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EXPANDED PROGRAMME ON IMMUNIZATION

DIVISION OF NUTRITION

DIVISION OF DIARRHOEAL AND ACUTE RESPIRATORY DISEASE CONTROL

PROGRAMME FOR THE PREVENTION OF BLINDNESS

USING IMMUNIZATION CONTACTS AS THE GATEWAY TO ELIMINATING VITAMIN A DEFICIENCY

A POLICY DOCUMENT

WORLD

HEALTH

ORGANIZATION

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the Task Force "Sight and Life"
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1. EXECUTIVE SUMMARY

• **Global goals.** WHO and UNICEF have jointly adopted challenging and historic goals for elimination or control of micronutrient malnutrition. These include the elimination of vitamin A deficiency and all its consequences by the year 2000. As a stepping stone towards these goals, the mid-decade goal for the end of 1995 is *to ensure that at least 80% of all children under 24 months of age living in areas with inadequate vitamin A intake receive adequate vitamin A through a combination of breast feeding, dietary improvement, fortification and supplementation.*[1]

• **Geographical phasing.** Countries in most need will be accorded priority. Both clinical and subclinical vitamin A deficiency (VAD) (see Glossary for definition) are problems in at least 73 countries. In 1995 WHO classified countries as having clinical or sub-clinical severe, moderate or mild problems of VAD (see Figure 1 on page 4 and the lists in Appendix 1). Most countries with clinical VAD (where children demonstrate eye signs and symptoms including blindness), are in south and southeast Asia and sub-Saharan Africa. Due to high population density, the largest number of persons affected by VAD are in south and southeast Asia. Severe VAD is also found in refugee settlements and displaced populations.

• **Strategies.** Although considerable progress has already been made in reducing VAD, its elimination by the target date of 2000 will require special efforts and a combination of different strategies involving intersectoral collaboration. These strategies will include promoting breast feeding, dietary diversification to increase intake of vitamin A-rich foods, agricultural reform and food fortification. Public health measures to deliver vitamin A supplements, such as via immunization programmes, and infection control will also contribute in appropriate situations. Each intervention can play a role, the relative importance of which will be country-specific. The delivery of vitamin A supplements is intended as a temporary solution to VAD until such time as other more natural methods of raising vitamin A status are brought into effect[2].

• **Routine immunization services.** The Expanded Programme on Immunization (EPI) should be regarded as the gateway to elimination of vitamin A deficiency. EPI provides a greater number of opportunities for delivery of vitamin A to mothers and children than any other health programme. These services reach about 80% of the world's children in their first year of life, as well as their mothers.

Any EPI contact after the age of six months is appropriate for supplementing the *infant or young child.* Using EPI contacts before 6 months for delivery of supplements may be considered in the future - pending completion of studies to ensure safety and benefits. The visit for measles vaccine at around 9-11 months of age is especially

suitable, linking two strategies for the protection of the child against measles virus in the one visit. In countries where such policies exist, preschool-age children can also be given vitamin A supplements along with booster doses of EPI vaccines.

Any contact the *mother* of a newborn child makes with immunization services within 8 weeks of delivery is suitable for administering vitamin A to her.

Several countries with a clinical or severe subclinical VAD problem are already distributing vitamin A supplements periodically through specific programmes. EPI-linked vitamin A distribution should complement these programmes. The EPI programme is ideally suited to initiate the vitamin A supplementation programme, since the first dose of vitamin A can be given from at least six months of age. In countries with severe clinical or subclinical VAD which do not yet have an intervention programme, the EPI should be adapted for vitamin A supplementation.

• **Supplementary Immunization Activities.** Supplementary immunization activities (see Glossary for definition) such as campaigns and mopping up are becoming an increasingly common feature of disease control in the 1990's, reaching a greater number of children in wider age ranges than routine immunization services. Linking vitamin A administration with supplementary immunization strategies also broadens the potential age range and the number of children who can be reached with the vitamin.

• **Cost-efficiency.** Vitamin A supplementation becomes highly cost-effective when combined with other on-going health interventions such as immunization.

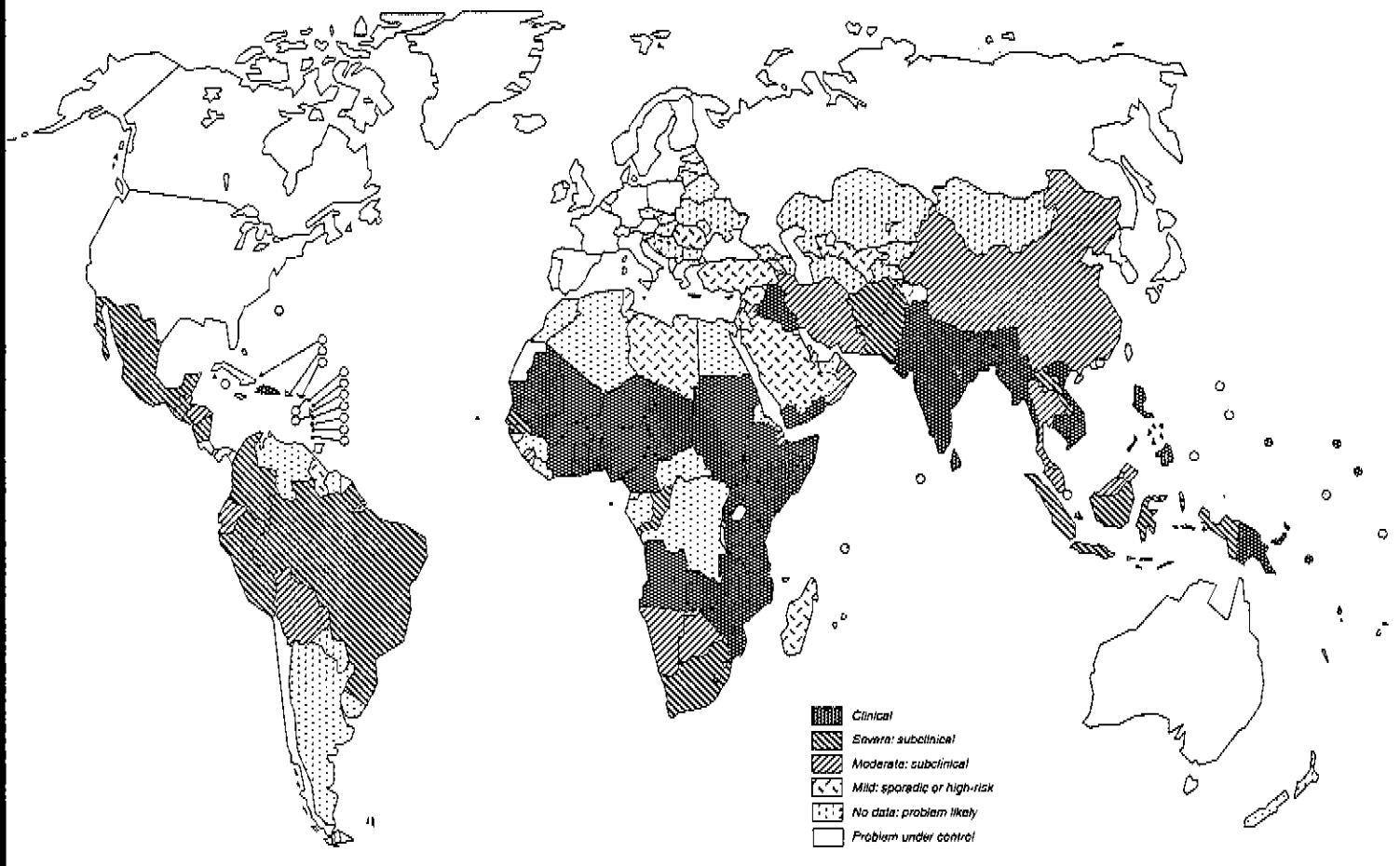
• **Programmatic phasing.** The elimination of VAD will occur in phases from both a geographical and programmatic point of view. There is considerable variability between countries both in levels of commitment, in the degree of need for intervention, and in progress of intervention and surveillance activities. Therefore, countries will implement elimination and control activities according to the current status of their programmes for control of malnutrition and immunization.

