OMNI Opportunities for Micronutrient Interventions

micronutrient facts

COUNTRY SERIES

NOTE: This document is a compilation of twenty-five individual country fact sheets.

Bangladesh
Bolivia
Ecuador
Egypt
Ethiopia
Ghana
Guatemala
Haiti
Honduras
India
Indonesia
Kenya
Malawi
Madagascar
Morocco
Nepal
Nicaragua
Niger
Peru
Philippines
South Africa
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Tanzania
Uganda
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OMNI Opportunities for Micronutrient Interventions

Bangladesh
1996

micronutrient facts
COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

Clinical **vitamin A deficiency** (VAD) remains widespread in Bangladesh, with the national prevalence (5%) exceeding ten times the WHO minimum criterion for public health significance. Nearly one million young children have xerophthalmia of whom 30,000 are blinded each year despite a national vitamin A program. Subclinical VAD is likely to be high as well. An encouraging factor is the high (> 80%) coverage of vitamin A supplements over the last three years using a national campaign approach. **Iron deficiency anemia** (IDA) is widespread among women and children, with 50-70% in both groups having low hemoglobin (Hb) levels. **Iodine deficiency disorders** (IDD) are a growing problem in Bangladesh. A 1993 national survey reported a total goiter rate in Bangladesh of 47%, much higher than previous rates of 10-28%. A universal salt iodization program initiated since then is expected to alleviate the extent and severity of IDD in the country although its success may be limited.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common cause of preventable blindness in children and leads to increased morbidity and risk of mortality in children. The 1982-83 Nutritional Blindness Study found that 4.6% of preschoolers had xerophthalmia (clinical eye lesions leading to nutritional blindness): 3.5% were night blind, 1.0% had Bitot's spots, and 0.1% had corneal disease.[1, 2] Prevalence appears to be similar in rural and urban slum areas. In Matlab Thana, 20% of children had low serum retinol levels (< 20 μg/dl),[2] while the mean level in children with night blindness was 16 μg/dl.[3] Household intakes of vitamin A average only ~38% of the recommended levels.[4] Breastfeeding exerts a consistent and strong protective effect against VAD.[5, 6, 7] Protective foods include fish, meat (liver), milk, dark green leaves, and yellow fruits and vegetables.[8] Animal sources though are infrequently eaten and plant sources tend to be highly seasonal, especially among the poor.[5]

Two evaluations of the national program demonstrate that dosing children with vitamin A on a six month basis can reduce the prevalence of night blindness by 25%[6] to 50%[9] but with little reduction in Bitot's spots or corneal lesions.[9]

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight and maternal mortality. The 1981-82 national nutrition survey found 70% and 40% of children 0-4 and 5-14 years of age, respectively, to have low Hb levels;[4] 47% of pregnant and/or lactating women, and 44% of nonpregnant, non-lactating women were also anemic. Smaller studies in Dhaka report prevalence rates of low Hb ranging from 46-66% among pregnant women.[10] Almost all (92%) households appeared to have an adequate iron intake.[4] Low intake of iron absorption enhancers,

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International Cooperation

The World Bank and ten bilateral agencies, including USAID, are contributing $440 million to the Fourth Population and Health Project over the next five years. The United Nations Population Fund, WHO, and UNICEF are supporting project management, procurement, and technical assistance. Partner agencies have formed the Population and Health Consortium, which has emerged as an important collective force in the health sector. The Asian Development Bank has joined the consortium with a $60 million investment in the project.

UNICEF provides vitamin A capsules for distribution. Helen Keller International (HKI) with support from USAID/Bangladesh has helped establish the biannual vitamin A capsule distribution to children, and currently supports nutrition education, health worker training, and an extensive home gardening program that covers 25% of the country. In 1993, a large scale, FAO-funded, vegetable seed development project was linked to HKI's home gardening program. HKI also supports social marketing and communications activities.

The Worldview International Foundation home gardening program which was piloted in 1984, currently covers one million people, using women's groups for its activities to promote consumption of vitamin A-rich foods.

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JSI

General Data	
Total population (millions)	117.8
Urban population	18%
Under 5 mortality rate/1000	117
Infant mortality rate/1000	91
Life expectancy at birth	55
Access to health services	45% *
Per capita GNP (in US$)	220
Women's literacy	23%

Nutrition Data	
Infants with low birth weight	50%
Children exclusively breastfed 0-3 months	54%
Children under 5 stunted	63%
Children under 5 wasted	17%
Children under 5 underweight	67%
Measles coverage rate (1 year olds)	95%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

The MOH's Blindness Prevention Programme was established in 1973 after xerophthalmia was identified as a serious problem. Since 1988, the program has supported massive distribution of vitamin A capsules to children 6-59 months of age, a social marketing campaign, and nutrition education, including a national homestead gardening program to improve dietary practices and vitamin A intake. Vitamin A distribution to preschool children is carried out twice a year with mean coverage rates estimated to be 49% in rural areas and 94% in urban slums between 1990-94.[6] Home gardening has shown great promise as a strategy to combat VAD, leading to marked increase in vegetable consumption among gardening households.[13]

Over three million people have been given injectable iodized oil since 1986 in 38 hyperendemic IDD areas. There have been considerable advances in establishing iodization capabilities in salt production facilities since 1989, when legislation mandated that all edible salt be iodized. A national target of universal salt iodization by the end of 1994 was established, but UNICEF recently estimated that only 18% of salt is iodized.

Although IDA is highly prevalent among women and children, national efforts to control anemia lack clear policy guidelines, operational norms, and coordination among various implementing agencies, resulting in low iron supplement coverage and impact. Iron and folic acid supplements are given to pregnant women through the government's maternal and child health and family planning services but the impact remains unclear.

Current Status - *cont.*

like vitamin C, and poor bioavailability of non-heme iron from cereal-based diets that constitute 84% of dietary iron, may be the primary cause of IDA in the population. VAD may also contribute to anemia.[4]

Iodine Deficiency Disorders (IDD)

IDD impairs growth, development, and intellectual capacity. Goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. IDD has increased dramatically over the past decade with a total goiter rate in 1993 of 47%, cretinism at 0.5%, and urinary iodine indicated deficiency at 69%.[11] These rates are much higher than those found during the 1981-82 survey (10.5%), partly due to methodologic differences.[4] The 1993 survey found similar, high rates of IDD in all ecological zones surveyed; 44% in the hilly areas, 51% in the flood-prone regions, and 46% in the plain zone. Bangladesh appears to be an iodine deficient region with 100% of its population at risk. Repeated annual flooding and heavy rains that cause severe soil erosion may be responsible for these high rates. Apart from low iodine content of the soil, goitrogen content of foods and the effect of fertilizers and pesticides on bioavailability of iodine may contribute to IDD in the country.

Key Sources

1 Bangladesh Nutritional Blindness Study 1982-83. Helen Keller International and Institute of Public Health Nutrition, Dhaka 1985.
2 WHO and UNICEF. MDIS Paper #2. Global prevalence of vitamin A deficiency. 1995.
3 Hussain A et al. Bull WHO 1995; 73:469-76.
4 Nutrition Survey of Rural Bangladesh 1981-82. Ahmad K, Hassan N. eds. Institute of Nutrition and Food Science, University of Dhaka, Bangladesh.
5 Zeitlin MF et al. Am J Clin Nutr 1992; 56:136-47.
6 Bloem MW et al. Am J Epi 1995; 142:843-55.
7 Mahalanabis D. BMJ 1991; 303:493-6.
8 Hussain A et al. Intal J Epi 1993; 22:1119-26.
9 Cohen N et al. Am J Clin Nutr 1987; 45:970-6.
10 WHO. The prevalence of anaemia in women: A tabulation of available information. 2nd ed. WHO, Geneva 1992.
11 Report of the National Iodine Deficiency Disorders Survey in Bangladesh-1993. Yusuf HKM et al. Dhaka University, ICCIDD, UNICEF, Dec 1993.
12 Vitamin A deficiency in Bangladesh: Prevention and Control. Darnton-Hill I (ed). Helen Keller International, Bangladesh 1989.
13 Islam N et al. Abstract. XVI IVACG Meeting, Chiang Rai, Thailand, Oct 24-28 1994.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Bolivia
1996

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COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

Although xerophthalmia is not prevalent in Bolivia, Ministry of Public Health surveys reveal that up to 20% of young poor children have subclinical **vitamin A deficiency** (VAD) in some regions and 11% nationally. This has stimulated the development of a National Vitamin A Program.

The prevalence rate of **iron deficiency anemia** (IDA) among pregnant women is estimated to be 0.5% nationally. An Anemia Consultative Group has been formed and national attention is being given to defining anemia at high altitude and rejuvenating iron supplementation schemes.

