



Vitamin A

at a glance

Why tackle vitamin A deficiency?

Vitamin A deficiency (VAD) dramatically increases the risk of dying from childhood diseases and malaria, and may contribute to maternal mortality, fetal loss, low birth-weight and preterm birth. WHO estimates that 1.4 percent of all deaths worldwide (0.8 million) are due to VAD. Of the 200,000 under-five deaths due to vitamin A deficiency, most occur in children with mild to moderate VAD. At least four independent meta-analyses of the studies showing vitamin A's link with child mortality all unequivocally conclude that improving vitamin A status in deficient populations would decrease pre-school child mortality. One meta-analysis of six studies found that giving vitamin A to preschool children reduced under-five mortality by 34%. Another meta-analysis of eight studies in five developing countries found that giving vitamin A to preschool children twice yearly reduced under-five mortality by 23%. The potential gain from giving vitamin A increases if child mortality is higher.

VAD also causes substantial morbidity. It is among the "top ten" health problems contributing to the global burden of disease. It causes blindness and night-blindness, compromises immune function, and may retard growth and affect iron metabolism.

What causes vitamin A deficiency?

Inadequate dietary intake of vitamin A is the major cause of VAD. Other factors contribute to and exacerbate VAD such as increased requirements for vitamin A during infections or malabsorption due to the absence of fat in the diet.

VAD prevalence and location

- 140 million preschool children and more than 7 million pregnant women are vitamin A deficient.
- Another 4.4 million preschool children and 6.2 million women suffer from clinical signs of VAD.
- Prevalence is probably high in other vulnerable groups such as primary school children and adolescents, although data are limited. One example is Malawi where a national survey found that 38% of school-age children are vitamin A deficient.
- VAD prevalence is highest in Africa, South Asia and Southeast Asia, where over a third of children are affected.
- Worldwide, half of all persons with VAD live in South Asia.

- Despite substantial progress in lowering VAD in the Middle East, North Africa, East Asia and the Pacific, it is still high in some countries. E.g., VAD prevalence among preschool children is 26% in Morocco, 38% in the Philippines and 58% in Indonesia.

(For more country data, see SCN, 2004 and Johns Hopkins, 2004 in Resources and References).

Three main ways to combat VAD

- Periodic dosing with vitamin A capsules/supplements and giving vitamin A for certain health and disease conditions—called "**supplementation**" programs,
- Vitamin A **fortification** of commonly consumed foods,
- Programs to **increase consumption** of foods with high vitamin A content.

Interventions that **reduce infectious disease** (i.e., immunization and the control of diarrhea) help reduce VAD by decreasing requirements for and improving absorption of vitamin A.

