should depend on local conditions and resources, but they need to be readily accessible and provide good quality services. It was also mentioned that there is little point in providing unattractive or uncomfortable spectacles. Experience has shown that in many situations children who were provided with free spectacles did not wear them for a variety of reasons.

It was considered that the provision of spectacles through community-based low-cost spectacle production (cutting and fitting lenses into frames) could provide a good balance of optimal spectacle supply and local employment. Thus the development of an eye-care service and optical supply chain could have social and economic benefits for communities. Appropriate equipment would need to be sourced or developed and incorporated into service delivery programmes. Ready-made spectacles represent the most rapid low-cost treatment for refractive error and can be used (though with some compromise on accuracy of optical correction) where custom-made spectacles are not available. It was not recommended to use recycled spectacles.

Factors for ensuring long-term sustainable provision of spectacles in developing countries include the provision of good-quality optical appliances, a convenient and effective supply chain (including widespread local distribution networks, and especially community-based services), affordability, social understanding and acceptance of spectacles, and comfortable and attractive appliances.

The need for training and appropriate deployment of human resources at primary, secondary and tertiary levels was stressed in order to meet the needs for screening, eye care, refraction and spectacle delivery. In particular, refractive error personnel at secondary level should be trained to detect, treat or refer sight-threatening conditions and general health conditions that have ocular manifestations. Countries were urged to promote the incorporation of appropriate indicators for refractive errors within an eye-health information system that is integrated into a national health information system, and to encourage the development of innovative public–private partnerships,
social enterprise approaches, health insurance and local financing options to promote the access to and sustainability of services for refractive errors.

In terms of research, the needs expressed included a situational analysis to determine what is already in place prior to embarking on a school health programme, studies of the prevalence of vision impairment due to uncorrected refractive errors and the cost and impact of uncorrected refractive errors, and measurement of the cost-effectiveness of refractive care. The need was expressed for better tools to measure the impact of uncorrected refractive errors (and of providing corrections) on the quality of life. It was also felt that uptake and compliance data are needed on spectacle use, as are data on community perceptions and acceptance of spectacles. Other foci for research could include the viability of local manufacture of affordable good-quality spectacle lenses and frames, the technical appropriateness of various instruments and techniques (in different settings), and technologies that enable affordable instruments and procedures to be provided for refraction, eye examination, spectacle lenses and frame production and supply, patient information, education and advocacy.

In discussion, the cost of falls and fractures in persons with uncorrected refractive errors was raised as a concern, but data are scarce. Other issues included the link between cognitive dysfunction and visual impairment, the difficulty of reaching children in areas with low school attendance, and difficulties in identifying amblyopia before the age of five years. It was agreed that the public health priority should be vision of less than 6/18. Local manufacture of spectacles was advised since imported spectacles do not cover astigmatism correction. Local servicing for spectacles also needs to be developed.

The supply chain for spectacles should vary according to the setting. Participants agreed that the public should be helped to understand the importance of complying with prescriptions for refraction. Having a shop that sells spectacles was judged to be often the best way to finance eye care (i.e. partly charitable and profit-making). It was added that hospitals could add an optical shop.

The extent of presbyopia was said to be often underestimated. People with presbyopia need corrected vision not just for reading but also for near work and for their overall quality of life. An approved procedure is needed at the primary level for the supply of spectacles and checking of eyes.

In summary, the participants concluded that the problem of uncorrected refractive errors exists in every region, and that correction should be available to all. Different supply chains for spectacles are possible according to the setting. Screening is appropriate in countries where the rate of refractive errors is high but may not be appropriate elsewhere. It was agreed that recycled spectacles are not appropriate, that there must be more investigation into why people do not wear corrections when they are available, and that presbyopia should be seen as an issue of more than just reading. One point of access to people with poor vision would be retirement homes. Education of the general public is important for refractive error.