• **Vitamin A supply.** UNICEF currently supplies the majority of vitamin A supplements to country programmes. In view of the predicted increase in vitamin A requirements, countries which already have manufacturing facilities are encouraged to raise local vitamin A production. Annual estimates of needs for both vitamin A and vaccines for routine and supplemental immunization activities should be prepared well ahead of time. Delivery of vitamin A supplies to central stores and arrangements for delivery to field sites will be coordinated with other logistical components of the supply of vaccine and essential drugs.

• **Joint responsibility**. This *Policy Document* is intended to be a guide for the formulation of specific *national plans of action* to use contacts with immunization services for vitamin A supplementation - both to infants and to mothers shortly after delivery. Successful implementation of the plan depends on joint responsibility and linking between immunization and nutrition or other public health programmes.

• **Cost.** The additional cost of delivering vitamin A supplements at immunization contacts in the 60 most affected countries, incremental to delivering immunization programme vaccines, is estimated at US$75 million each year until the year 2000.

Figure 1.
Countries categorized by degree of public health importance of vitamin A deficiency



The designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines represent approximate border lines for which there may not yet be full agreement.

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2. INTRODUCTION

2.1 Global goals

WHO and UNICEF have jointly adopted the goals for control and eventual elimination of micronutrient malnutrition (see Glossary for definition). These include the elimination of vitamin A deficiency (VAD) and all its consequences by the year 2000. The World Health Assembly (WHA), the 1990 World Summit for Children, the 1991 Montreal Policy Conference on "Ending Hidden Hunger" and the 1992 International Conference on Nutrition have endorsed the goal of elimination of VAD by the year 2000.

The mid-decade goal for the end of 1995 is *to ensure that at least 80% of all children under 24 months of age living in areas with inadequate vitamin A intake receive adequate vitamin A through a combination of breast feeding, dietary improvement, fortification and supplementation.*

2.2 Prevalence of VAD

- VAD is a public health problem in over 73 countries;
- At any one time, up to 250 million children are at risk of clinical or subclinical VAD;
- Over one million VAD-associated childhood deaths occur annually.

2.3 Causes of vitamin A deficiency

VAD occurs where diets contain insufficient vitamin A for the basic needs of growth and development, for physiological functions, and for periods of added stress due to illness. Infections such as measles may precipitate a child into clinical VAD. In VAD areas, women of child-bearing age are at high risk of VAD and its consequences because of the extra requirements during pregnancy and lactation. Having been born vitamin A-depleted, their newborns need more vitamin A than can be supplied through their mother's milk after 4-6 months of nursing if they are to be prevented from developing VAD.

2.4 Effects of VAD

- 2.8-3 million pre-school children already have some eye damage from VAD.

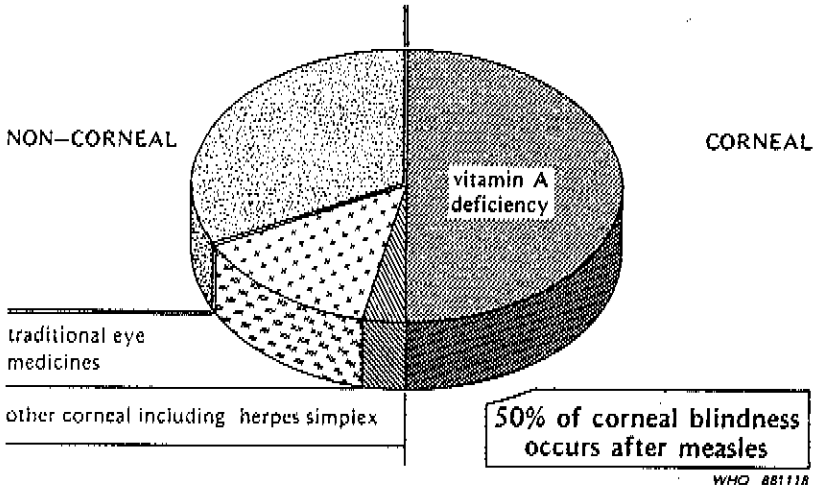
• At least 350,000 pre-school children become partially or totally blind every year from VAD. About 60% of these children die within a few months of going blind.

• VAD is associated with an increase in the severity of some infections, particularly measles and diarrhoeal disease.

• Through synergism with measles infection, VAD contributes to the estimated 1.1 million childhood deaths from measles every year.

• Half of all childhood corneal blindness in developing countries is from VAD, and half of that is from added measles infection (figure 2).

Figure 2.
Causes of bilateral childhood blindness - Tanzania



data from A Foster and A Sommer, 1986.

2.5 Benefits of improving vitamin A status

Improving the vitamin A status of deficient children and treating cases of measles with vitamin A, even in populations where xerophthalmia is rare, can substantially reduce childhood morbidity and mortality [3-8].

Taking account of results from eight randomized controlled community supplementation trials, one report[9] concluded that improving the vitamin A status of young children reduced mortality rates by about 23%. Studies from Ghana and Brazil also indicated that vitamin A supplementation was associated with a decrease in disease severity. In three

studies on children hospitalized with measles, vitamin A supplementation reduced the death rate by about 60%.

2.6 Strategies to control VAD

This Policy Document outlines WHO strategy, targets and activities for using immunization contacts to deliver vitamin A supplements. It draws on experience from such countries as Brazil where VAD is endemic and where large doses of vitamin A have been administered over a twenty year period to preschool-age populations, as well as on more recent experience in Bangladesh directly linking vitamin A delivery to immunization.

Successful implementation of the plan depends on agreement, as well as shared responsibility on inputs and outcomes, among those responsible for both immunization and nutrition at global, Regional and country levels.

Although elimination of VAD is only one of the WHA and World Summit for Children nutrition-related goals, it has unique features: for example, as compared with the challenge of controlling protein-energy malnutrition, elimination of VAD has the potential for being achieved rapidly. The cost-effectiveness ratio is also highly favourable[10]. It is therefore a test case of both political will and, subsequently, managerial ability to implement known technologies and known solutions.