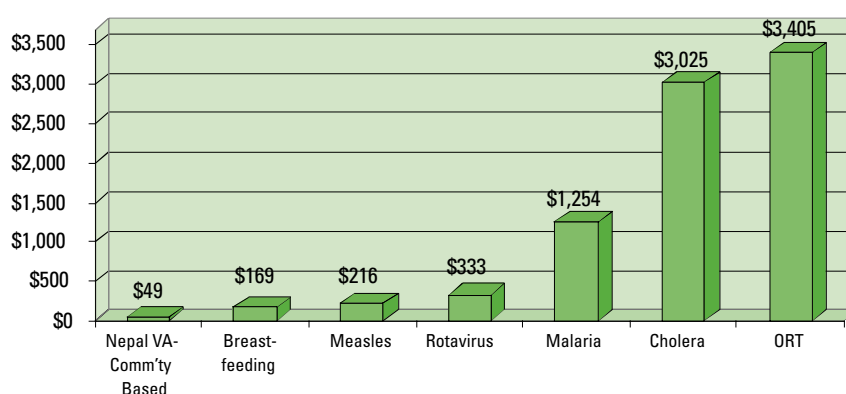
Supplementation – details

Because of its public health significance and low cost, giving vitamin A supplements to children 6-59 months is currently the major intervention to address the deficiency. Infants younger than 6 months receive vitamin A through breastmilk; to ensure that the vitamin A content of breastmilk is adequate, their mothers need to receive a dose of vitamin A immediately after delivery or within 60 days. To obtain the mortality-reducing effect of vitamin A supplementation, at least 85% of children 6-59 months need to receive two doses of vitamin A per year. In areas where health services are well utilized, giving vitamin A to children 6-59 months should be part of routine health services, including immunization services. To obtain high coverage in areas where utilization of health services is low, many countries distribute vitamin A supplements through immunization campaigns, special micronutrient or child health days or community-based distributors. In 2001, 59 countries distributed vitamin A to children. In 13 of these countries $\geq 85\%$ of children 6-59 months received the first dose of vitamin A and at least 70% received two doses. In 19 countries $\geq 85\%$ of children received one dose of vitamin A in 2001. Vitamin A supplementation programs may be the single most cost-effective child survival intervention (see Box).

Vitamin A supplementation programs may be the single most cost-effective child survival intervention

The annual cost of a supplementation program varies by country, program delivery mechanism and other factors. The cost of providing a child with twice-yearly doses of vitamin A ranges from \$2.04 to \$2.20 when provided through an immunization campaign and from \$.50 to \$1.34 per child when provided through a community-based distribution system. Vitamin A supplementation through community-based distribution may be the single most cost-effective child survival program intervention. A study of the Nepal National Vitamin A Program estimated that it cost only \$49 per child death averted, far lower than the average cost estimated for other primary health care interventions, as shown below.

Comparing Cost-Effectiveness of Primary Care Interventions – Cost Per Death Averted (in 1996 US\$)



Source: Adapted from Fiedler, 2000 and 2001

Vitamin A supplements are safe, if administered correctly, and do not interfere with and may even improve response to some immunizations (e.g., measles, diphtheria, polio). Side effects occur in 1-3% of people, are not serious and subside within a few days.

Clinically targeting vitamin A

When a child with severe malnutrition, clinical signs of vitamin A deficiency, measles, severe diarrhea, acute respiratory infection or other infectious diseases is presented for health care, the recommended dose of vitamin A should be given. Siblings under five years of age of children with clinical signs of VAD should all be given vitamin A. Giving vitamin A to high-risk children is often referred to as “disease targeting”.

Fortification

In several countries, vitamin A status has been improved by fortifying sugar, monosodium glutamate or cooking oil with vitamin A. However, food fortification is still a nascent activity in most developing countries because it requires identification of a food for fortification which vulnerable groups consume, a well-developed food industry that can market its products to the intended beneficiaries, strong public-private partnerships, and multi-level monitoring and enforcement mechanisms. Fortified products for children that can be sprinkled, crumbled or spread on food are being developed for use in developing countries and show promise for improving dietary intake of vitamin A and other micronutrients—as long as these products are affordable for poor families.

Increasing consumption of vitamin A

The vitamin A found in animal products (retinol) is well-absorbed from food but not affordable to poor people. Certain carotenes, available in green, orange and yellow fruits and vegetables, have “vitamin A activity” because they are converted in the body to retinol when there is a physiological need for it. Absorption of carotenes is less efficient than retinol but they are more affordable and thus a significant source of vitamin A in developing countries, if they are consumed. Consuming fruits and vegetables should be promoted in all developing countries because they supply carotenes and other important vitamins, minerals and antioxidants important for good health. Not consuming fruits and vegetables also is in the top ten health problems contributing to the global burden of disease. Protecting local sources of fruits and vegetables that are collected from the bush or forest and introducing new crops high in carotene (e.g., orange sweet potato) are essential to sustain and improve the supply of carotene and ultimately vitamin A to households.

Reaching the poor and most vulnerable

Poor and vulnerable groups have less access to foods and programs that would improve their vitamin A status. For example, because of food taboos and poor information about feeding young children, foods rich in vitamin A are often not given to young children, even when they are available. A review of feeding practices in 6 African countries found that only 10-30% of children were receiving food sources of vitamin A at six months when these foods should be introduced. More attention needs to be given to improving

young child feeding in developing countries to improve intake of vitamin A and other micronutrients as well as energy intake.