**Blindness in children**

*Professor Clare Gilbert, London School of Hygiene & Tropical Medicine, London, United Kingdom*
Avoidable causes of blindness in children include congenital and developmental cataract, conjunctivitis of the newborn (ophthalmia neonatorum), the use of harmful traditional eye remedies, retinopathy of prematurity (ROP) and, to a lesser extent than previously, vitamin A deficiency and measles. A review of all studies since 1990 on blindness in children shows that there is an association between under-five mortality rates and the prevalence of blindness in children, with countries with low under 5 mortality rates having a lower prevalence. The number of blind children worldwide, which was estimated at 1.4 million in 1999, is thought to have fallen by 10%, to 1.26 million in 2010 according to new estimates by the International Centre for Eye Health, London. However, the decline is not consistent, as the revised estimate suggests that the number of blind children has actually increased in sub-Saharan Africa due to the growing child population, and the failure to control under 5 mortality rates in several countries in the region.  

Data on 36 000 blind children from 43 countries since 1990 revealed that blindness in children has a wide range of underlying causes i.e. chromosomal/genetic abnormalities, infections (both in utero and as a child), nutritional deficiencies, prematurity/birth hypoxia, malignancies and trauma. The data showed that in rich communities 600 children are blind in every 10 million population, usually from congenital abnormalities or complications of preterm birth. In middle-income countries, in each 10 million population there are some 1800 blind children while in poor and extremely poor communities the number of blind children per 10 million population may be as high as 3600 or 6000 respectively.

In all regions of the world there are unavoidable causes of blindness (e.g. congenital abnormalities, retinal dystrophies and central nervous system lesions), but socioeconomic variation influences the pattern of avoidable causes of blindness in children. For example, in high-income countries blindness in children is overwhelmingly due to unavoidable causes such as congenital abnormalities, retinal dystrophies and central nervous system lesions (often secondary to prematurity). In the middle-income countries of Latin America and the Former Socialist Economies ROP is reaching epidemic proportions and cataract and glaucoma are less well managed. In poor communities, cataract and glaucoma are potentially avoidable causes, but not ROP as neonatal care services are not yet well developed. In poor communities acquired conditions of childhood can also lead to blindness e.g. vitamin A deficiency, measles, ophthalmia neonatorum and harmful traditional eye remedies.

Changes in health care and socioeconomic status are altering the prevalence and pattern of causes of blindness in children. Thus efforts to lower the under-five mortality rates (such as vaccination campaigns against measles) have led to a reduction in corneal blindness in poorer countries, while the increased survival of preterm babies has resulted in more ROP blindness in middle-income countries. Unregulated assisted fertilization which leads to multiple fetuses and preterm births also results in greater rates of blindness in children.

Control of corneal scarring, cataract in children and ROP were each examined from the perspectives of the community, primary, secondary and tertiary care, and policy with regard to what needs to be in place, the current status, and what should be done to improve the situation over the next 10 years. Control of blinding eye diseases in childhood requires comprehensive approaches from

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families and communities through to tertiary level service delivery, education and rehabilitation, and from prenatal risk counselling through to follow-up throughout childhood.

Efforts to reduce childhood blindness need to be integrated into primary health care and child health initiatives, and it is important that other disciplines become involved. Policy measures for corneal scarring would be to maintain and increase measles vaccination and vitamin A supplementation as well as programmes to improve the diet and nutritional status of children. Over the next 10 years, these efforts to control corneal scarring should be maintained in middle-income countries and expanded in low-income and least developed countries. Such efforts should take place at community level (improved water and sanitation, education for women, health education on measles, vitamin A deficiency, avoiding traditional practices and sexually transmitted infections, and prevention of corneal scarring), primary health care level (eye care as part of primary health care, school eye health, training traditional birth attendants to perform Credé’s method), secondary level (Credé’s ocular prophylaxis, diagnosis and treatment of corneal ulceration), and at tertiary level (diagnosis and treatment of corneal ulcers and optical iridectomy/corneal grafting for established corneal scarring.