Less than six years remain to the year 2000 target date. Providing vitamin A at immunization contacts is logistically feasible. However, this short term strategy does not correct the underlying cause of the problem - insufficient vitamin A in the diet. Countries that choose to use immunization contacts to deliver vitamin A to infants and mothers should plan from the outset to provide a food-based solution within a defined time period such as five years.

3. OBJECTIVES

3.1 By the year 1995

- All countries will have identified whether they have a problem of VAD and classified whether that problem is severe, moderate or mild[11]. Countries will have established the basis for approaches to ensure elimination.

- Plans of action will be developed or updated in all countries where VAD is a public health problem (according to the WHO classification, Appendix 1).

3.2 By the year 1997 at country level

- Administration of vitamin A with immunization contacts will be established in all countries in the clinical and "severe" subclinical categories (appendix 1), both by routine immunization services to mothers and infants, and by supplementary immunization activities. As immunization activities are accelerated in connection with disease control goals, higher coverage with vitamin A will also be achieved.

- Surveillance systems for both clinical and biochemical indicators[11] will be established in every country on the WHO classification list.

- Vitamin A will be administered immediately on diagnosis to all cases of measles in all countries known to have clinical vitamin A deficient areas (appendix 1), and to all hospitalized cases and cases in areas with high measles case fatality rates.

- Required supplies of vitamin A will be estimated using an annual forecast and broken down by quarter. Procurement will be from either national or international sources including UNICEF.

3.3 By the year 1997 at Regional and global level

- Reporting and monitoring of progress will be by EPI routine reporting at country, Regional and global levels, and through nutrition surveillance. Survey protocols and methodologies for indicators will be established.

- At least one laboratory will be identified in each WHO Region to monitor biochemical indicators of progress.

- Appropriate training materials will be distributed to all countries and adapted to local circumstances.

- Vitamin A delivery will be included in the agenda of global meetings to be organized by WHO each year by the units concerned with immunization and nutrition.

3.4 By the year 2000

- Elimination of clinical and severe and moderate subclinical VAD[1] as a public health problem will be achieved in every country and every district.

- Procedures will be in place to monitor interventions as well as to verify elimination of VAD.

- Once objectives have been achieved, they will be sustained as appropriate in future years.

[1] Achieving the elimination of clinical and severe and moderate subclinical vitamin A deficiency will be measured by clinical and biomedical parameters:

- the absence of clinical signs of vitamin A deficiency including:

  - elimination of severe corneal involvement, or
  - Bitôt spots with conjunctival xerosis in less than 0.5% of pre-school children, or
  - night blindness in fewer than 1% of preschool-age children (2 - 6 years).

- biomedical parameters of:

  - serum vitamin A. There will be fewer than 5% of preschool-age children (6 months to 6 years) with serum vitamin A with values less than 0.70 μmol/l (20 μg/dl); or

  - breast milk vitamin A. There will be fewer than 10% of lactating women with breast milk vitamin A levels less than 1.05 μmol/l (30 μg/dl) (or less than 8 μg/gm milk fat).

4. STRATEGIES

There are four essential strategies for using immunization contacts to deliver vitamin A supplements:

- Raising political commitment.
- Promoting intersectoral involvement in vitamin A goals.
- Using immunization activities as a gateway to the delivery of supplements to both infants and mothers.
- Developing effective surveillance and monitoring of programme objectives.

4.1 Raising political commitment

No matter how technically sound the policy basis for a public health initiative, it cannot succeed without a critical level of political commitment. Such commitment is necessary to obtain adequate personnel, supplies and financial resources for its implementation. The long-term benefits of elimination of VAD will far exceed the costs of the elimination initiative.

Creating and maintaining public awareness of the VAD elimination initiative, and its potential for improving the health and survival of children as well as mothers, are fundamental to gaining and sustaining necessary political and financial commitment. Vitamin A and other micronutrient control initiatives (elimination of iodine deficiency disorders and reduction in iron deficiency) can serve as bases for other innovative activities to improve nutritional status, household food security and care of children.

In recent years political, religious and community leaders have successfully and enthusiastically participated in social mobilization for the acceleration of immunization. This support must be built on and used to ensure a similarly effective record for delivery of supplements and improvement of diets along with vaccines. There is already evidence from several countries that the role of vitamin A as a vital nutrient is becoming recognized. Combining vitamin A with immunization can increase demand for both services. An example of community participation in vitamin A activities is outlined in appendix 3.

4.2 Promoting intersectoral involvement in vitamin A goals

The nutrition of mothers and infants is influenced by a large number of different factors including socio-economic development, education, agricultural practices and conditions, cultural beliefs, intra-familial food distribution, dietary patterns and caring practices. The elimination of VAD is thus an intersectoral activity involving, for example, agriculture, health, education and social welfare. The food industry can usefully be involved because of its interest in food fortification. A management structure must therefore be developed which defines areas of responsibility and builds a system for joint planning and effective coordination.

In addressing the specific goal of elimination of VAD, it is nevertheless clear that in most situations the focal point will be the national nutrition programme. Such a nutrition programme may organizationally be in the Ministry of Health as part of MCH, or alternatively in the Ministry of Agriculture. But its role in determining technical policy guidelines, ensuring implementation and monitoring progress will be the same. Therefore it is essential at the outset to formalize the principle of the linkage between the nutritional objectives of controlling VAD and the disease control objectives of immunization programmes.

In some countries, valuable support can be mobilized through child care and blindness prevention programmes which can sensitize communities at risk and train auxiliary cadres of health workers. Pediatricians and ophthalmologists are valuable resource professionals who should be alerted to the programme and involved in planning and surveillance. They might also take an active part in public education and in the training of primary health care workers.

Joint responsibility for delivery of vitamin A must be understood at all levels of the health sector. Agreement between sectors on policies and strategies is essential, as well as responsibility to provide adequate resources for implementation. Such responsibility should be defined in detail including setting down implementation schedules, monitoring procedures and collecting data to track progress and coordinate financial and supply resources.

All planning and quality control of monitoring, with the possibility of eventual course corrections to improve outcome, will involve combined meetings with representative individuals or groups as a minimum from both the nutrition and immunization sectors. The responsibility to reach target populations with vitamin A will be defined for the health worker or vaccinator. Attaining the vitamin A goal will be given equal importance with reaching immunization and other disease control goals.

4.3 Delivery of vitamin A supplements

By 1990, 80% of the world's children were receiving immunization in their first year of life, thereby receiving protection against the six main target diseases of the EPI: tuberculosis, diphtheria, pertussis, tetanus, poliomyelitis and measles. This represented around 500 million contacts between mothers with children and immunization services. Even if only some of these contacts are used to deliver vitamin A to children over 6 months of age in countries where a clinical or severe sub-clinical problem exists, the potential is enormous for raising vitamin A supplementation levels through immunization services.