Despite successes in some countries, vitamin A supplementation program coverage falls short of what is recommended, with only 75% of children in Sub-Saharan Africa and 46% of children in South Asia receiving at least one dose of vitamin A annually. Programs to give women vitamin A postpartum, which would protect breastfed infants, have limited coverage because postpartum care is itself limited. Rich children receive more vitamin A than poor children, with a 30% difference in coverage between the poorest and richest income groups worldwide. The differential between rich and poor is even higher for women receiving vitamin A, with coverage of the poorest income group only half that of the richest group. In some countries, but not all, as program coverage increases, more of the poor are reached with vitamin A.

Even where vitamin A supplementation coverage is high, some children will be missed, probably the most vulnerable. Reaching these children is important but could be expensive. In the mean time, it is imperative that "disease targeting" with vitamin A be rigorously complied with so that vulnerable children are given vitamin A.

Improving vitamin A status in other groups

Few programs have been implemented to give vitamin A routinely to groups other than children <5 years and postpartum women, although older children have received vitamin A at school as recommended by the Focusing Resources on Effective School Health (FRESH) initiative. Research is underway to determine the benefits of giving micronutrient supplements to people living with HIV/AIDS, but no recommendations have been made yet. Adequate amounts of vitamin A and carotenes should be consumed by the entire population to prevent VAD.

Cutoff Criteria for Public Health Significance of Vitamin A Deficiency (VAD) in a Population

Criteria	Prevalence (%)
<i>Clinical Signs of VAD</i>	
Children 2-5 years old	
Nightblindness (XN)	>1.0
Bitot's spots (X1B)	>0.5
Corneal xerosis (X2) & corneal ulcers (X3)	>0.01
Corneal scars (XS)	>0.05
Women of childbearing age	
Night blindness (XN) in recent pregnancy	>5.0
<i>Biochemical Signs of VAD</i>	
Preschool children	
Serum retinol <0.70 µmol/L or <20 µg/dL	>15.0

Source: SCN, 2004

Making decisions about vitamin A interventions: Program Manager's checklist.

How to decide when routine vitamin A supplementation for children and women is needed

- Collate available information on prevalence of VAD. The cutoff criteria in the Table indicate a significant public health problem that warrants routine, twice-yearly doses of vitamin A for children 6-59 months and one dose of vitamin A for women during the 60-day postpartum period.
- The same routine supplementation is needed if there are no VAD prevalence data, and under-five mortality is >70.

How to decide if disease targeting of vitamin A to high-risk individuals is needed

- All children or adults with clinical signs of VAD should be given vitamin A.
- In all developing countries where VAD prevalence is unknown, vitamin A should be given to severely malnourished children and those with infectious diseases.
- In developing countries where VAD is a known problem, vitamin A should be given to severely malnourished children, those with infectious diseases and all under-five siblings of children with clinical signs of VAD.

Strategic Considerations in Designing Supplementation Programs

Explore delivery channels for distributing vitamin A to ensure high coverage (≥85%) of children and women

- Clearly define the problem, target groups and coverage goals.
- Where utilization of health services is high (≥85%) for children 6-59 months and postpartum women, these groups should be given vitamin A routinely during health contacts. Vitamin A can be integrated into routine immunizations.
- Where utilization of health services is not high for children 6-59 months and postpartum women (<85%) vitamin A should be distributed during immunization campaigns.
- Where immunization campaigns occur only once per year (or less frequently), vitamin A should be distributed twice yearly through child health days or community distributors.
- Where immunization or child health day campaigns and community distributors are used to deliver vitamin A, continue to build capacity and coverage of health services so they can treat at-risk individuals and eventually implement routine supplementation.
- Routine supplementation should occur immediately before the season when incidence of diarrhea, measles and other infectious diseases is highest.
- Vitamin A should be given during sick child visits when needed (through IMCI where it has been introduced).

Build capacity to develop and sustain vitamin A supplementation programs

- Organize stakeholders interested in or already working to control VAD to plan future directions and raise awareness in other stakeholders about the importance of controlling VAD.
- Strengthen procurement and logistics to ensure adequate supplies of vitamin A are available at health facilities during campaigns and for community distributors. Create emergency supplies, as needed.
- Ensure vitamin A is properly stored in an unopened, opaque container and utilized within 2 years for stored vitamin A and within 6-8 weeks after opening.
- Ensure that training on the benefits and protocols for giving vitamin A are included in pre-service and in-service training in Ministry of Health programs.
- Raise demand and support in the community for vitamin A and disseminate information about the benefits and safety of vitamin A.