For cataract in childhood, the overall policy measure would be to improve tertiary level services and case detection and referral, and to avoid catastrophic health expenditure. The focus of high-income countries should be to improve the evidence base for management, through well conducted randomized trials; for middle-income countries it would be to improve outcomes and follow-up, while in low-income and least developed countries it would be to develop more tertiary services with improved case finding and referral mechanisms.

The focus of services at community and primary level for childhood cataract should be on case detection, counselling of parents, and prompt referral to eyecare services. At community level this might entail training traditional birth attendants, preschool and school eye-health programmes, and health education for parents of blind children. At primary health care level, approaches should include examination of the eyes of the newborn (e.g. the red reflex test), training of immunization and MCH clinic staff to identify cataract, integration within child health programmes (such as Integrated Management of Childhood Illness), and involvement not only of the government health sector but also the private health sector (such as drug vendors) and even the informal health sector. At secondary level, efforts should focus on detection and referral of younger children with cataract, with high-quality surgery and follow-up for older children, backed by good optical services. At tertiary level it was recommended that there should be one Child Eye Care Centre for managing for every 10 million population. Such a centre should be able to offer high-quality surgery by a well trained team, a child-friendly environment, appropriate facilities (e.g. outpatient department, operating theatre, ward), counselling, optical and low vision services for children, and collaboration with rehabilitation and education staff.

With regard to control of ROP, overall policies should address both the prevention and treatment of ROP; the risks of assisted fertilization and the avoidance of catastrophic health expenditure associated with treating the severe stages of the condition. In the coming decade, high-income countries should continue to improve their control of ROP in light of new developments in neonatal care, middle-income countries should strengthen control at all levels, low-income countries should make improvements where care is poor, while in the least developed countries ROP is unlikely to become a problem. Again, recommended efforts were outlined at community level (health
education related to antenatal care, the risks of assisted fertilization, and the reduction of teenage pregnancy), primary health care level (patient care, referral of high-risk pregnancies), secondary level (antenatal steroids prior to preterm delivery, resuscitation of preterm babies which avoids the unnecessary use of supplemental oxygen), and tertiary level (a) for the prevention of ROP i.e. excellent neonatal care with adequate equipment, nursing competencies and ratios, b) for the detection of ROP needing treatment, by regular examination by an ophthalmologist, or high quality telemedicine, with laser treatment of babies developing Type 1 ROP and c) sight preserving vitreoretinal surgery for stage 4 ROP). Examined and treated babies require long-term follow-up, and collaboration with rehabilitation and education services.

In discussion, participants expressed the view that children's eye care should be part of the responsibility of an eye care centre. It was proposed that WHO documents on neonatal and postnatal care should include advice on eye care and guidelines on the use of oxygen. Some countries in Latin America have a government policy that preterm children should have their eyes examined. However, even if policies exist in countries, they are not always implemented. It was pointed out that one eye care centre per 10 million people can accumulate a large amount of information that could be used to develop policies. Childhood blindness is numerically a small problem compared with the extent of unoperated cataracts. However, in terms of the number of years lived with disability, the problem of childhood blindness is enormous.

In summary, the session stressed that children's eye health should be addressed across the health system, that education of health care providers is needed as they give neonatal and postnatal care to children (i.e. an approach that does not just focus on the elderly), and that policies are needed on childhood blindness interventions (though the interventions will vary according to local conditions). Participants concluded that the development of comprehensive eye-care systems is a major need.

**Selecting strategies for different settings in Member States**

This discussion focused on common strategies and interventions for diabetic retinopathy, glaucoma, AMD, refractive errors and childhood illness that can be integrated into public health. Dr Mariotti opened the discussions by explaining that the initial purpose was to discuss the integration of strategies for the five conditions and then to assess how the set of integrated strategies could be implemented within public health. It was noted that some interventions may not be relevant in some development settings. Participants agreed that all conditions discussed at the consultation, including cataract, should be integrated into comprehensive eye care. They further stressed that any guidance for selecting strategies should focus on settings and their resources rather than on country income levels since higher-income countries may include lower-settings and lower-income countries may include higher-resource settings.