The target for vitamin A supplementation linked to immunization services is to provide regular doses of vitamin A from at least 6 months of age to all children who are at risk of VAD. Not every child, however, is reached by the immunization services. Global coverage figures mask areas and communities that have not been reached. Often those in most need have the lowest coverage. In countries where VAD is a public health problem, it is often those in most need of vitamin A supplementation who are not reached, living in either remote communities or in socially disadvantaged situations where for a variety of reasons parents do not take the children to the services offered. Special attempts to overcome these blocks has been a special feature of the EPI over recent years, using both *routine* and *supplementary* immunization contacts to reach the hard-to-reach. Proof of the success of these approaches is evidenced in the Americas where polio has been eradicated from the continent. If EPI vaccines can reach virtually every child, then so too can vitamin A supplementation. While this strategy will not solve all problems related to vitamin A supplement delivery, using EPI as the "gateway" to the solution means that the vital first dose or doses are given to the very young, those who are at most risk. Subsequent doses can be administered either through future contacts with immunization services, or through contact with other health services - depending on the country situation. (Further details of strategies are provided in Appendix 2).

As an example of implementation, Brazil has successfully linked vitamin A administration to national and sub-national immunization days (NIDs and SNIDs) since 1983. Over 500,000 immunization sites have been set up in health facilities, community centers, schools, public markets, bus stations etc. There is wide media coverage and community participation. Health professionals work side by side with volunteers at all these sites. The army assists with boats and planes to reach the most distant parts of the jungle. In this way, between 300,000 and 1 million pre-school children per year have been reached since 1983 with vitamin A supplements during NIDs. In 1994, the programme was scaled up to reach 3.5 million children between the ages of 6 months and 5 years in 1,135 towns. Coordinators unanimously report the inclusion of vitamin A in NIDs has improved compliance with immunization services.

4.4 Surveillance

Surveillance is a vital aspect of an effective nutritional deficiency control system. Improved surveillance of EPI target diseases is already a high priority and, when realized, will significantly advance monitoring of VAD. Surveillance data on VAD are needed to assess progress, to detect areas of low coverage and to guide refinement of strategies. Reporting of coverage with vitamin A supplements, both through routine and supplementary immunization activities, will be included with reporting of other EPI vaccines at district, country, Regional and global levels. Such coverage figures may be derived from routine reporting or from cluster surveys using the tested EPI methodology[12]. (Further details of surveillance are provided in Appendix 2).

5. PHASING OF IMPLEMENTATION

5.1 Outline

Both clinical and subclinical VAD is a problem in more than 73 countries. In 1995 WHO classified countries as having severe, moderate or mild problems of VAD (see map on page 5 and a list in Appendix 1). Most countries with severe VAD (where children demonstrate eye signs and symptoms including blindness, and where low blood levels of vitamin A have been shown to be extensive), are in south and southeast Asia and sub-Saharan Africa. The largest number of persons affected by VAD are in south and southeast Asia. Severe VAD is also found in refugee settlements and displaced populations (which are predominantly in Africa).

Paragraphs 5.2 and 5.3 below outline the phasing of vitamin A delivery activities. These are intended to assist countries in determining the most appropriate timing and level for implementation of the intervention. Both the timing of vitamin A supplementation and the level of activity will depend on the stage of development of immunization programmes as well as the degree of country commitment to elimination of VAD. The outline is a guide for decisions which need to be taken at country level, and should be interpreted broadly in the context of local circumstances. Even within countries, different levels of activities may be appropriate in different areas.

5.2 Countries with clinical or severe subclinical VAD

The 60 countries with known clinical or severe subclinical VAD (see Appendix 1) should have made a long-term political and financial commitment to intensified activities leading to the elimination of VAD by the end of 1995 at the latest.

The first programmatic step towards elimination for such countries is to ensure that vitamin A supplementation is administered appropriately using routine immunization services to deliver the first dose or doses. Several countries with a clinical or severe subclinical VAD problem are already distributing vitamin A supplements periodically through specific programmes. EPI-linked vitamin A distribution should complement these programmes. The EPI programme is ideally suited to initiate the vitamin A supplementation programme, since the first dose of vitamin A can be given from at least six months of age. In countries with no intervention programmes, EPI programmes should be adapted to cope with vitamin A supplementation. Particularly in Africa, many countries in this group still have relatively low routine immunization coverage and efforts should be made to increase coverage by using the added impetus of vitamin A supplementation.

Where coverage and access to health care remain low for the populations at risk, supplementary immunization through mass campaigns will be essential to achieve the EPI disease reduction goals. Those countries in the clinical and severe subclinical VAD groups which are planning supplementary immunization activities such as national immunization days (NIDs) or sub-national immunization days (SNIDs) should give high priority to ensuring that vitamin A supplements are delivered at the same time as vaccines. Other opportunities should also be taken for supplement delivery, including outbreak response, mopping-up and treatment of VAD-associated diseases, especially complications of measles.

5.3 Countries with moderate to mild VAD

For almost all the 19 countries classified by WHO as having moderate VAD, there may be sporadic clinical evidence of VAD, eye signs or symptoms, but most of the problem is sub-clinical. Amongst this group of countries, Bangladesh, India and Indonesia have distributed vitamin A supplements to a large target population for some years through a vertical programme. In Indonesia, concurrent dietary-based education and development strategies have contributed to lessening the severity of VAD. Vitamin A delivery with immunization in these countries is likely to be limited in both time and scale.

5.4 Other countries on WHO listing

These are countries with only a mild problem of VAD, or sporadic cases. Vitamin A delivery with immunizations is not recommended. Dietary approaches should be pursued vigorously.

5.5 Refugee and Displaced Populations

Refugee camps and settlements for displaced populations, prolonged droughts and other natural disasters are special situations in which distribution of vitamin A supplements is a priority. It is recommended that in such emergency situations, and wherever there is evidence of malnutrition, as a minimum all children 6 months to 6 years be given supplements as they enter the camp environment. This can best be done at the same time as administration of measles vaccine and other immunizations[13]. It is desirable, although difficult in practice, to administer a dose of vitamin A to mothers within 8 weeks of delivery in these situations (see appendix 2 for more practical details of dose and frequency). Infants who are not breast-feeding in such situations are also at high risk and should receive vitamin A supplementation.

5.6 First steps

Countries wanting to move forward in implementing this plan of action (if not already achieved) should begin by:

- endorsing global, Regional and national goals for elimination of VAD;

- agreeing on country policies for implementation involving both nutrition and immunization programmes, and including sustainable measures which can replace supplementation within a defined time period; and

- allocating budget resources and personnel for implementing vitamin A delivery.

6. RESPONSIBILITY FOR IMPLEMENTATION

6.1 National authorities

The most important activities are those carried out by national health and other relevant intersectoral authorities. Policies must be decided for supplement delivery within a framework of overall interventions to control VAD. The same authorities will be responsible for strengthening immunization and surveillance/monitoring systems. The main responsibilities for planning, resource mobilization, donor coordination, training, implementation, monitoring, evaluation and research are at the country level. WHO will collaborate in these activities through the office of the WHO Representative, and through support from immunization and nutrition staff and consultants at all levels.

6.2 WHO

WHO will provide global technical leadership in the management and coordination of vitamin A supplement delivery along with immunization. WHO will seek the collaboration of a wide spectrum of agencies, institutions and donors of all kinds. Commitment from governments and individual political and community leaders will be essential. Financial and technical support will be required from multilateral and bilateral development agencies, NGOs, private and voluntary groups.