In combating micronutrient deficiencies, Bolivia has made the most progress in controlling **iodine deficiency disorders** (IDD). In 1983, a national survey of school children found that goiters were present in 65% of the population, a level higher than that of any other country in the world. A national IDD program was implemented and the prevalence of goiter in school children eight to ten years old was reduced to 4.5% by 1994.

Micronutrient programs have recently been combined into a Programa Nacional Contra la Malnutricion de Micronutrientes (PNCMM). PNCMM has set the goals of eliminating goiter, reducing anemia during pregnancy by 30%, and assuring that 90% of children consume adequate levels of vitamin A.

Current Status

Vitamin A Deficiency (VAD)

A recent regional conference on micronutrient deficiencies classified Bolivia as one of eleven Latin American countries with significant vitamin A deficiency. The prevalence of VAD is highest in the rural Altiplano, with nearly 20% of children one to five years old having serum retinol levels below 20 μg/dl, compared to an estimated national prevalence of 11% (0.1% were <10 μg/dl).[1]

Bolivia's National Department of Nutrition and its National Committee on Deficiency Diseases have developed a National Vitamin A Program in coordination with regional sanitary units, NGOs, and local units of the Ministries of Education and Agriculture. The goal of this program is to prevent and control VAD in children one to five years of age through vitamin A capsule distribution, food fortification, nutrition education, and increased production and consumption of vitamin A-rich foods.

USAID, through its OMNI Project, and UNICEF are working together to launch and evaluate a pilot vitamin A sugar fortification project in Bolivia's Oruro Department. The potential for child mortality impact is 2,900 fewer deaths per year.

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Government Policy and Micronutrient Interventions

The government of Bolivia appears to be greatly under-invested in micronutrient programs despite the presence and active advocacy of UNICEF and assistance provided by USAID, previously through VITAL and currently through OMNI. Nevertheless, there is political commitment at the highest level with the First Lady taking a personal interest in launching vitamin A and iron programs. There are MOH staff dedicated to the micronutrient program, but as yet no budget line-item for micronutrient activities. As a result, financial sustainability of micronutrient activities remains a central issue. There may be a need to estimate budgetary requirements and obtain financial commitments to sustain the program on the national and local levels. The current emphasis on fortification and supplementation has not been tested for cost-effectiveness, and the role of dietary diversification strategies has not yet been completely identified. The issue of relatively low subclinical vitamin A deficiency nationally with a higher prevalence in certain geographic areas, along with the implications of this epidemiologic pattern on the choice of intervention, will be addressed. Developing a mechanism to assure adequate levels of vitamin A in sugar at the production/mixing sites and also at retail/consumption sites is the operational issue most immediately in need of attention. A monitoring system to track these levels is also being developed.

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JSI

General Data	
Total population (millions)	7.2
Urban population	60%
Under 5 mortality rate/1000	110
Infant mortality rate/1000	73
Life expectancy at birth	59
Access to health services	67% *
Per capita GNP (in US$)	760
Women's literacy	71%
Nutrition Data	
Infants with low birth weight	12%
Children exclusively breastfed 0-3 months	53%
Children under 5 stunted	28%
Children under 5 wasted	4%
Children under 5 underweight	16%
Measles coverage rate (1 year olds)	86%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Current Status - *continued from front*

Iron Deficiency Anemia (IDA)

Recent national survey estimates of the prevalence of IDA among pregnant women in Bolivia average 50.5%, with 56% in the Altiplano, 62% in the Llanos, and 33% in the Valle regions of the country.[2] In southeast Bolivia, intestinal parasitism, especially hookworm, is suspected, in addition to a dietary deficit of absorbable iron as a cause of iron deficiency.[3]

Anemia and iron deficiency control activities are actively underway throughout Bolivia. An ongoing World Bank-supported Integrated Health Development project is helping to detect and treat deficiencies of iodine, iron, and vitamin A. An estimated 14% of pregnant women receive some iron supplementation, but no iron supplementation activities exist for infants and young children. Assuming a 20% reduction in maternal deaths attributable to preventing anemia, lives saved from IDA control programs is estimated at 317 per year.

Iodine Deficiency Disorders (IDD)

In the 1980s, Bolivia had the most severe iodine deficiency problem in the world, with cretinism reaching up to 16% in some communities. By 1989, the total goiter rate (TGR), as reported by the National Prevalence Survey, was 21% among school children,[4] down dramatically from 65% in 1983,[5] paralleling increased iodized salt consumption and intensified iodized oil campaigns. Areas with goiter rates above 30% include Beni and Pando, but most other areas presently appear to be at lower risk of IDD, with a TGR of 11% to 30%.[4] However, a likelihood that iodine deficiency may subclinically affect approximately two to three times more persons in Bolivia than suggested by TGR emphasizes the importance of aggressive IDD control. Salt iodization at thirty-five regulated and monitored commercial plants has played an important role in achieving this control. However, approximately 1.5 million people are estimated to still be iodine deficient in Bolivia, with consequences ranging from mild neurological impairment to severe mental and growth retardation.

In 1983, the Government of Bolivia created the National Program to Fight Against Goiter (PRONALCOBO), in response to the growing awareness of the severe consequences of IDD. Funded by the Italian Government through the Joint Nutrition Support Programme of PAHO/WHO-UNICEF, the program has made notable progress through production and distribution of affordable iodized salt, direct administration of iodized oil to those at highest risk, and public campaigns to increase awareness of IDD and methods of IDD control.

International Cooperation

In September 1995, efforts coordinated by USAID's OMNI Project, UNICEF, UNAGRO Industries, and the National Health Secretariat succeeded in introducing a vitamin A-fortified sugar, VitAzucar, into the markets of the Bolivian Department of Oruro. OMNI is providing quality assurance and control systems for the fortification effort, training the staff at the UNAGRO sugar mill in laboratory techniques to assess the correct level of vitamin A in the sugar, and providing technical assistance in the sugar social marketing campaign. As part of the monitoring and evaluation plans established with the private and public sectors, community agents will be trained to collect information that measures the success of the marketing campaign in educating consumers to buy fortified sugar. The National Secretariat of Health will evaluate the success of a private sector initiative to fortify sugar in the absence of universal fortification legislation.

Under the Programa Nacional Contra la Malnutricion de Micronutrientes (PNCMM), with support from PAHO/WHO, ferrous sulfate/folic acid tablets are administered to pregnant women in their second trimester who attend prenatal services at health centers and maternity hospitals. The MOH has also conducted a preliminary study investigating the feasibility for iron fortification of wheat flour.

Key Sources

1 WHO and UNICEF. Global Prevalence of Vitamin A Deficiency. MDIS Working Paper #2. 1995

2 WHO. The Prevalence of Anaemia in Women: A Tabulation of Available Information, 2nd ed. Geneva: WHO, 1992.

3 Bartolini A et al. Parassitologia 1990; 32:335-8.

4 WHO, UNICEF, and ICCIDD. Global Prevalence of Iodine Deficiency Disorders. MDIS Working Paper #1. July 1993.

5 Eduardo A et al. The Prevention and Control of Iodine Deficiency Disorders. BS Hetzel, JT Dunn, JB Stanbury, eds. New York: Elsevier Science Publishers, 1987.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

micronutrient facts

COUNTRY SERIES

Ecuador

1996

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

The problem of micronutrient deficiencies in Ecuador is most evident in the Andean highland provinces of the country. Deficiencies of vitamin A, iodine and iron appear to cluster in the Sierra, mainly among the rural and dispersed populations. Approximately one-fifth of preschool children in poor rural areas have low vitamin A status.

Comprehensive planning to prevent **vitamin A deficiency** (VAD) is underway. **Iron deficiency anemia** (IDA) is widespread among children and women living in the Sierra. Assessments of IDA prevalence in these regions must take into account increased hemoglobin (Hb) levels induced by altitude-associated hypoxia, i.e. too little oxygen in cells. Goiter, which reflects significant iodine deficiency in a population, has been endemic in the highland region for decades. Recent data, however, indicate that the prevalence of **iodine deficiency disorders** (IDD) may have decreased dramatically in the past decade, primarily due to effective distribution of iodized salt.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and risk of mortality. In the five poorest rural provinces included in the 1993 National Nutrition and Health Survey, 22% of children 12-59 months of age had low serum retinol levels.[1] The prevalence in the urban areas, by contrast, was 13%. A national representative survey in 1986 had estimated 14% of preschool children to have low serum retinol concentration, with prevalence rates tending to be higher in rural and dispersed areas (16.4%) as compared to urban areas (11.9%), and higher among boys (17.1%) than among girls (10.7%). Dietary data also reveal a wide gap in the recommended versus actual intakes of vitamin A among children, especially those living in the rural highlands, where more than 80% of children consumed less than 50% of the recommended vitamin A intake.[2]

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. The national nutrition and health survey of 1986 found the prevalence of anemia to be 22.2% among children 6-59 months of age, after correcting for the effects of high-altitude hypoxia on hemoglobin (Hb) values. The prevalence of anemia varied significantly by age, with highest rates among children 6-11 months old

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Government Policy and Micronutrient Interventions

The Ministry of Health (MOH) has developed a National Action Plan for Food and Nutrition coordinated by a multi-sectorial National Committee for Food and Nutrition Policies and Programs (CONPAN). The plan includes a micronutrient program (PROMI) which has identified food fortification as the primary action to combat micronutrient deficiencies. The Instituto del Investigaciones y Desarrollo de la Salud (IIDES) of the MOH managed the national iodine program and is now responsible for PROMI.