**High-resource settings**

With regard to diabetic retinopathy in high-resource settings, there was some discussion on the effectiveness of national screening programmes. It was agreed that the aim should be to provide access to support, with a focus on marginalized populations. For high-income settings in general, participants agreed that the aim would be to recommend what improvements can be made to existing interventions.
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For glaucoma, it was agreed there is a need for case-finding in high-risk groups (i.e. family members, older persons). It is also important to ensure more accuracy in case definitions before diagnosis since diagnoses may sometimes be inaccurate.

On refractive errors, it was agreed there are unmet needs at all ages. Many people have vision of less than 6/18. There is a need to raise awareness of the importance of normal sight – from school children to the elderly. Other unmet needs include school screening, health promotion for adults, and correction of refractive errors in nursing homes for the elderly.

On AMD, the multidisciplinary approach was considered to be particularly important for identification and rehabilitation. It was stressed that rehabilitation must include not only the person but also the person’s environment (such as the home). Detection of depression is also important.

With regard to childhood blindness, it was agreed to recommend an eye examination at birth (including red reflex), screening for ROP, and the provision of treatment according to national guidelines. One tertiary reference centre per 10 million people was also recommended. Additionally it was agreed that rehabilitation services for the blind and persons with low vision would be necessary. It was further emphasized that there should be links to education and health promotion services.

**Middle-resource settings**

It was agreed that diabetes mellitus patients must be identified and examined for diabetic retinopathy. Training for professionals in middle-resource settings should be developed and strengthened so that both diabetes and diabetic retinopathy can be identified. One diabetic retinopathy treatment centre should be recommended for every 10 million population. In addition, a system of referral is needed for complex cases.

In relation to glaucoma, secondary care centres are needed that are able to diagnose glaucoma correctly and treat it properly (use of laser treatment, surgery, and drugs). Glaucoma medicines – prostaglandin and timolol – are to be included in the next edition of WHO’s *Model List of essential medicines*. It was stressed that patients diagnosed with glaucoma should be granted access to appropriate drugs.

For refractive errors, it was agreed to make the same recommendations for middle-resource settings as for high-resource ones. There is a clear need for universal access to treatment for refractive errors in middle-resource settings, and a great need for affordable spectacles. It was agreed that awareness should be raised of the importance of good vision, especially in relation to compliance (i.e. to ensure that people wear the spectacles that are provided to them).

It was decided that management of AMD may not be a priority in middle-income settings but that it could be made available if decided locally (by the government), if expected (by patients), or if local epidemiology indicates a need. The training of care providers would be a priority. It was noted that a change in the means of treatment delivery might change the rationale for making interventions available. Reference centres should make services available for rehabilitation and for persons with low vision.
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It was agreed that the recommendations on childhood blindness should be the same as for high-resource settings, with addition of the prevention of ROP.

**Low-resource settings**

For diabetic retinopathy in low-resource settings, the consultation agreed that diagnosis and treatment should be provided by tertiary reference centres (both those providing general health care and those specializing in eye health).

For glaucoma, it was agreed to recommend detection where treatment options are available. It was stressed that persons detected with glaucoma must be offered treatment. There is a need for training of all appropriate types of personnel for both detection and referral. It was noted that there is an increase in optometrists and ophthalmologists graduating in Africa (e.g. Ethiopia, Malawi and Mozambique).

In the case of refractive errors, it was agreed that there is a need for affordable high-quality spectacles to be made available. Various types of training are also required. A carefully developed supply chain is essential and, in this regard, it would be important for local people to take on the roles of supply and dispensing. Services providing checks for refractive errors are an opportunity to identify other possible eye conditions, thus providing comprehensive eye care. It was recommended that services for refractive errors should be provided on the basis of population density and needs.