- Involve community volunteers working at distribution sites to ensure high coverage of campaigns.
- Start a dialogue with government to ensure financing and create a budget line item for vitamin A supplements.
- Collect data (see indicators in table) to track effectiveness of vitamin A programs and improvement in vitamin A status. To assist with monitoring, child health and women's health cards, growth charts, immunization records, etc. should provide spaces to record when vitamin A supplements and counseling to improve dietary intake are given. Vitamin A supplementation is a convenient indicator to use to monitor budget support for public health because coverage of vitamin A supplementation is being monitored by several international organizations. It should be collected along with the main nutrition indicators using anthropometric data (weight, height)

For Other Information:

Nutrition Advisory Service: email nutrition@worldbank.org

Resources and References

Fiedler, J. (2000). The Nepal national vitamin A program: prototype to emulate or donor enclave? *Health Policy and Planning* 15(2):145-156.

Fiedler, J. (2001). The Nepal national vitamin A program: Cost estimates for 2000 and alternative configurations of a nationwide program. USAID Partnerships for Health Reform (PHR) Project, Special Initiatives Report 41. www.phrproject.com

Fiedler, J., D.R. Dado, H. Maglalang, N. Juban, M. Capistrano, & M.V. Magpantay (2000). Cost analysis as a vitamin A program design and evaluation tool: A case study of the Philippines. *Social Science and Medicine* 51:224-242.

FRESH, Focusing Resources on Effective School Health, has a list of key references on Vitamin A programs (www.schoolsandhealth.org)

IVACG provides information and publications on vitamin A. (<http://ivacg.ilsa.org/>)

Jones, G., R. Steketee, R.E. Black, Z. A. Bhutta, S.S. Morris & the Bellagio Child Survival Study (2003). How many

child deaths can we prevent this year? *The Lancet* 362:11-17.

Johns Hopkins (2004). Global Vitamin A Website. Johns Hopkins School of Hygiene and Public Health (<http://www.jhsph.edu/CHN/GlobalVAD.html>).

The Micronutrient Initiative provides information and publications on vitamin A and other micronutrients. (<http://www.micronutrient.org/>)

MOST provides information and publications on vitamin A and other micronutrients (<http://www.mostproject.org/>)

SCN (2004). Nutrition for improved development outcomes. 5th Report on the World Nutrition Situation. United Nations Standing Committee on Nutrition. (<http://www.unsystem.org/scn/Publications/AnnualMeeting/SCN31/SCN5Report.pdf>)

Sommer, A. & K.P West, Jr. (1996). *Vitamin A Deficiency. Health, survival and vision.* New York: OUP.

WHO/UNICEF/IVACG Task Force (1997). *Vitamin A supplements. A guide to their use in the treatment and prevention of vitamin A deficiency and xerophthalmia.* World Health Organization.

WHO (2002). *World Health Report.* World Health Organization, Geneva.

World Bank. Data on health by income group. Go to www.worldbank.org/hnp and click on "Poverty & Health"

Expanded versions of the "at a glance" series, with e-linkages to resources and more information, are available on the World Bank Health-Nutrition-Population web site: www.worldbank.org/hnp