With iodized salt increasingly available, and a comprehensive salt monitoring system in place, IDD appears to have decreased nationwide. Iodization of all salt for human consumption was legislated in 1968. Aggressive marketing by ECUASAL, producer of 78% of the country's salt, has resulted in iodized salt being available in most rural areas and virtually all urban areas, even in the highlands. UNICEF estimates that 85% of salt is iodized in Ecuador.

Currently, efforts are underway to promote legislation and build a consensus within the food industry to fortify sugar with vitamin A.

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JSI

General Data	
Total population (millions)	11.2
Urban population	58%
Under 5 mortality rate/1000	57
Infant mortality rate/1000	45
Life expectancy at birth	69
Access to health services	88%*
Per capita GNP (in US$)	1200
Women's literacy	87%

Nutrition Data	
Infants with low birth weight	11%
Children exclusively breastfed 0-3 months	31%
Children under 5 stunted	34%
Children under 5 wasted	2%
Children under 5 underweight	17%
Measles coverage rate (1 year olds)	100%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Current Status - *continued from front*

(69.4%) and 12-23 months old (46.3%).[3] Anemia was highest in the rural, dispersed areas and boys were at greater risk than girls. The prevalence of anemia in a small, hospital-based population of pregnant women was 46%.[3]

Another study reported iron-responsive anemia in 61% of 412 pregnant Ecuadorean women.[3] Infection with intestinal parasites is high in Ecuadorean children and women and may contribute to IDA in combination with low dietary iron intakes. Children with current or past parasitic infection, for example, had significantly lower iron intake, and reduced Hb and hematocrit levels compared to uninfected children. In pregnant women from Quito, parasitic infection was associated with decreased maternal serum Hb and reduced fetal growth.

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. Goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. While recent national data are not available on IDD prevalence in Ecuador, a goiter rate of 10% is estimated based on sub-national data and goiter rates in border regions of neighboring countries.[4] This estimate is much lower than the prevalence of 36.5% reported in a 1983 national survey conducted in 11 provinces. At that time, goiter rates varied dramatically by province, ranging from 12% to 54%. The prevalence was highest in the Andean highlands, where cretinism was also found.[4] Considerable improvements in the availability of iodized salt has led to suggestions that IDD in Ecuador may be under control.

Key Sources

1 WHO and UNICEF. Global Prevalence of Vitamin A Deficiency. MDIS Working Paper #2. 1995

2 Rodriquez A et al. "Vitamin A Deficiency Prevalence Survey in Ecuador," paper presented at the XVI IVACG Meeting, Chiang Rai, Thailand, 24-28 February 1994.

3 Ministerio de Salud Publica, Instituto de Investigaciones y Desarrollo de la Salud. "Proyecto Integrado para el Control de las Deficiencias de Micronutrientes en Ecuador." Quito, January 1995.

4 WHO, UNICEF, and ICCIDD. Global Prevalence of Iodine Deficiency Disorders. MDIS Working Paper #1. July 1993.

A list of additional resources is available from OMNI upon request.

International Cooperation

USAID and PAHO have assisted the MOH in obtaining estimates of the extent of VAD and IDA in the country. USAID's VITAL Project provided significant technical and financial assistance for assessments, workshops, and initial strategy development to prevent VAD. Currently, USAID's OMNI Project is assisting the MOH and USAID/Ecuador in the implementation of the National Micronutrient Plan of Action.

The Government of Belgium has supported the IDD control program since 1984. Program activities include: monitoring 120 salt samples per month from factories and retailers; active media promotion via radio; training of local health personnel and volunteers; developing printed materials and promotional videos; and carrying out local, community-based assessments and interventions. UNICEF has also supported the national IDD program.

The MOH, PAHO, and the International Life Sciences Institute (ILSI), with USAID support, signed an agreement in 1994 to prepare a national plan to "virtually eliminate deficiencies of iron, vitamin A and iodine" with technical assistance from the Universidad de San Francisco in Quito, primarily through food fortification and dietary diversification, including breastfeeding promotion.

Shorter-term measures, such as iron and vitamin A supplementation for pregnant and postpartum women and children one to three years of age, will also be undertaken. MOH's nutrition activities are funded, in part, under a World Bank loan through the FASBASE program.

OMNI Opportunities for Micronutrient Interventions

Egypt
1996

micronutrient facts
COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk. Despite a reasonable degree of food security and caloric adequacy in the diet of most Egyptians, micronutrient deficiencies exist at moderate levels, especially in the low-income urban and rural areas of the country. In general, micronutrient deficiencies are more apparent in Upper than Lower Egypt.

There is a moderate public health problem of **vitamin A deficiency** (VAD) according to the recent National Survey for Assessment of Vitamin A Statistics in Egypt. Vitamin A intakes of rural women and children are calculated to be half or less of their recommended daily requirements. Xerophthalmia (clinical eye lesions leading to nutritional blindness) does not appear to be a public health problem in Egypt.

Iron deficiency anemia (IDA) has been, and continues to be a crucial problem among women and children. The highest prevalence of anemia is seen among pregnant and lactating women (20-40%) and toddlers (54%). Inadequate intake and poor bioavailability of dietary iron (primarily of cereal origin) appear to underlie poor iron status in these groups. Since wheat flour and bread are widely sold at fixed, subsidized prices throughout the country, iron fortification of these commodities may be a promising intervention.

Mild levels of **iodine deficiency disorders** (IDD) were reported in a 1991 national prevalence survey of goiter in school children. The total goiter rate in the coastal areas and Lower Egypt was lower than the standard 5% cutoff. However, the rate in the New Valley area of the country was much higher (26%), requiring urgent action in this region.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and risk of mortality. Vitamin A intake across the population in Egypt appears to be low in most groups, including pregnant, nonpregnant, and non-lactating women, and school-age children and toddlers who consume an estimated 50-60% of their requirement.[1] Lactating women are estimated to consume only 30% of recommended levels. A study examining the effect of intestinal parasitism in response to vitamin A treatment in 70 school boys found 30% to have low serum levels of vitamin A.[2] Average breastmilk vitamin A levels in one study were shown to be significantly lower in lactating mothers of sick infants than of the healthy ones.[3] The 1994 National Survey for Assessment of Vitamin A Status in Egypt showed that 12% of children and 10% of mothers had low serum retinol levels, signifying a moderate public health problem.[4]

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. In the 1988 State of Egyptian Children Report, anemia prevalence rates among pregnant, lactating, and nonpregnant women were reported to be 22%, 25%, and 17%, respectively.[5] The village of Kalama in Qualubia Governate, one of three global field sites for the Human Nutrition Collaborative Research Support Program study,[1] reported a prevalence of anemia of 21% in nonpregnant, non-lactating women, 31% in women during the second trimester of pregnancy, and 42% during the first three months of breastfeeding. Another 10-15% of the pregnant women were iron deplete without anemia. Over a quarter of children were found to be anemic in the recent national nutrition survey (1995),[4] a reduction from the 1978 national survey figure of 38%. There were no statistical differences between the prevalence in rural and urban areas, or between males and females. Prevalence of IDA among the examined non-pregnant women was 15% compared to 22% in 1978. Inadequate dietary iron due to low bioavailability is the principal cause of anemia in these groups. In a trial of the effect of iron supplementation on diarrhea, anemia was observed in 31% of preschoolers and 34% of school children.[6] Prevalence of ascaris and other intestinal parasites was high among these children (25-30%).

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. Goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. Based on a national prevalence survey in 1991, the

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USAID

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General Data	
Total population (millions)	61.6
Urban population	45%
Under 5 mortality rate/1000	52
Infant mortality rate/1000	41
Life expectancy at birth	63
Access to health services	99%*
Per capita GNP (in US$)	660
Women's literacy	34%

Nutrition Data	
Infants with low birth weight	10%
Children exclusively breastfed 0-3 months	38%
Children under 5 stunted	24%
Children under 5 wasted	3%
Children under 5 underweight	9%
Measles coverage rate (1 year olds)	90%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

The Government of Egypt has outlined a comprehensive set of food and nutrition policies and strategies. An interministerial committee, chaired within the Ministry of Agriculture, has prepared a draft National Nutrition Plan of Action, which lists reduction of micronutrient deficiencies through fortification of food commodities as one of its objectives.