AMD was considered not to be a high priority in low-resource settings. Nevertheless, it was agreed that diagnosis and treatment should be available in tertiary centres (both those providing general health care and those specializing in eye health).

In low-resource settings, interventions for childhood blindness should take place mainly in the context of primary health care (i.e. general child health care). It was recommended that rehabilitation and paediatric eye surgery should be made available in tertiary reference centres.

**Integration of strategies**

Participants in the consultation reviewed the elements of prevention, detection and screening, and treatment for each of the chronic eye diseases.

**Prevention**

It was agreed that the prevention of diabetic retinopathy should include health promotion, advocacy, and synergy with the agenda and activities for diabetes control. There is a great need for education, which should be aimed at practitioners, patients and the general public. It was felt that a risk-factor approach will be important since diabetes is a risk factor for diabetic retinopathy.

The consultation agreed that glaucoma prevention is not a major priority, but it was also felt that any efforts to prevent glaucoma should include awareness-raising.
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It was agreed that the prevention of refractive errors should include promotion of a healthy lifestyle, hygiene, good lighting for reading and close work (i.e. health promotion aimed at reducing risk). The prevention of AMD should include encouragement not to smoke.

In the case of childhood blindness, prevention strategies should include good nutrition, immunization against measles and rubella, refraining from the use of harmful traditional medicines, ROP, and vitamin A supplementation. For mothers, it was agreed that there should be health promotion about sexually transmitted diseases, breastfeeding and diet.

Detection and screening

For diabetic retinopathy, the consultation stressed that training should be expanded and detection should be integrated into the work of diabetes clinics. Any delivery of vision care should be accompanied by a check for diabetic retinopathy.

It was agreed that glaucoma detection should involve a focus on making at-risk groups more aware of the disease, as well as the training of practitioners to identify the condition. There should be checks for glaucoma at every delivery of vision care.

For refractive error, screening should take place as children enter school in low- and middle-income settings. The consultation stressed that all screening must be accompanied by the availability of spectacles. The school screening package should include checks for other health concerns. Any eye examination or delivery of eye-care services should also involve a check for refractive error. It was recommended that health professionals should ask patients at any adult health examination whether they wear spectacles and, if necessary, test their sight.

For detection of AMD, the recommendation was that any person aged over 50 years having an eye examination should be offered a test. Detection of childhood blindness should include the examination of siblings. It was also emphasized that screening for cataract also presents an opportunity for the detection of other diseases and conditions.

Treatment

The consultation recognized a number of opportunities for synergies with regard to treatment. For diabetic retinopathy, for instance, the treatment setting, which will include lasers and glycaemia control, may also be used for AMD, ROP and glaucoma. Similarly, glaucoma treatment should be integrated with that of AMD, diabetic retinopathy and ROP.

As time was short, it was agreed that the remainder of the assessment should be completed after the meeting.

Integration to the health systems

The consultation then considered the integration of the above set of strategies into the general health care system.

For diabetic retinopathy, for instance, there were seen to be links with care of NCDs, diabetes mellitus, and care of the elderly in general. The link with occupational health care was also noted.
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With regard to glaucoma, potential areas of integration were identified as care of NCDs, the elderly and occupational health.

The consultation agreed that potential links for addressing refractive errors would be with NCD care, school health programmes, and occupational health, and also with some areas not directly related to health – such as literacy, job creation, education and microcredit schemes.

For AMD, links for integration were foreseen with NCD care, care of the elderly and mental health.

In the area of childhood blindness, it was anticipated that opportunities for integration would include maternal and child health, Tay-Sachs disease (TSD), nutrition, education, social services, immunization programmes and clinic-based rehabilitation (CBR) programmes.

The evidence base

Professor Gilbert presented a set of tables providing an evidence base for setting priorities in different settings, by income level. Participants considered each disease and the relevant income level. The WHO health system framework was explained and participants reviewed the strength of evidence in different settings.