Core Vitamin A (VA) Interventions: Beneficiaries and Key Management Indicators

Situation/ Goal	Core Interventions	Beneficiaries	Indicators
Reduce Child Mortality by Preventing and Treating Vitamin A Deficiency (VAD)	<p><i>Provide Vitamin A Routinely</i> 200,000 IU to women immediately after or within 60 days after delivery to protect breastfed infants <6 months.</p> <p>50,000 IU to infants <6 months who are not breastfed or breastfed infants whose mothers did not receive VA.</p> <p>100,000 IU to children 6-12 months twice-yearly.</p> <p>200,000 IU to children >12-59 months twice-yearly.</p> <p><i>Clinically Target Vitamin A</i> Immediately upon diagnosis: 50,000 IU to children <6 months; 100,000 IU to children 6-12 months; and 200,000 IU to children >12-59 months. Children with clinical signs of VAD receive the same age-specific dose the next day and again at least two weeks later.</p>	<p>Breastfed infants <6 months and postpartum women.</p> <p>Non-breastfed infants and breastfed infants whose mothers did not receive VA.</p> <p>Children 6-12 months.</p> <p>Children >12 to 59 months.</p> <p>Children 0-59 months at high risk.</p>	<p>% breastfed infants <6 months whose mothers receive VA.</p> <p>% non-breastfed infants <6 months receiving VA. % breastfed infants <6 months, whose mothers did not receive VA, receiving VA.</p> <p>% of children 6-59 months who receive VA twice-yearly.</p> <p>% high risk children 0-59 months receiving VA.</p>
<p>Treat high risk children 0-59 months (with clinical signs of VAD; measles, diarrhea, respiratory infection, chicken pox or other severe infections; severe malnutrition; or children <5 years living with another child with clinical signs of VAD)</p>	<p>Prevent and Treat Vitamin A Deficiency in Other Groups</p>	<p>All older children and pregnant women.</p>	<p>% older children receiving VA. % pregnant women receiving VA.</p>
<p>Treat all individuals with xerophthalmia</p>	<p>Immediately upon diagnosis: 200,000 IU to individuals with xerophthalmia; the same dose should be given the next day and at least two weeks later. Note: women of reproductive age should only receive this regime if there is active xerophthalmia (acute corneal lesions). Women with nightblindness or Bitot's spots should receive 5,000-10,000 IU per day for at least 4 weeks.</p>	<p>All individuals.</p>	<p>% of people with clinical signs of VAD receiving VA.</p>

Situation/Goal	Core Interventions	Beneficiaries	Indicators
Prevent vitamin A deficiency by improving dietary intake of vitamin A			
Improve vitamin A status	<p>Promote exclusive breastfeeding in children <6 months of age and continued breastfeeding until two years of age.</p> <p>Fortification of foods that vulnerable groups consume widely (staples or targeted foods).</p> <p>Production and promotion of foods rich in VA or with VA activity.</p>	<p>Children 0-2 years of age.</p> <p>Population-wide for fortified staples, but making sure that women and children consume adequate amounts; mothers and children 6-59 months for fortified foods that are targeted to mothers and children.</p> <p>Population-wide for foods rich in VA or VA activity, making sure that women, children and people living with HIV/AIDS consume adequate amounts.</p>	<p>% of infants <6 months exclusively breastfed.</p> <p>% of infants 6-24 months receiving breastmilk.</p> <p>% of each of these groups consuming foods fortified with VA: population, pregnant women, postpartum women, children 6-59 months.</p> <p>% increase in production of foods rich in VA or with VA activity.</p> <p>% of each group consuming foods rich in VA or VA activity: population, pregnant women, postpartum women, children 6-59 months and people living with HIV/AIDS.</p>
Other Important Activities to Reduce Vitamin A Deficiency: Promote public health interventions to protect vitamin A status			
Protect children from communicable diseases	<p>Fully immunize children.</p> <p>Treat sick children with diarrhea, respiratory infections and other communicable diseases.</p>	<p>Children <5 years.</p>	<p>% children <12 months fully immunized for DPT; measles.</p> <p>% children <5 years appropriately treated for communicable diseases.</p>
Protect children and women from parasites	<p>Deworming where helminths are prevalent; treat for malaria and promote use of insecticide treated bednets.</p>	<p>Children <5 years, older children and pregnant women (in second or third trimester for deworming).</p>	<p>% of children <5 years of age, older children, and pregnant women who are dewormed.</p> <p>% children <5 years and pregnant women who slept under an insecticide treated bednet the previous night (malaria risk areas).</p>
Adequate feeding of children and pregnant women	<p>Promote adequate feeding practices of children < 5 years, older children, and pregnant women.</p>	<p>Children <5 years, older children and pregnant women.</p>	<p>% children <5 years, older children and pregnant women receiving adequate food.</p>
Care of women	<p>Ensure women have access to good quality antenatal and postpartum care.</p>	<p>Pregnant and postpartum women.</p>	<p>% of women receiving antenatal care.</p> <p>% of women receiving postpartum care.</p>