The earliest intervention to eliminate IDD was iodine fortification of salt and cookies in 1965. More recently, the National Council for the Control of IDD was established to plan and coordinate government efforts. The Council's strategy includes supplementation with iodized oil, promotion of iodized salt consumption in the most affected areas of the New Valley, and universal salt iodization by 1996, supported with social marketing and advocacy campaigns. To date, legislation with modified salt specifications has been enacted, and non-iodized salt or salt not conforming to the legal specifications has been banned. The national salt producer, El Nasr Salt Company, recently received a Ministry of Finance grant (US $800,000) to upgrade salt production facilities for iodized salt production.

Iron tablets are commonly provided to pregnant and lactating women through the primary health care system. Despite iron supplementation, the prevalence of anemia remains high among women and children. The Egyptian food subsidy system is one of the most extensive in the world. The government is exploring possibilities for fortifying wheat flour with iron, and pilot fortification trials of bread with iron have started. Small children who consume little bread and pregnant or lactating women whose requirements are high may still require alternative interventions. In 1994, UNICEF and the Nutrition Institute collaborated on the National Survey for Assessment of Vitamin A Status in Egypt.

Current Status - *continued from front*

total goiter rate (TGR) was 5.2% among school-age children, skewed heavily by the high rate (26%) found in the New Valley desert area.[7] TGR was 5% or less in other regions surveyed. Nevertheless, approximately 3 million people may be affected by IDD in Egypt. The national survey in 1991 found the goiter prevalence rate among older school children to be almost twice that of primary school children. TGR was 21% in mothers in the recent national nutrition survey in 1994/95.[4]

International Cooperation

UNICEF, WHO, FAO, DANIDA, and USAID are among the key donors supporting micronutrient work in Egypt. UNICEF and WHO have been supporting research on iodine and iron deficiency. UNICEF is planning limited importation of iodized oil for residents of the New Valley oases, where IDD prevalence is the highest, and providing technical assistance to the national salt producer for iodized salt production. UNICEF collaborated with the Nutrition Institute to help carry out the 1994 National Survey for Asessment of Vitamin A Status in Egypt.[4] FAO is supporting nutrition surveillance by the Ministry of Agriculture and has supported the development of the Nutrition Action Plan. USAID has financed numerous child survival activities as well as a food consumption study.

Key Sources

1 Kirksey A et al. Human Nutrition Collaborative Research Support Program (NCRSP): Egypt Project. Final Report to USAID. Cairo: Nutrition Institute, 1992.

2 Hamdy BH et al. International Journal of Vitamin Nutrition Research 1982; 52:235-240.

3 Hussein L et al. International Journal of Vitamin Nutrition Research 1987; 57:3-11.

4 National Survey for Assessment of Vitamin A Status in Egypt. Nutrition Institute/Government of Egypt, UNICEF. Unpublished report, 1995.

5 The State of Egyptian Children. The Central Agency for Public Mobilization and Statistics and the United Nations Children's Fund. 1988.

6 Hussein MA et al. Food and Nutrition Bulletin 1988; 10:35-9.

7 WHO, UNICEF, and ICCIDD. Global Prevalence of Iodine Deficiency Disorders. MDIS Working Paper #1. July 1993.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Ethiopia
1996

micronutrient facts

COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

Nutritional problems in Ethiopia are related to the chronic poverty situation in the country compounded by intermittent droughts and civil unrest, which have disrupted large areas of the country and created millions of displaced persons. Ethiopia harbors all three major micronutrient deficiency problems.

Vitamin A deficiency (VAD) is a problem of public health significance in Ethiopia, particularly in certain ecological zones. Severe VAD has been encountered among displaced and refugee populations as well.

The traditional Ethiopian diet is known to have a high iron content and **iron deficiency anemia** (IDA) is rare among adults, even among pregnant and lactating women. However, IDA has been found in young children. A survey of the hematocrit levels of children, 6-72 months old, showed the prevalence of anemia to be 47%.

Surveys have shown that **iodine deficiency disorders** (IDD) are widespread in the country as reflected by a mean goiter rate of 31% among school children. A program to distribute iodized salt has been initiated to eliminate goiter.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and risk of mortality. VAD is clearly a problem of public health significance in Ethiopia, particularly in the cropping and pastoral ecological zones.

A 1980-81 national survey of children 6-59 months old found that 1% had Bitot's spots (white or gray deposits on the white of the eye indicating clinical VAD), 16% had deficient levels of serum retinol, 44% had low serum retinol, and 4.8% had conjunctival xerosis.[1] A survey of 2,022 children in Arzi zone found an 11% xerophthalmia (clinical eye lesions leading to nutritional blindness) rate, with rates as high as 28.3% in one village.[2] VAD has also been found to be severe in refugee camps. In the Shoa region, a large-scale study in 1991 found the prevalence of Bitot's spots to be just above 0.5%.[3]

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcomes including prematurity, low birth weight, and maternal mortality. The magnitude and distribution of anemia in Ethiopia are not clearly known. Hematological investigations carried out in Addis Ababa indicated a prevalence of 5.3% in preschool children, 7.5% in school-age children, 7% in adult males, and 8.2% in adult females. A study in the rural town of Ijaji, using the same criteria, showed a prevalence of 8% in infants and 48% in preschool children. A 1987 study of children 6-72 months old in a periurban area in northwestern Ethiopia found a prevalence rate of 47%.[4] Thus, although the iron content of the traditional Ethiopian diet may be very high, anemia is prevalent among preschool and school-age children.

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. Iodine deficiency has long been recognized as a problem of public health significance in Ethiopia. Based on a 1990 national survey, 22% of the population were suffering from goiter.[5] This rate represents a decrease in the prevalence from approximately 30% found in the previous national survey of 1980-81.[5,6]

Goiter rates were highest in areas at altitude 2,000 meters and higher (34%) as compared to areas at less than 2,000 meters (19%).[7] Prevalence was higher in school-age girls (36%) than boys (25%). An estimated 59,000 Ethiopians were cretins in 1990, while three times as many individuals suffered from some degree of developmental or neurological impairment attributable to iodine deficiency. Moreover, the estimated annual reproductive losses due to iodine deficiency were high: 13,600 for neonatal deaths, 14,800 for still-births, and 20,000 for miscarriage/infertility.[7]

USAID

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JSI

General Data	
Total population (millions)	53.4
Urban population	13%
Under 5 mortality rate/1000	200
Infant mortality rate/1000	117
Life expectancy at birth	47
Access to health services	46%*
Per capita GNP (in US$)	100
Women's literacy	21%
Nutrition Data	
Infants with low birth weight	16%
Children exclusively breastfed 0-3 months	74%
Children under 5 stunted	64%
Children under 5 wasted	8%
Children under 5 underweight	48%
Measles coverage rate (1 year olds)	29%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

A five-year national VAD control program began in 1989, consisting of disease-targeted and universal distribution of vitamin A capsules, nutrition education, horticulture development, and food fortification.

The Ethiopian Health and Nutrition Research Institute plays a key role in conducting research, delivering technical assistance, and coordinating programs. The Ministries of Health, Education, and Agriculture and the National Blindness Prevention Program are other key players in implementing the program. Capsule distribution has reached 2.5 million children with disease-targeted distribution in 60% of rural health units. In selected high prevalence areas, universal distribution of vitamin A capsules has reduced the prevalence of xerophthalmia from 11% to 2%.[8] Horticultural development of vitamin A-rich foods has been undertaken through 36 school nutrition clubs. Posters and leaflets on vitamin A are distributed as part of the nutrition education component of the program.

Salt iodization and iodized oil treatment are being implemented simultaneously as long-term and immediate responses to control IDD in the country. The major objective of the program is to reduce the goiter rate from 25% to 10% by 1994 and to less than 5% by 2000, and to make available and distribute 110,000 tons of iodized salt by 1994.

International Cooperation

UNICEF provided assistance in the formulation of the national VAD control program, and is currently supporting nutrition education and supplementation interventions.

In December 1995, Eritrea took major steps toward achieving Universal Salt Iodization when it inaugurated salt iodization plants in Assab and Massawa on the Red Sea Coast. This initiative will have a strong impact in both Eritrea and Ethiopia, which purchases most of its salt from producers based in Assab.

The inauguration of the salt plants is the outcome of two years of concerted efforts between the Government of Eritrea and UNICEF which received the necessary funding from the governments of the United States (USAID) and Canada (CIDA).