The consultation reviewed the availability of studies or clinical trials that could be used as evidence for the effectiveness of interventions for each eye condition. Participants contributed references to trials and descriptive studies that they were familiar with, and proposed other possible sources of evidence. Suggestions related to studies on primary, secondary and tertiary prevention approaches. Participants noted the need to report further studies to expand the corpus of evidence.

The consultation also reviewed the evidence base for interventions for each eye condition in relation to classification/diagnostic tests, screening, programme impact, and cost-effectiveness. Further suggestions were made concerning areas for which clinical trials and other studies had taken place.

In addition, proposals were made regarding areas where research is needed. Examples included the impact of sight restoration on productivity or economic status, the willingness to pay for services, and the impact of different financing systems.

Tables of evidence related to visual impairment by resource level and by eye condition were created. It was agreed that the different tables should be linked in order ultimately to guide the development of options for countries.

Closing session and conclusions

Dr Nicholas Banatvala, Senior Advisor to the Assistant Director-General, gave a brief report on NCD discussions at the United Nations High Level Panel on the Action Plan for Chronic Diseases New York which included eye diseases.

Participants in the consultation were asked if they wish to continue with this work with WHO or, if not, to suggest someone who could replace them. They were further requested to suggest other groups that should be added to the consultative panel in order to further its work. Ultimately the
process will lead to a set of recommendations or options that will go to the WHO Guidelines Review Committee and will become WHO’s recommendations on this topic. It was agreed that the document with the recommendations should reflect the concept of ocular health as opposed to solely the prevention of blindness.

Dr Mariotti closed the meeting by thanking the participants.


### SCHEDULE

**19 September 2011**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
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<tbody>
<tr>
<td>8.45-9.30</td>
<td>Opening</td>
</tr>
<tr>
<td>(45mn)</td>
<td>Introduction of Participants</td>
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<td></td>
<td>Scope and Purpose</td>
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<td>Officers</td>
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<tr>
<td>9.30-9.45</td>
<td><strong>1. OVERVIEW OF THE ACTION PLAN TASK 59</strong></td>
</tr>
<tr>
<td>(15mn)</td>
<td>i. Description of the action plan, its content and timeframe and scope:</td>
</tr>
<tr>
<td></td>
<td>Low and Middle income experience, not clinical</td>
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<tr>
<td>9.45-10.15</td>
<td><strong>2. GLOBAL MAGNITUDE OF VISUAL IMPAIRMENT AND CAUSES</strong></td>
</tr>
<tr>
<td>(30mn)</td>
<td>i. Review the global and regional magnitude, and causes, the rationale</td>
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<tr>
<td></td>
<td>for using the country development index: World Bank classification of</td>
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<td></td>
<td>countries by WHO Region</td>
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<tr>
<td>10.15-10.25</td>
<td><strong>3. REVIEW OF MEETINGS / PAPERS FOR BACKGROUND</strong></td>
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<tr>
<td></td>
<td>i. Review the set of available background documents, their</td>
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<table>
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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>(10mn)</td>
<td>structure/ content, their recommendations</td>
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<tr>
<td>10.25-10.40</td>
<td><strong>4. WHO FRAMEWORK FOR RECOMMENDATIONS</strong></td>
</tr>
<tr>
<td>(15 mn)</td>
<td>i. presentation of WHO requirements for issuing recommendations - GRADE</td>
</tr>
<tr>
<td>10.40-11.00</td>
<td>COFFEE BREAK</td>
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<tr>
<td>(20mn)</td>
<td>5. <strong>DIABETIC RETINOPATHY</strong></td>
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<tr>
<td>11.00-12.00</td>
<td>a. MAGNITUDE / DISTRIBUTION</td>
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<tr>
<td>(60mn)</td>
<td>b. STRATEGIES</td>
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<td></td>
<td>c. P.H. MANAGEMENT OPTIONS</td>
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<td></td>
<td>d. DISCUSSION</td>
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<tr>
<td>12.00-13.30</td>
<td>LUNCH</td>
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<tr>
<td>(1h30mn)</td>
<td>6. <strong>GLAUCOMA</strong></td>
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<td>13.30-14.30</td>
<td>a. MAGNITUDE / DISTRIBUTION</td>
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<tr>
<td>(60mn)</td>
<td>b. STRATEGIES</td>
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<td>c. P.H. MANAGEMENT OPTIONS</td>
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<td>d. DISCUSSION</td>
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<tr>
<td>14.30-15.30</td>
<td>7. <strong>AGE-RELATED MACULAR DEGENERATION</strong></td>
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<tr>
<td>(60mn)</td>
<td>a. MAGNITUDE / DISTRIBUTION</td>
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<td>b. STRATEGIES</td>
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<td>c. P.H. MANAGEMENT OPTIONS</td>
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<td>d. DISCUSSION All</td>
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<tr>
<td>15.30-15.50</td>
<td>TEA BREAK</td>
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<tr>
<td>(20mn)</td>
<td>8. <strong>REFRACTIVE ERRORS</strong></td>
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<tr>
<td>15.50-16.50</td>
<td>a. MAGNITUDE / DISTRIBUTION</td>
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<td>d. DISCUSSION All</td>
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<tr>
<td>16.50-17.50</td>
<td>9. <strong>CHILDHOOD BLINDNESS</strong></td>
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<tr>
<td>(60mn)</td>
<td>a. MAGNITUDE / DISTRIBUTION</td>
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<td>b. STRATEGIES</td>
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<td>c. P.H. MANAGEMENT OPTIONS</td>
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<td>d. DISCUSSION All</td>
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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>17.50-18.00</td>
<td>Summary of the day and adjourn (Chair)</td>
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<tr>
<td>18.00</td>
<td>Reception in WHO Restaurant</td>
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#### 20 September 2011