WHO headquarters activities will be conducted jointly through the Global Programme for Vaccines and Immunization, the Programme for the Prevention of Blindness, Division of Diarrhoeal and Respiratory Disease Control, and the Nutrition Unit, in collaboration with other programmes as appropriate. Responsibilities for vitamin A delivery will be distributed at national, Regional and global levels in the same manner as responsibilities for immunization programmes and nutrition are distributed.

At the **Global level**, WHO will provide overall technical guidance including:

- leadership in resource mobilization and donor coordination;
- development and implementation of improved surveillance, monitoring and evaluation methodologies;
- production of technical support documents and training materials;
- support for Regional offices and country programmes through the provision of both expertise and funds;

- feedback to programme managers, quarterly, with information on coverage, progress towards elimination, outstanding high-risk countries and other selected measures;

- promotion of operational research addressing country programme priorities, in collaboration with Regional offices;

- recommending of procedures for verifying global elimination of VAD;

- reviewing progress annually at a joint technical meeting of Nutrition and the Global Programme for Vaccines and Immunization;

- liaison as necessary with WHO programmes involved in vitamin A administration.

The World Health Assembly (WHA). There will be periodic review by the Executive Board and the World Health Assembly. Such a review will include focus on at least the following topics:

- action taken on priorities identified in the previous year's plan;

- country by country summaries of vitamin A status and programme progress for all countries on WHO listing;

- coverage reports for all countries implementing vitamin A delivery at immunization contacts;

- Regional reports on VAD indicators, including timeliness and completeness of country reporting;

- constraints in moving towards the elimination target.

WHO Regional Offices will ensure:

- development and updating of Regional Plans of Action, based on the results of country programme assessments;

- provision of technical support and coordination, including mobilization of resources and coordination of donors, within the Region;

- support to national managers in planning, training, monitoring, evaluation and research;

- special emphasis on surveillance and tracking of progress, including feedback of surveillance data to countries;

- training for laboratory staff and management of the Regional laboratory network;

- review of progress, at least annually, at Regional or sub-Regional meetings of programme managers or at a Regional Technical Advisory Group.

6.3 UNICEF

UNICEF has played a key role in promoting vitamin A control at the highest possible political levels. The agency has also been extremely active at Regional, country and community levels in translating agreed policies into action. The agency has provided vitamin A, logistic support and involvement in programme management, where appropriate, at country level. UNICEF has been represented at all meetings to discuss policy, progress and new initiatives related to the elimination target. The 1991 Montreal conference on micronutrient malnutrition, 'Ending Hidden Hunger', was organized jointly by WHO and UNICEF. Subsequently the resolutions of the Montreal Conference and the World Summit for Children were endorsed by the 1992 International Conference on Nutrition.

Since the early 1970s UNICEF has been involved in programmes for control of VAD, including national and sub-national distribution of supplements. UNICEF has also been a key organization for the extension of immunization services worldwide through the provision of vaccine, cold chain equipment and diverse logistic support.

Leadership and involvement in the elimination of VAD are part of UNICEF's outstanding commitment to "Ending Hidden Hunger", including not only VAD but also the control of iodine deficiency disorders and anaemia due to iron deficiency. It is important to maintain flexibility in interpreting organizational responsibilities. UNICEF clearly has a number of key roles to play in the implementation of plans to move towards elimination of VAD. These key roles include:

- participation in developing global, Regional and national policies for using immunization contacts to eliminate VAD;

- participation in assessing needs, and providing practical support in implementation and tracking of progress towards elimination;

- supply of vitamin A for routine as well as supplementary supplementation activities, including coordination with manufacturers and, where appropriate, assessment and support of local production;

- support for surveillance activities integrated within both nutritional surveillance and EPI surveillance activities;

- development of materials for training and improvement of management;

- assistance in the development and maintenance of the laboratory network;

- strengthening social mobilization to ensure political commitment and community participation.

6.4 Bilateral Agencies

Several bilateral agencies and governments have contributed considerably to existing programmes delivering vitamin A supplements including, as examples, CIDA, DANIDA, SIDA, USAID and the governments of Australia and the Netherlands. There is a need to obtain further resources from bilateral agencies and governments if successful control of VAD is to be achieved. Bilateral agencies need to be involved at an early stage in all planning and development activities at global, Regional and country levels.

Specific roles for bilateral agencies include:

- participation in planning, strategy development and needs assessment from the outset;

- ensuring the availability of sufficient resources for implementation, including vitamin A supplements;

- provision of technical expertise as required;

- support for training, social mobilization and public information activities;

- strengthening of laboratory capacity at all levels;

- participation in meetings to review progress.

6.5 Nongovernmental Organizations (NGOs)

NGOs have an important part to play in providing support to initiatives for control of VAD. International NGOs such as Helen Keller International, International Eye Foundation, International Association of Lions Clubs, Task Force "Sight and Life", Sight Savers (UK) and Worldvision International Foundation already have long records of commitment to this field of endeavour. Many local NGOs are doing similar work within countries or specific Regions. Inputs should vary according to the needs, size of the NGO and requirements of the programme. Such inputs would include:

- catalysing donor support
- technical assistance
- vitamin A supply
- management and evaluation skills
- logistical support during supplement distribution
- training
- social mobilization and public information.

So that they can fulfil these roles, NGOs should be involved from the start in developing plans of action at all levels. They should be aware of global, Regional and national targets related to elimination of VAD.

7. RESOURCE REQUIREMENTS

Realistic estimates of funding, personnel requirements and formal studies of cost-effectiveness are essential to create donor confidence and achieve support for elimination of VAD.

7.1 Vitamin A supplements

A sufficient quantity of vitamin A supplements must be available to meet routine and supplementary immunization requirements and to provide vitamin A for treatment. It is essential that the effectiveness of forecasting demand be improved so that there are no shortfalls at country level. Accurate forecasting will be particularly critical for NIDs, where large stocks of vitamin A may be required. In the case of a few key VAD countries, it may be appropriate to explore the local manufacture of vitamin A.

In all countries with populations at risk from VAD, immunization services should be used as the gateway to vitamin A distribution, that is as the delivery mechanism for the first dose of vitamin A supplementation. This first dose will be followed by doses of vitamin A delivered every four to six months through either additional contacts with immunization services, or, more likely, through other Primary Health Care services. Thus the cost of those doses of vitamin A delivered through immunization contacts will be borne by the immunization programme. Current estimates suggest that, for many countries, 80% of immunization programme costs are borne by the countries themselves with 20% provided by external support. In 1994, external support approximates $300 million a year. Bilateral donors provide about 50% of this external support, 40% comes from multilateral donors and 10% from NGOs.

During 1994, UNICEF provided some 115 million doses of vitamin A supplement for use in existing distribution programmes. The cost of a 200 000 IU vitamin A supplement, in capsule form, is US cents 1.6 - 2.0. Liquid vitamin A delivered through a dispenser should cost somewhat less per unit dose, a maximum of US cents 1.5. This does not include costs of transport and distribution which are considerably reduced when coupled with delivery of vaccines. If dispensers are used, they must also be ordered in quantities that ensure availability appropriate to the demand.