Key Sources

1 Wolde-Gebriel Z, Demeke T, West CE. “Xerophthalmia in Ethiopia: a nationwide ophthalmological, biochemical and anthropometric survey,” European Journal of Clinical Nutrition, October 1991 (45:10): 469-478.
2 Taffesse Y, Fissha T. “Blinding Malnutrition: A Serious Threat in a District of Aris Ethiopia,” paper presented at the XVI IVACG Meeting, Chiang Rai, Thailand, 24-28 October 1994.
3 Wolde-Gebriel Z et al. British J Nutr 1993; 70:593-607.
4 Zein ZA “Haematocrit levels and anemia in Ethiopian children,” East African Medical Journal June 1991; 68:412-419.
5 WHO, UNICEF, and ICCIDD. Global Prevalence of Iodine Deficiency Disorders. MDIS Working Paper #1. July 1993.
6 Wolde-Gebriel Z et al. British J Nutr 1993; 69:257-68.
7 Tebeb HN. Am J Clin Nutr 1993; 57:315S-6S.
8 Taffesse Y, Fissha T. Vitamin A Deficiency Control Program in Ethiopia (1989-93). Abstract, XVI IVACG Meeting, Chiang Rai, Thailand, 24-28 October 1994.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

micronutrient facts

COUNTRY SERIES

Ghana

1996

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

Baseline data from two vitamin A supplementation trials conducted in 1989-91 in the savannah area of Ghana found the prevalence of clinical **vitamin A deficiency** (VAD) to range from 0.7% to 1.5%, indicating that VAD was a problem of public health significance in some regions of the country. Moreover, low serum retinol (< 20 μg/dl) was found in 65-70% of the study children, reflecting high levels of subclinical VAD in the population. Vitamin A supplementation has been shown to reduce child mortality in Ghana.

Early studies in southern, rural areas showed moderate **iron deficiency anemia** (IDA) (hemoglobin [Hb] <10 g/dl) to be prevalent among 25% and 10% of children 0-4 years and 5-9 years old, respectively. Prevalence of anemia among women 15-29 years of age was 11%. Malarial infection may be a major factor underlying anemia in the population. In a hospital population of children, anemia (Hb <11 g/dl) was found in 70% of the population. Although no national data are available, small surveys conducted in the Upper East region report high goiter rates of 60-80%. Other areas may have moderate levels of **iodine deficiency disorders** (IDD).

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common cause of preventable blindness in children and leads to increased morbidity and risk of mortality. The best estimate of the prevalence of VAD in Northern Ghana is available from two recent large community trials that conclusively showed that vitamin A supplementation every four months could reduce both child mortality (by 20%) and the severity of morbidity.[1] The mortality study found prevalence of xerophthalmia (clinical eye lesions leading to nutritional blindness) to be 0.7% among 22,000 children aged 6-90 months. The prevalence among the 1,455 children included in the morbidity study was twice as high (1.5%), although this might be a less precise estimate because of the smaller sample size and locale. While clinical VAD rates were very close to the WHO minimum cut-off of 1% for defining VAD as a public health problem, subclinical deficiency was high (57% in the mortality study and 73% in the morbidity study populations) based on low serum retinol levels of <20 μg/dl at baseline.[1] In comparison, a small study reported only 13% of 263 subjects, 3-60 years of age to have low serum retinol in southern Ghana.[2] Since only 5% of the individuals examined had retinol levels <10 g/dl, it was concluded that VAD did not exist in this community. In a subsequent study of 162 children, 3-5 years old, prevalence of deficient (<10 μg/dl) and low (10-20 μg/dl) serum retinol levels was 4% and 17%, respectively.[2] The same group found significant seasonality in the daily intake of vitamin A among

(continued on back)

Government Policy and Micronutrient Interventions

Following the recommendation of the International Conference on Nutrition, Ghana initiated the preparation of a National Plan for Action for Food and Nutrition in April 1993.[7] A multisectoral task force was formed, including various ministries, research institutes, nongovernmental organizations (NGOs), FAO, WHO, and UNICEF. A micronutrient deficiency control program was established with sub-committees for iodine, vitamin A, and iron. There are now four regions covered by national intervention strategies. Programs are beginning for vitamin A supplementation of pregnant and lactating mothers using existing health facilities, home and school gardens to promote production and consumption of vitamin A-rich foods, drying of vitamin A-rich foods at the community level using women's groups, and legislation for food fortification. NGO programs distribute vitamin A capsules to children. A rapid assessment study in Bolgatanga-Frafra district found that providing vitamin A supplements along with immunization had minimal additional cost and presented a good opportunity for achieving significant vitamin A supplementation coverage.[8] Iodized oil has been distributed in Upper East areas surveyed. Coverage of populations at-risk for IDD has increased from 10% to 30% for iodine, from 30% to 40% for iron, and from 20% to 30% for vitamin A.

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General Data	
Total population (millions)	16.9
Urban population	36%
Under 5 mortality rate/1000	131
Infant mortality rate/1000	76
Life expectancy at birth	56
Access to health services	60%*
Per capita GNP (in US$)	430
Women's literacy	46%

Nutrition Data	
Infants with low birth weight	17%
Children exclusively breastfed 0-3 months	8%
Children under 5 stunted	26%
Children under 5 wasted	11%
Children under 5 underweight	27%
Measles coverage rate (1 year olds)	49%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

International Cooperation

The World Bank supports a pilot scheme that provides anemic women with iron supplements and nutrition education. The FAO Technical Cooperation Program supports a field project in the Upper East region of the country. Training at the USAID-supported Program Against Micronutrient Malnutrition has helped the Government of Ghana's Nutrition Office develop comprehensive micronutrient control plans, establish a laboratory, train technicians, and mobilize salt producers. USAID and ODA have both been involved in micronutrient activities, as has WHO.

Current Status - *cont.*

children in Northern Ghana; 36% and 95% of the RDA for vitamin A retinol equivalents were met during the pre- and post-harvest seasons, respectively.[3]

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. A hospital-based study in Accra found 71% of 15,450 children to have Hb levels below 11 g/dl, indicating high levels of IDA in this population.[4] Moreover, almost 60% of the 554 post-neonatal deaths in the emergency rooms per year were related to severe anemia. An earlier study has shown prevalence of anemia in southern Ghana to be fairly common, particularly in children and women.[5] Moderate to severe anemia (Hb < 10 g/dl) was found in 25% of 0-4 year olds, 10% of 5-9 year olds, and 11% of women 15-29 years old. Malarial infection may be an important cause of anemia among Ghanians, especially among primiparous pregnant women, who have an increased susceptibility to malaria. Hookworm infection was found in 40% of children ranging from 20% in those under four years old to 62% in those 15-19 years of age. Among young children, low iron content and poor bioavailability of the iron in maize and cassava foods is an important contributing cause of IDA. There is a need for obtaining more current data on the prevalence of IDA and its etiologies.

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. While national data are not available, the estimated national goiter rate is 9.5%.[6] A small survey in the Upper East region found goiter prevalence to be 59% in Sekoti and 77% in Builsa. Following this survey, iodized oil was distributed in the region. A national survey is required to measure the extent and severity of IDD in the country.

Key Sources

1 Ghana VAST Study Team. Lancet 1993; 342:7-12.
2 Takyi EEK, Harrison E. Serum retinol levels in preschool children in southern Ghana and the effect of cooking on the 8-carotene levels of commonly used leafy vegetables. Abstract XVII IVACG Meeting, Guatemala, 18-22, 1996.
3 Armar-Klemesu M et al. Food habits, consumption patterns and vitamin A intake by preschool children in rural Northern Ghana community. Abstract, XVI IVACG Meeting, Chiang Rai, Thailand, 24-28 Oct, 1994.
4 Commey JO, Dekyem P. West African J Med 1995; 14:101-4.
5 Bruce-Tagoe AA et al. Trop Geogr Med 1977; 29:237-44.
6 Micronutrient Deficiency Information System. Global prevalence of iodine deficiency disorders. MDIS Working Paper # 1. WHO, Geneva, 1993.
7 Agble R. Development of National Plan of Action for Food and Nutrition in Ghana as follow-up to the International Conference on Nutrition - the case of micronutrients. Abstract, XVI IVACG Meeting, Chiang Rai, Thailand, 24-28 Oct, 1994.
8 Archin DC et al. Vitamin A supplementation in Bolgatanga-Frafra district, Ghana: Costs and the window of opportunity for integration with EPI. Abstract, XV IVACG Meeting, Arusha, Tanzania, 8-12 Mar, 1993.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Guatemala

1996

micronutrient facts

COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

Although the prevalence of protein-energy malnutrition has declined in Guatemala since the 1970s, micronutrient deficiencies ("hidden hunger") remain a major concern in this country. **Vitamin A deficiency** (VAD) continues to be a public health problem, although sugar fortification with vitamin A and other approaches, such as home gardening and vitamin A supplementation, have been shown to effectively control VAD. **Iron deficiency anemia** (IDA) is most common among young children and women of reproductive age, especially among pregnant women. Wheat flour fortification with iron has been implemented since the late 1980s. **Iodine deficiency disorders** (IDD) appear to be on the decline in Guatemala, based on information from a 1995 national micronutrient survey.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common cause of preventable blindness in children and leads to increased morbidity and risk of mortality. On the basis of a number of small studies, WHO classifies VAD in Guatemala as a clinical public health problem. Small studies in rural areas have found some indication of clinical VAD among preschool children.[1] A 1986 study in Chimaltenango found that 0.5% of children under ten years of age had signs of xerophthalmia (clinical eye lesions leading to nutritional blindness). In 1988 and 1989, 26% of children under five years of age had low serum retinol levels. Sugar fortification was carried out during two periods in Guatemala, initially in 1975-77 when a national study demonstrated a significant improvement in serum retinol levels of preschool children, with a drop in the prevalence of low serum retinol from 18.2% to 8.9%. Prevalence of VAD increased again when sugar fortification became lax through the mid-1980s. Some improvement has been seen again after eight years of renewed efforts to fortify sugar with vitamin A: the national prevalence rate in 1995 was 15.8% among children under five years of age.[2]