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>9.00-9.30</td>
<td><strong>10. MATRIX FOR STRATEGY SELECTION FOR MEMBER STATES</strong></td>
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<tr>
<td></td>
<td>i. Present a matrix where country development status crosses disease specific prevalence / priorities (from the GBBL2010) and present the development-blindness relationship</td>
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<tr>
<td>9.30-11.30</td>
<td><strong>11. WORKING GROUP ON INTEGRATION OF STRATEGIES</strong></td>
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<tr>
<td></td>
<td>i. Review matrix from presented/agreed strategies in thematic AI. Identify the cross sectional actions among various diseases and synergize strategies among themselves in terms of logistic, procedures, age groups</td>
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<tr>
<td>10:30-10:50</td>
<td>COFFEE BREAK</td>
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<tr>
<td>11.30-12.00</td>
<td><strong>SUMMARY OF WORKING GROUPS</strong></td>
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<tr>
<td>12.00-13.30</td>
<td>LUNCH</td>
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<tr>
<td>13.30-15.00</td>
<td><strong>12. WORKSHOP ON INTEGRATION INTO PUBLIC HEALTH</strong></td>
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<tr>
<td></td>
<td>i. Review the matrix from AI 10 and define how best integrate it into the public health care system. Mainly define integration of human resources training, health system information, infrastructure development, according to anticipated needs according to development status epidemiology</td>
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<tr>
<td>Time</td>
<td>Session</td>
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<td>15-15.30</td>
<td>TEA BREAK</td>
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<tr>
<td>15.30-16.00</td>
<td>SUMMARY OF WORKING GROUPS WORK</td>
</tr>
<tr>
<td>16.00-16.30</td>
<td>13.CONCLUSIONS &amp; WAY FORWARD Chair / WHO</td>
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<tr>
<td>16.30</td>
<td>ADJOURN</td>
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Annex 2

**PROVISIONAL LIST OF PARTICIPANTS**

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