It is estimated that 350 million doses of vitamin A supplements will be required each year for the next decade. This level of demand takes account of implementation of national immunization days, transfer of some supplements from use in vertical programmes to delivery at immunization contacts, treatment needs and 5% for wastage.

7.2 Other resource requirements

Additional resources will be needed to ensure the success of the VAD elimination initiative. These will include:

- funds to purchase vitamin A capsules. Vitamin A supplies must be provided to countries, in addition to those supplements already being distributed through ongoing programmes,

- technical assistance to be available to support national programme managers and draw up protocols for implementation of new activities,

- additional training requirements,

- additional storage requirements,

- additional surveillance activities including special surveys, and

- laboratories capable of carrying out measurements for special surveys A network of laboratories will need to be established, which will involve capital investment for equipment, strategies for quality control and training activities for personnel.

The additional cost of delivering vitamin A supplements at immunization contacts in the 60 most affected countires, incremental to delivering immunization programme vaccines, is estimated at US$75 million each year until the year 2000. This additional cost will be phased, in line with the strategies set out in the phasing plan. About 90% of these funds are required at the country level. Additional small percentages will be used at the WHO Headquarters and Regional levels for technical support, coordination, development of training materials and surveillance methodologies, laboratory procedures development, resource mobilization and feedback.

APPENDIX 1: Categorization of countries by degree of public health importance of VAD. By WHO Region.

(From information available to WHO as of March 1995)

WHO Region	Clinical	Subclinical			VAD under control/no problem likely	No data available
		Severe	Moderate	Mild		
AFRICA	Angola Benin Burkina Faso Cameroon Chad Ethiopia Ghana Kenya Malawi Mali Mauritania Mozambique Niger Nigeria Rwanda Togo Uganda United Rep. of Tanzania Zambia Zimbabwe	Burundi Cape Verde Congo Côte d'Ivoire Gambia Lesotho Senegal South Africa	Botswana Namibia Sierra Leone	Madagascar		Algeria Central African Republic Comoros Equatorial Guinea Eritrea Gabon Guinea Guinea-Bissau Liberia Mauritius Sao Tomé & Principe Seychelles Swaziland Zaïre

(Continued)

WHO Region	Clinical	Subclinical			VAD under control/no problem likely	No data available
		Severe	Moderate	Mild		
AMERICAS	Dominican Republic Haiti	Brazil Columbia El Salvador Guatemala Mexico Nicaragua Peru	Belize Bolivia Ecuador Honduras	Guyana Panama	Antigua & Barbuda Bahamas Barbados Canada Chile Costa Rica Grenada Jamaica St Kitts & Nevis St Lucia St Vincent & the Grenadines Trinidad & Tobago USA	Argentine Cuba Dominica Paraguay Puerto Rico* Suriname Uruguay Venezuela
EASTERN MEDITERRANEAN	Iraq Somalia Sudan Yemen	Afghanistan Pakistan	Djibouti Islamic Republic of Iran Oman	Jordan Lebanon Libyan Arab Jamahiriya Saudi Arabia Syrian Arab Republic Tunisia	Bahrain Cyprus	Egypt Kuwait Morocco Qatar United Arab Emirates

(Continued)

WHO Region	Clinical	Subclinical			VAD under control/no problem likely	No data available
		Severe	Moderate	Mild		
EUROPE				Israel Romania Turkey Uzbekistan	Austria Belgium Denmark Finland France Germany Greece Iceland Ireland Italy Luxembourg Monaco Netherlands Norway Poland Portugal Russian Federation Spain Sweden Switzerland United Kingdom of Great Britain and Northern Ireland	Albania Armenia Azerbaijan Belarus Bosnia and Herzegovina Bulgaria Croatia Czech Republic Estonia Georgia Hungary Kazakhstan Kyrgyzstan Latvia Lithuania Malta Republic of Moldova San Marino Slovakia Slovenia Tajikistan The Former Yugoslav Republic of Macedonia Turkmenistan Ukraine Yugoslavia

(Continued)

WHO Region	Clinical	Subclinical			VAD under control/no problem likely	No data available
		Severe	Moderate	Mild		
SOUTH-EAST ASIA	Bangladesh Bhutan India Myanmar Nepal Sri Lanka	Indonesia	Thailand		Democratic People's Republic of Korea	Maldives
WESTERN PACIFIC	Cambodia Kiribati Marshall Islands Federal States of Micronesia Papua New Guinea Philippines Solomon Islands Vanuatu Viet Nam	Lao People's Democratic Republic	China Malaysia		Australia Brunei Darussalam Fiji Japan Republic of Korea Mongolia Samoa Singapore	Cook Islands Nauru New Zealand Niue tonga Tokelau* Tuvalu

*Associate Member

APPENDIX 2.
Strategies for Programme Managers

1. Routine Immunization

Routine immunization services provide a greater number of opportunities for delivery of vitamin A to mothers and children than any other health programme. They reach 80% of the world's children in their first year of life, as well as their mothers, through an estimated 500 million contacts. At least two immunization contacts during infancy are available for administering vitamin A to the *mother* of a newborn child within 4 weeks of delivery. The present WHO immunization schedule has five routine contacts in the first year of life. Any EPI contact after the age of six months is appropriate for the administration of vitamin A supplementation to the *infant or young child.*

Supplementation of mother. At least two immunization contacts during infancy are suitable to administer vitamin A to the *mother* of a newborn child within 8 weeks of delivery. These are when the mother brings the child for BCG or for the polio-zero dose. In areas of VAD, vitamin A supplements given to the lactating mother shortly after delivery increase vitamin A levels not only in her own body reserves but also in breast milk.

Large doses of vitamin A (exceeding 10,000 IU daily) are only fully safe for women of child-bearing age within 8 weeks after delivery, if she is exclusively breast feeding. This is because large doses of vitamin A given early in pregnancy may cause teratogenic damage (see Glossary for definition) to the unborn child. There is virtually no chance that a mother who is breast-feeding her new infant will become pregnant again within 8 weeks of giving birth. The chance of returned fertility remains very low for at least 3 months after giving birth for exclusively breast-feeding women.

Supplementation of infant and young child. The child should be screened by checking the immunization card or "Road to Health" card to determine if he/she is eligible for a dose of vitamin A from the age of six months. Routine supplementation may be considered in the future, but is not recommended at this time. Supplementation should not be repeated more frequently than every four to six months. This screening should occur at every contact the mother and child have with the health services, including at immunization clinics. The visit for measles vaccine (and yellow fever vaccine in endemic areas) at around 9-11

months of age is especially suitable, linking two strategies for the protection of the child against measles virus in the one visit. All doses administered would be recorded on the immunization card or the "Road to Health" card.

Other opportunities occur after the age of six months and before measles immunization, for example visits for growth monitoring or delayed BCG, OPV1-3 or DPT1-3, and the opportunity should not be missed to give vitamin A at these visits. Countries that have a policy for booster doses of EPI vaccines should use the further opportunities to give vitamin A during these critical preschool years. There should also be an interval of 4 - 6 months between doses.