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. Studies from over 20 years ago indicate a significant anemia problem, particularly among young children, adolescent females, and people living at higher altitudes. One study found anemia rates (based on hemoglobin levels) of 7.6%, 12.5%, and 45.4%, respectively, among pregnant women in Guatemala City, rural southern coastal areas, and rural mountainous areas.[3] Intestinal parasites may be an important contributing cause of anemia during pregnancy. In 1995, a national survey reported a 26% anemia prevalence rate in children between the ages of one and five years, with 50.1% of children 12-23 months old anemic. Among women 15-44 years of age, the anemia prevalence rate was 35.4%, with women between ages 15-19 highest at 42.3%, and pregnant women at 39.1%.[2]

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. A 1987 national prevalence survey found that the total goiter rate among school children was 20.4%.[4] Regional rates ranged from 12% in Peten to 27% in the northwest. In 1995, a national micronutrient survey found the average iodine excretion rate in urine to be 22.2 μg/dl, indicating reduction in IDD among school children. The survey also found that 63.7% of the salt available in households was adequately fortified with iodine.[2]

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General Data	
Total population (millions)	10.3
Urban population	41%
Under 5 mortality rate/1000	70
Infant mortality rate/1000	51
Life expectancy at birth	65
Access to health services	34% *
Per capita GNP (in US$)	1,100
Women's literacy	46%

Nutrition Data	
Infants with low birth weight	14%
Children exclusively breastfed 0-3 months	N/A
Children under 5 stunted	58%
Children under 5 wasted	1%
Children under 5 underweight	34%
Measles coverage rate (1 year olds)	66%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

While sugar fortification is the foundation of Guatemala's vitamin A deficiency prevention strategy, the strategy also includes administration of pharmacological doses of vitamin A two to three times per year to high-risk populations, and nutrition education combined with the promotion and consumption of vitamin A-rich foods. Sugar has been fortified with vitamin A since the 1960s, although setbacks occurred in the 1970s due to a lack of foreign exchange for the purchase of fortificant. At least 90% of the population consumes fortified sugar, although some problems with dosage levels remain. UNICEF estimates that in 1994, 10% of infants 6-12 months old received at least one high-dose vitamin A capsule and that 10% of mothers who gave birth received a postpartum capsule. A recent cost-effectiveness analysis of three approaches to VAD prevention revealed that fortification was considered to be the best option for meeting vitamin A needs if adequate vitamin A levels in sugar are maintained and an effective quality assurance and control system is in place.[5]

Iodized salt legislation was first passed in 1955, then revised in 1980, but the program had only limited effectiveness due to budget constraints, difficult transportation in mountainous areas, and the continued availability of non-iodized salt. Ten percent of the salt supply is imported from El Salvador and is not iodized. In the mid-1980s, only 11% of salt consumed was iodized.

International Cooperation

INCAP, with the support of USAID and more recently UNICEF, has been the primary moving force behind micronutrient initiatives in Guatemala. While INCAP has historically been responsible for the development of micronutrient initiatives in Guatemala, several nongovernmental organizations (NGOs), including Project Concern International, the International Eye Foundation, and Project Hope, collaborated on a program that promoted increased consumption of vitamin A-rich foods. Under USAID's Vitamin A Technical Assistance Program (VITAP), the Manoff Group provided assistance to NGOs in communication activities related to micronutrients. USAID's OMNI Project, together with PATH, UNICEF, INCAP, and ANSAL (the Guatemalan salt producers association), is working with the private sector in assisting small-scale salt producers to improve salt quality and iodine content.

The World Bank's Social Investment Fund project provides funding for community-generated projects, including some that address micronutrient deficiencies. In 1994, the FAO assisted in the formulation of a program for home-gardening training and nutrition education.

Key Sources

1 WHO and UNICEF. Global Prevalence of Vitamin A Deficiency. MDIS Working Paper #2. 1995.
2 Guatemala Ministerio de Salud Publica y Asistencia Social. Informe de la Encuesta Nacional de Micronutrientes. Guatemala. 1995
3 Franzetti S et al. Archivos Latinoamericanos de Nutricion 1984; 34:69-82.
4 WHO, UNICEF, and ICCIDD. Global Prevalence of Iodine Deficiency Disorders. MDIS Working Paper #1. July 1993.
5 Phillips M et al. The costs and effectiveness of three vitamin A interventions in Guatemala. Latin America and Caribbean Health and Nutrition Sustainability Project. Working Paper #2. Nutrition cost effectiveness studies. May 1994.

A list of additional resources is available from OMNI upon request.

Haiti
1996

OMNI Opportunities for Micronutrient Interventions

micronutrient facts

COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

There are no recent, national data on the micronutrient status of Haitians, but it is unlikely that the situation has improved since 1974-75, when a national nutrition survey was conducted. Haiti is one of the least developed countries in the Caribbean and Central American region, and famine, drought, and civil unrest in recent years may have aggravated nutrient deficiencies among children and women. The prevalence of corneal scars attributed to **vitamin A deficiency** (VAD) was 8.1/1000 in the northern districts in 1975, one of the highest recorded rates in the world at that time. **Iron deficiency anemia** (IDA) is likely to be widespread, partly due to the endemicity of malaria in Haiti. The prevalence of **iodine deficiency disorders** (IDD) may be low based on the total goiter rate found in 1978.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common cause of preventable blindness in children and leads to increased morbidity and risk of mortality. A xerophthalmia (clinical eye lesions leading to nutritional blindness) survey conducted in 1976 by the American Foundation for Overseas Blind found a high prevalence of corneal scars (8.1/1000) among 5,600 children under six years of age living in the northern region of Haiti.[1] There was a striking difference in the apparent risk of xerophthalmia by region, with the prevalence of corneal scars being only 1.2/1000 in the southern region, which still exceeded the WHO criterion for a public health problem. Half of the cases with corneal scars could be clearly linked to VAD by history.

A dietary survey revealed that on average, children consumed only 34% of the recommended intake for vitamin A.[1] A targeted vitamin A distribution program for sick and malnourished children six months to seven years of age was implemented within a year of the survey. Its evaluation showed a nine-fold reduction in the prevalence of vitamin A-related corneal scarring (0.9/1000).[2]

Baseline data for a vitamin A supplementation field trial in the early 1990s reported a prevalence of 2.7/1000 for corneal xerosis and 1.4/1000 for keratomalacia or corneal scarring.[3] Data on subclinical VAD are not available at present.

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Government Policy and Micronutrient Interventions

Malaria, a major cause of anemia in Haiti, is one of the six health priorities being addressed by the Ministry of Health. Wide-spread malaria control programs are currently being planned.

A xerophthalmia prevention program was implemented in 1976 after high rates of xerophthalmia were found during the 1975 national survey. Vitamin A capsule distribution was targeted specifically to sick and malnourished children through existing hospitals, health clinics, and nutrition centers. Capsule distribution through the immunization program began in 1989. The current national policy supports the provision of vitamin A and iron supplements free of charge.

UNICEF estimates that in 1994, 25% of infants 6-12 months old received at least one high-dose vitamin A capsule, 10% of women who gave birth received a postpartum capsule, 10% of children 6-24 months old received adequate vitamin A via fortified foods, and 10% of the same group received adequate vitamin A via dietary improvement programs. Sugar may be fortified with vitamin A in the future.

USAID

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JSI

General Data	
Total population (millions)	7.0
Urban population	31%
Under 5 mortality rate/1000	127
Infant mortality rate/1000	74
Life expectancy at birth	56
Access to health services	50%*
Per capita GNP (in US$)	370
Women's literacy	38%

Nutrition Data	
Infants with low birth weight	15%
Children exclusively breastfed 0-3 months	3%
Children under 5 stunted	34%
Children under 5 wasted	5%
Children under 5 underweight	27%
Measles coverage rate (1 year olds)	24%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

International Cooperation

USAID supports a number of private voluntary organizations (PVOs) as well as several bilateral projects that are designed to expand access to health services, safe water, and oral rehydration therapy. Helen Keller International (HKI) has assisted in the distribution of vitamin A capsules (supplied by UNICEF) and provided nutrition education, emphasizing the production and consumption of vitamin A-rich foods. From 1986 to 1990, a USAID project provided vitamin A supplementation to the northwest region of Haiti, and also supported vitamin A capsule distribution through the EPI program. Save the Children/Haiti undertook a targeted intervention approach for high-risk individuals that included distribution of vitamin A capsules, promotion of traditional home gardens with vitamin A-rich plants, and counselling of mothers of malnourished children.[6] They reported a 130% increase in the coverage of children with vitamin A supplements and significant increase in maternal knowledge regarding vitamin A-rich foods.