Pending completion of trials in progress to assess safety and benefits, WHO may in the future recommend supplementary doses of vitamin A for infants within the first six months of life. At present, however, vitamin A supplementation is *not recommended* for infants under the age of six months unless there is clinical evidence of deficiency. Particular attention should be given to non-breast-fed infants under 6 months of age. There are no contraindications to giving vitamin A supplements to infants over the age of six months. Vitamin A supplements should be given to mothers only within 8 weeks after delivery; during that period there are no contraindications. Doses of vitamin A for infants, children and mothers are given below in tables 1, 2 and 3.

2. Supplementary Immunization

Using supplementary immunization (see Glossary for definition) strategies (including campaigns and mopping-up) is critical to the delivery of vitamin A. Campaigns are becoming an increasingly common feature of disease control in the 1990's, reaching a greater number of children in wider age ranges than routine immunization services. Linking vitamin A administration to supplementary immunization strategies also broadens the potential age range and the number of children who can be reached with vitamin A. It may also increase immunization coverage by raising demand in certain situations. Administration of the vitamin during campaigns will follow the recommended schedule for dosage and interval between supplements. When NIDs or SNIDs follow at an interval of less than four months, vitamin A should be given during one campaign only.

In the case of an outbreak of polio, it is usual to immunize all children in the district or nation. If the case occurs in a vitamin A-deficient area, this may be an ideal opportunity to provide vitamin A supplements as well. Mopping-up (see Glossary for definition) is also a time when vitamin A can be administered to children, however, it should *never be used* to administer vitamin A to pregnant women or women of

Table 1.
Schedule for administration of vitamin A supplements
to prevent VAD.

AGE	DOSE	FREQUENCY
Infants <6 months*	50,000 IU	Once only
Infants 6-11 months	100,000 IU	Once every 4-6 months
Children 12-71 months	200,000 IU	Once every 4-6 months

* Infants under 6 months of age with clinical eye signs, or for those not breast-fed in areas of endemic VAD

Table 2.
Schedule for administration of large dose vitamin A supplements
to women after delivery

TIMING	DOSE	FREQUENCY
ONLY within 8 weeks after delivery	200,000 IU	ONLY ONE DOSE

Table 3.
Measles case treatment with vitamin A

- Give the first dose of vitamin A to the child immediately on diagnosis. Give the second dose the following day. The reason for the second dose is to make sure that the body stores are built up again, even if the child has diarrhoea and is very ill.

- If the child has clinical signs of VAD (such as Bitôt spots), a third dose should be given 4-6 weeks later.

- Instruct the mother about the administration and importance of vitamin A, as the second dose may have to be given at home.

- Advise the mother about the importance of feeding locally available vitamin A-rich foods.

- Avoid a second visit to the clinic. The risk is too great of infecting other children with measles.

Schedule of Vitamin A supplements for case management of measles

AGE	IMMEDIATELY ON DIAGNOSIS	NEXT DAY
Infants <6 months	50,000 IU	50,000 IU
Infants 6-11 months	100,000 IU	100,000 IU
Children 12 months plus	200,000 IU	200,000 IU

childbearing age. This is because of the already emphasized slight risk of teratogenic damage to the unborn child.

3. Case management of measles

Measles is an important risk factor for the development of severe VAD and blindness due to corneal damage. Children living in vitamin A-deficient areas are at increased risk from this complication. An integral part of measles treatment is the administration of vitamin A to all cases of measles in vitamin A-deficient areas immediately on diagnosis, and to all cases in areas with high measles case fatality rates. Even in countries where measles is not usually severe, vitamin A should be given in all cases of severe measles. Hospitalized children or children admitted to clinics for severe, complicated measles should be given a second dose of vitamin A on the day following admission. In the case of measles outbreaks, simultaneous administration of measles vaccine and vitamin A supplements will reduce both the case fatality and morbidity rates in vitamin A-deficient areas.

4. Preparations, handling and supply of vitamin A

Vitamin A supplements are available in two preparations: vitamin A solution in capsules and vitamin A solution in a bottle with a dispenser system. It is recommended wherever possible to use capsules only for children over 24 months of age, and for mothers after delivery. For younger children the capsules will need to be opened. Vitamin A supplements are more stable than vaccines; they do not need a cold chain and need not be stored in a refrigerator (see document WHO/EPI/TRAM/93.6 in the section on Additional Resources). Vitamin A is not particularly heat sensitive, but is inactivated by direct sunlight - the flasks and capsules should therefore always be protected from light. Once a bottle containing vitamin A capsules is opened, the capsules should be used within one year. Once a bottle of vitamin A solution is opened, it should be used within six months. Containers should be clearly labelled with warnings to avoid use during pregnancy or possible pregnancy.

Countries must decide themselves whether to use vitamin A capsules or liquid vitamin A solution. At present, capsules have been used in most countries though India uses vitamin A solution dispensed with a measuring spoon, and other countries such as Brazil use pre-calibrated liquid dispensers for delivering the vitamin. The cost per unit dose of liquid vitamin A solution is slightly less than the cost of capsules. But vitamin A capsules are not expensive compared with vaccines; vitamin A costs around 2 US cents per dose as compared with 9 US cents for OPV and 15 US cents for measles vaccine. There is a small added expense for replenishing the supply of dispensers.

Obtaining adequate supplies of vitamin A for both routine and supplemental delivery is essential. UNICEF is the main supplier of vitamin A supplements worldwide. Other bilateral donors such as CIDA, SIDA and USAID have also been involved in supplying vitamin A to selected countries, along with NGOs such as Helen Keller International and Task Force 'Sight and Life', Switzerland. Few countries with a VAD problem currently produce vitamin A supplements, India being the major exception. Production, or alternatively bulk importing and packaging, of vitamin A could be encouraged in selected countries for each Region.

Detailed estimates for projected vitamin A needs must be made as for vaccines. Annual estimates of need, routine and supplemental, should be made with quarterly forward ordering. In estimating country needs, a margin of 15% for treatment of VAD eye signs and symptoms and measles, and for wastage, should be allowed. Although not included in the cold chain, storage requirements for vitamin A must be allowed for at central, district and peripheral levels. There is also a need to reserve volume for transport of vitamin A at all levels of the distribution system.

5. Surveillance and tracking of progress

Surveillance is a vital aspect of an effective nutritional deficiency control system. Improved surveillance of EPI target diseases is already a high priority and, when realized, will significantly advance monitoring of VAD. Surveillance data on VAD are needed to assess progress, to detect weakness in coverage and to guide improved strategies. Coverage with vitamin A supplements, both through routine and supplementary immunization activities, should be included with reporting of other EPI vaccines at district, country, Regional and global levels. Such coverage figures may be derived from routine reporting or from cluster surveys using the tested EPI methodology (ref EPI cluster method).

Surveillance should be designed to be able to demonstrate the impact of supplementation strategies. It should be emphasized, however, that it is difficul to follow trends using the measurement of potentially blinding lesions or blindness due to malnutrition because of their relatively low incidence. On the other hand, isolated clinical reports of potentially blinding corneal lesions or blindness due to VAD are useful indicators of high-risk areas.