UNICEF has also funded an emergency distribution of iodine tablets and implementation of salt iodization in one zone, although data are lacking on the extent of the IDD problem, nationwide.

The Centers for Development and Health (CDS), in collaboration with the Ministry of Health, distributes vitamin A and iron supplements in the northeast region and in Port-au-Prince. USAID's OMNI Project provided technical assistance to CDS to improve its distribution operations and micronutrient education strategy.

Current Status - *cont.*

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcomes including prematurity, low birth weight, and maternal mortality. A 1988 survey indicated that 30% of preschool children and 38% of women were anemic. Malaria is endemic in Haiti and may be an important cause of anemia in the population. Recent evidence suggests a general decline in the number of malaria cases from 1982 to 1991.[4]

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. National data from 1978 showed that the goiter rate in Haiti was 3.8%.[5] Based on this rate, which has not been updated, IDD is probably not a problem of public health significance in Haiti.

Key Sources

1 Toureau S, Sommer A, Doty MM, Pettiss ST. Assessment of xerophthalmia in Haiti. Project Report. American Foundation for Overseas Blind Inc. New York, 1976.
2 Toureau S, Pizzarello L, Leone SE. Evaluation of a program to prevent xerophthalmia in Haiti. Project Report. Helen Keller International Inc. New York, 1979.
3 Stansfield SK et al. Lancet 1993; 342:578-82.
4 Bonnlander H et al. Bull PAHO 1994; 28:9-16.
5 WHO, UNICEF, and ICCIDD. Global prevalence of iodine deficiency disorders. MDIS Paper #1. July 1993.
6 Swedberg EA, Stetson V, Adrian JM, Zayan A. Multiple approaches to vitamin A. Abstract, XVI IVACG Meeting. Chiang Rai, Thailand 24-28 October, 1994.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Honduras

1996

micronutrient facts

COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

While the prevalence of protein-energy malnutrition has declined significantly since the 1970s, less is known about the extent and severity of micronutrient deficiencies. To resolve this, USAID supported a national vitamin A and iron survey that was completed in October 1996. Based on the limited data available from previous surveys, WHO has categorized Honduras as a category 1 country, harboring significant subclinical **vitamin A deficiency** (VAD) which represents a public health problem in all or part of the country. Sugar fortification with vitamin A was legislated in the 1970s and has been implemented intermittently since then. The prevalence of **iron deficiency anemia** (IDA) is highest in young children and pregnant women. The prevalence of **iodine deficiency disorders** (IDD) has declined by half in the past two decades, although some provinces continue to show high goiter rates. Salt iodization has been in place since the 1970s. A June 1996 assessment found a relatively low 4.9% goiter rate in provinces that had previously reported high prevalence rates.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and risk of mortality. Data are not yet available from the 1996 national micronutrient survey, but in the 1987 national nutrition survey, 18% of children were vitamin A deficient in Honduras.[1] This was lower than the 1965-67 prevalence of 39% in children under five years old and 29% in children five to nine years old.[2] The survey also reported that almost 75% of all families (86% in the rural areas) consumed less than 50% of their recommended daily intake level of vitamin A. Sugar fortification, initiated in 1970, has been implemented intermittently since then. In the 1995/96 harvest, 55% of all sugar produced for domestic consumption in Honduras was fortified with vitamin A.[2] All table sugar was fortified in the 1995/1996 harvest. Sugar intended for industrial use is not fortified. The vitamin A (retinol) levels in fortified sugar are now adequate, but there is an influx of unfortified sugar intended for industrial use into retail markets of household sugar. Although practically all sugar intended for direct human consumption was fortified, with a mean content of 15.3 μg/g at the plants, about 31% of the samples from households did not have vitamin A. The mean content of all household samples containing vitamin A was 8.0 μg/g.

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. Again, data from the 1996 national micronutrient survey are not yet available, but available information indicates that approximately 40% of pregnant women and 30% each of children and women of childbearing ages are anemic. A 1994 study of women of reproductive age and young children in three of the nine health districts showed high anemia rates: 39% in women and 65% in children under five years of age (65% in under five months, 80% in 6-11 months, 67% in 12-23 months and 62% in 24-36 months).[4]

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. Goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. The goiter rate in Honduras, based on a national prevalence survey in 1987, was 8.8%[5] or one-half that observed (17%) in 1969. A recent study of school children in three provinces (Comayagua, La Paz, and Choluteca), showed a 4.9% prevalence.[4]

Salt iodization has been legislated since 1960. In 1987, only 30% of all salt samples from households were found to have adequate levels of iodine. In 1996, approximately 70% of the salt in households had adequate levels of iodine.

USAID

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JSI

General Data	
Total population (millions)	5.5
Urban population	43%
Under 5 mortality rate/1000	54
Infant mortality rate/1000	41
Life expectancy at birth	69
Access to health services	64%*
Per capita GNP (in US$)	600
Women's literacy	60%

Nutrition Data	
Infants with low birth weight	9%
Children exclusively breastfed 0-3 months	11%
Children under 5 stunted	39%
Children under 5 wasted	2%
Children under 5 underweight	21%
Measles coverage rate (1 year olds)	94%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

Legislation for fortification of sugar with vitamin A was passed in the early 1970s but was implemented sporadically. Vitamin A sugar fortification resumed in recent years with increasing coverage and quality. The government has developed and implemented a coordinated micronutrient strategy over the past four years with active participation by the public and private sectors.[3] This includes sugar fortification with vitamin A, salt iodization, vitamin A and iron supplementation, social marketing of vitamin A-rich foods, dietary diversification, and micronutrient surveillance.

International Cooperation

UNICEF supports salt iodization efforts in Honduras, primarily in the form of technical assistance and training for salt producers. UNICEF also supports vitamin A capsule distribution. Save the Children, the International Eye Foundation (IEF), and Project Hope, with support from USAID, include vitamin A interventions as part of their child survival programs in Honduras.

USAID/IMPACT, in conjunction with INCAP/WHO and UNICEF, has been providing technical assistance for vitamin A programs and activities. INCAP, in cooperation with the Instituto Centro Americano de Investigacion y Tecnologia Industrial (ICAITI) is implementing an operations research effort, under OMNI Research, focused on developing a food fortification (salt and sugar) quality assurance system.

Key Sources

1 WHO and UNICEF. Global Prevalence of Vitamin A Deficiency. MDIS Working Paper #2. 1995.
2 Dary O. Advances in the process of fortification of sugar with vitamin A in Central America. PAHO Bull 1994; 117:529-37.
3 Mora JO. Vitamin A deficiency in Latin America and the Caribbean, 1994. Nutriview, Special Issue 1994.
4 Plan de Apoyo USAID/IMPACT en Micronutrientes, 1994/1996. Honduras. Informe Final. (Draft 10/28/96).
5 WHO, UNICEF, and ICCIDD. Global Prevalence of Iodine Deficiency Disorders. MDIS Working Paper #1. July 1993.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

India
1996

micronutrient facts

COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

Nearly half of the world's micronutrient deficient people may be found in India. For example, of the 20-40 million children worldwide who are estimated to have at least mild **vitamin A deficiency** (VAD), half reside in India. VAD causes an estimated 60,000 children in India to go blind each year. **Iron deficiency anemia** (IDA) is the most pervasive of all nutritional deficiencies in India, particularly affecting women, especially pregnant women, as well as infants, young children, and adolescent girls. Various estimates from different parts of the country indicate that more than 70% of pregnant women, approximately 50% of all women, and 65% to 70% of adolescent girls may suffer from IDA. Prevalence of anemia among young children may be as high as 90% when hookworm infections are present.

The burden of **iodine deficiency disorders** (IDD) in India is of major proportions; approximately 150 million people are at risk of IDD, of whom 54 million have goiter, 2.2 million are cretins, and 6.6 million have milder neurologic deficits. Small surveys conducted over the past two decades have identified IDD in 24 of the 25 states.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and risk of mortality. Although prevalence of xerophthalmia (clinical eye lesions leading to nutritional blindness) has decreased significantly over the past 15 years, there remains clinical and biochemical evidence of VAD. An estimated 5-7% (6.6-9.2 million) preschool children suffer from xerophthalmia which causes at least 60,000 children to go blind each year.[1] Prevalence rates vary greatly among the states and range from 2.2% in Andra Pradesh to 9.0% in Bihar. VAD in India remains a significant public health problem.