- **High-risk areas.** High risk areas (see Glossary for definition) should receive special attention to ensure the highest possible immunization coverage along with routine administration of vitamin A.

- **Routine surveillance for night blindness.** Night blindness is one of the clinical symptoms of VAD that can be assessed under field conditions. Therefore knowing the prevalence of night blindness can be useful in different circumstances. Asking questions

during routine examination in the clinic will identify individuals at risk. Surveys carried out by specially trained personnel will provide an assessment of the level of night blindness in the community[5]. Such surveys assess community prevalence of vitamin A status, and are a method for identifying high-risk areas to target interventions and to monitor progress towards elimination. Less than 1% night blindness in a defined population together with adequate biochemical indicators is the elimination target. A history of night blindness is an important indicator for pregnant and lactating women and for children 2 - 6 years of age.

The accuracy of a history of night blindness as reported by the mother of young children, or during pregnancy, depends on the existence of a specific local term. In many countries, especially of Africa, such a local term for night blindness does not exist. Night blindness cannot be used for community surveillance in those situations.

Periodic EPI cluster surveys which measure vaccine coverage can be adapted to ask questions of mothers about a history of night blindness in their children. Prevalence reports can be submitted at intervals to be decided on a country basis (probably six monthly). Reports should be forwarded by the country to the WHO Regional office.

• **Dietary and biochemical indicators.** Special surveys will be needed at intervals to determine the proportion of children under 24 months of age with adequate dietary vitamin A intake, the distribution of serum vitamin A in preschool-age children, or breast milk vitamin A concentrations. Since the biochemical procedures are relatively difficult and expensive, countries would not be expected to report on biochemical indicators more than every 2-5 years. Dietary intake should be reported annually using cluster samples, not only until the target of 80% adequate intake has been reached, but for several subsequent years, to confirm maintenance of adequate intake levels.

• **Laboratory Support.** Laboratories have an important role in measuring vitamin A concentrations in serum and breast milk. Specially trained personnel will be required. Relatively low cost technology and equipment which provide outcomes with less sensitivity can be used where high technology and relatively high cost equipment with greater sensitivity are not available[11].

A laboratory capable of measuring vitamin A concentrations should be available to every country. WHO will identify already existing laboratories which can perform these tests. These laboratories will serve as a basis for a Regional laboratory network to ensure that each country has access to laboratory support. Units responsible for pharmaceuticals quality and laboratory services in WHO Regional offices and headquarters will be requested to help. Headquarters will be requested to coordinate this effort.

National laboratories, where they exist, will test in-country samples. Countries which do not have a national laboratory must make arrangements for sending samples outside the country for testing. Regional laboratories will handle samples from countries without a national laboratory, and will serve as reference laboratories. They will coordinate the network within the Region, including proficiency testing of national laboratories.

An important part of the effective functioning of the laboratory network is the development of information exchange between laboratories and field staff.

6. Public awareness and training

Programmes have sometimes not been implemented because local authorities regard the occurrence of VAD as a criticism of their administration. Public misconceptions as to the risk of adverse events need to be corrected.

As countries commit themselves to the elimination of VAD, training will be needed for many types of workers. Key health workers at all levels will need to understand the purpose and demands of the surveillance system. Teams of specially trained investigators will need to conduct dietary surveys and take samples for analysis of serum and breast milk vitamin A levels. Laboratory workers will need to update their knowledge on recent techniques of measurement.

Efforts will be made, so far as possible, to integrate the training materials for monitoring and surveillance into the curricula of institutions training health staff in general surveillance principles. WHO is preparing joint training materials for use by those working in programmes addressing VAD, immunization and other primary health care interventions.

APPENDIX 3.
An example of how social mobilization is carried out for vitamin A activities

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■ Indonesia

- SOMAVITA

Fatayat NU Urban Project. As a part of the Nadhlatul Ulama (NU) national conference in Jakarta, FNU conducted a big vitamin A campaign. Activities included:

A *Tabligh Akbar* (Great Sermon) in which KH. Zainuddin MZ, the most popular religious speaker in the country, spoke about the role of mothers and mentioned the importance of vitamin A for children. The audience included more than 10,000 mothers.

A musical show in which Rofigah Darto Wahab, a well-known singer, sang a song about vitamin A and invited the audience to participate. She also made a speech on the importance of vitamin A for children.

A marching contest in which 350 groups from various schools and organizations participated. The SOMAVITA group from FNU won second place in the contest. They were wearing vitamin A tee-shirts, singing the vitamin A song, and rhythmically chanting the vitamin A slogan.

The distribution of vitamin A flyers to mothers and provision of additional information for those who wanted to know more about vitamin A.

Four out of five available TV stations covered and aired all the above activities.

Vitamin A banners were put up around the NU national conference site.

Besides the campaign, *pengajian* (learning groups) at seven project subdistricts have been ongoing with each *pengajian* having approximately 50 - 200 participants. Banners have also been put up at public places such as mosques and market.

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GLOSSARY OF TERMS FOR CONTROL OF VAD

Routine immunization. Immunization carried out according to the adopted national immunization schedule by fixed, mobile or outreach health services.

Supplementary immunization activities. Immunization activities undertaken beyond routine immunization services, including outbreak response, mass campaigns and mopping up immunization (see below).

Mass Immunization Strategies. Various strategies have been designed to accomplish different aspects of disease control:

National Immunization Days (NIDs) or Sub-national Immunization Days (SNIDs). Immunization days evolved from the need to interrupt transmission of polio by achieving high coverage in a short time. Usually, children up to 5 years of age are immunized over a few days. A greater impact is achieved if contiguous countries conduct campaigns simultaneously and do so in the low season for virus transmission. When OPV is given during NIDs or SNIDs, the opportunity is often taken to offer other vaccines including measles.

Outbreak response immunization. This strategy minimizes the occurrence of additional cases by protecting individuals through immunization. It involves localized mass immunization conducted rapidly in response to detection of cases. The extent and age groups targeted for immunization will depend on the epidemiology of the disease and the progress of disease control in the country.

Mopping-up. This strategy was developed for polio control and has been reserved for countries where there is only focal poliovirus circulation. It is the administration of OPV in areas at high risk of wild polio virus, house to house, to all children in the targeted age range, usually all children up to five years of age, regardless of their immunization status. Two doses are administered four to six weeks apart.

Outbreak response. The immediate actions to be taken when an outbreak of a target disease is suspected. These include investigation, surveillance, strengthening of case management and, where appropriate, immunization.

Micronutrient malnutrition. The main vitamin or mineral nutritional deficiencies of public health significance - VAD, iodine deficiency disorders and iron deficiency anaemia.

Vitamin A Deficiency (VAD). Vitamin A tissue concentrations low enough to have adverse consequences, even though clinical signs and symptoms may not be apparent.

High risk areas. Areas where clinical cases of VAD are known to occur, where dietary intake is known to be inadequate/marginal, where there are epidemics of measles, where disadvantaged populations are living in conditions favouring transmission of infectious diseases such as in urban slums or refugee camps, or where access to health care is difficult.

Teratogenic damage. Insult to the fetus resulting in a malformation of organs in the infant.

Night blindness. Reduced vision in low light intensity (dusk and night).