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. A 1984 evaluation of the National Nutritional Anemia Prophylaxis Program revealed that 88% of pregnant women were anemic (hemoglobin < 11g/dl).[2] Among nonpregnant, non-lactating women anemia rates were 25-90%. Over 50% of preschool children and 65-70% of adolescent girls are also believed to be anemic. Low food availability, discrimination against females, and substantial dietary tannins and phytates (which decrease iron bioavailability) contribute to this serious problem.

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in specific

(continued on back)

International Cooperation

USAID's OMNI Project is providing technical assistance to USAID/India and CARE/India in their efforts to implement sustainable community level projects for improving nutritional status of target populations and to support the Government of India's micronutrient goals. An intervention mix is supported by USAID/India including the distribution of vitamin A and iron supplements, strengthening of ongoing training and communications efforts, and nutrition education.[6]

The World Bank is addressing micronutrient malnutrition in India through support of several project activities: iron supplementation, nutrition education for women, and periodic deworming of children through the Seventh Population Project and the Tamil Nadu II Project; and the distribution of iron-folic acid tablets and production and administration of vitamin A capsules through the Child Survival and Safe Motherhood Program, jointly funded by UNICEF and CIDA. UNICEF also provides assistance in the training of Integrated Child Development Services (ICDS) workers, development of communications, supply of iodization plants, and strengthening of iodization monitoring systems. CARE works through the ICDS program with its health and nutrition education component.

USAID

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JSI

General Data	
Total population (millions)	918.6
Urban population	27%
Under 5 mortality rate/1000	119
Infant mortality rate/1000	79
Life expectancy at birth	60
Access to health services	85%*
Per capita GNP (in US$)	300
Women's literacy	34%
Nutrition Data	
Infants with low birth weight	33%
Children exclusively breastfed 0-3 months	51%
Children under 5 stunted	65%
Children under 5 wasted	N/A
Children under 5 underweight	69%
Measles coverage rate (1 year olds)	86%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Current Status - *cont.*

geographic areas. The 1991 national total goiter rate based on estimates from the Ministry of Health and Family Welfare was 9%,[3] but rates are as high as 66% in Himalayan districts. A 1989 survey of 14 districts recorded goiter and cretinism rates of 21% and 0.7%, respectively.[2] Of the 167 million people at risk of IDD, at least 54 million have evidence of goiter or other overt consequences, more than 2 million are cretins, and over 6.5 million have mild neurological disorders. IDD causes an estimated 90,000 stillbirths and neonatal deaths each year in India.

Government Policy and Micronutrient Interventions

In May 1996, the Government of India (GOI) developed an Action Plan on Nutrition and established a task force for each micronutrient to: identify strategies for different age groups, suggest improvements in delivery mechanisms of existing interventions, prepare mass communication plans, and suggest intersectoral coordination mechanisms in accordance with the country's commitment to the goals of the International Conference on Nutrition. The National Vitamin A Prophylaxis Program, providing large doses of vitamin A to children one to six years of age, began in 1971 and has since been integrated with the primary health care (PHC) system and the Integrated Child Development Services (ICDS) program. Vitamin A is made locally and procured by the GOI. However, poor coverage (20-50%), especially among high risk children in poor, rural communities, has prompted an attempt to improve coverage by linking vitamin A administration to the ongoing immunization program. Nutrition education, horticultural interventions, and vitamin A food fortification are other strategies being pursued to combat VAD in India. Currently, 62 dairies are fortifying milk with 200 IU/100 ml with future plans for expansion.

The National Goiter Control Program was launched in 1962 with iodization of salt as its primary strategy for control of IDD. Several logistic problems have been identified including inadequate salt production that meets only 50% of the annual requirement of iodized salt, centralized salt production, and lack of community awareness.[2] Since then salt iodization has received more attention, and the program now includes a subsidy to manufacturers of iodized salt, free supply of potassium iodate used for fortification, and prioritized transportation of iodized salt by the railroad sector. Monitoring the iodine content of salt has become widespread with recent evidence that as much as 80-85% of all salt in the market meets the 30 ppm standard for iodine concentration. Recently, however, monitoring of the iodine content of salt in the sub-Himalayan endemic goiter-belt of northern India showed only 14-63% of samples with adequate iodine content,[4] emphasizing the need for more rigorous monitoring and supervision.

The National Nutritional Anemia Prophylaxis Program was launched in 1970. Pregnant and lactating women, family planning acceptors, and children 1-11 years of age are the target groups for this program and receive iron-folic acid supplements for 100 days/year through the PHC or ICDS distribution channels. The ICDS is the largest nutrition and health program in India, and covers 29 million children under six years of age and 5 million women of reproductive age.

The three nutrition programs to combat micronutrient deficiencies have been in operation for over two decades, but have had little perceptible biological impact due to constraints such as lack of coordination, shortage of resources, inadequate and irregular supplies, lack of proper orientation and training of functionaries, poor monitoring and supervision, insufficient nutrition education, and continuing poverty of those most at risk.[5]

Key Sources

1 WHO and UNICEF. Global prevalence of vitamin A deficiency. MDIS Working Paper #2. 1995.
2 Reddy V et al. Nutrition trends in India. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad 1993.
3 WHO, UNICEF, and ICCIDD. Global prevalence of iodine deficiency disorders. MDIS Working Paper #1. July, 1993.
4 Pandav CS et al. Bulletin WHO 1995; 73:71-5.
5 Vijayaraghavan K. Indian J Med Res 1995; 102:216-22.
6 Nestel P, Cogill B. A micronutrient strategy for USAID/India. OMNI c/o JSI. May 24, 1996.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Indonesia
1996

micronutrient facts

COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

The prevalence of clinical **vitamin A deficiency** (VAD) in Indonesia has declined significantly in the past 14 years, due to a highly effective national program that includes vitamin A capsule distribution, nutrition education, and social marketing approaches. Xerophthalmia rates, for the first time, are now below minimum criteria set by WHO. However, subclinical VAD remains widespread in preschool children and in pregnant and lactating women. **Iron deficiency anemia** (IDA) is highly prevalent among rural women and children and female factory workers. Low bioavailability of dietary iron from predominantly rice-based diets, combined with parasitic infections contribute to IDA. Goiter and cretinism have long been endemic in Indonesia. Although goiter rates have sharply declined in recent years, **iodine deficiency disorders** (IDD) persist at high levels in certain regions of the country.

Current Status

Vitamin A Deficiency (VAD)

VAD in children causes blindness and contributes significantly to infection-related morbidity and mortality. Indonesia has been the home of pioneering research over the past 20 years on the epidemiology of xerophthalmia (clinical eye lesions leading to nutritional blindness) and the impact of vitamin A supplementation and fortification of monosodium glutamate (MSG) on mortality.[1] A national survey in 1992 revealed a decline in the prevalence of xerophthalmia among preschool children from 1.3% in 1977-78 to 0.3% in 1992,[2] although some provinces (South Sulawesi, Maluku, North Sumatra and West Kalimantan) continue to show rates higher than the WHO criterion for defining VAD as a problem of public health importance. Also, prevalence of subclinical deficiency ("low" serum retinol <20μg/dl) remains at 50% among preschool children.[3]

Women of reproductive age are susceptible to VAD. The prevalence of low serum retinol is 66%, 51%, and 58%, respectively among pregnant, lactating, and nonpregnant non-lactating women from rural East Java[4] and 34% among pregnant women in West Java.[5] Thus, maternal VAD appears to be a public health problem in parts of Indonesia. Efforts to control VAD in children and women remain a priority.

Iron Deficiency Anemia (IDA)

IDA is associated with poor pregnancy outcomes including prematurity, low birth weight, and maternal mortality. The Nutrition Research and Development Center (Bogor) has reported 53% of pregnant women to be anemic (hemoglobin <11g/dl),[6] down from a 1986 national estimate of 74% among pregnant women.[7] The highest rates are found in West Java and South Kalimantan (63%). Prevalence of anemia in pregnant women from West and

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International Cooperation

USAID's OMNI Project, working through Helen Keller International (HKI) and the Program for Appropriate Technologies in Health (PATH), with a number of other partners, will implement four interrelated activities with the objective of improving the general and reproductive health of women through improved micronutrient status. The four activities that will be carried out include: social marketing to increase the consumption of vitamin A-rich foods; increased consumption of iron supplements through the private sector; improved reproductive health of young adolescent women through the school system, and improved reproductive health of adult women through the factory system. The World Bank's Community Health/Nutrition II Project provides approximately US $2 million to support activities to control micronutrient deficiencies in five provinces of the country.

Preliminary findings from a study of the salt industry commissioned by UNICEF, in coordination with the World Bank, suggest that a substantial portion of salt can be iodized reasonably quickly, but there is a need for strong social marketing efforts to promote utilization of iodized salt. UNICEF plans to provide technical support to salt manufacturers to improve their salt iodization plants and to ensure that there are adequate monitoring systems in place.

USAID

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JSI

General Data	
Total population (millions)	194.5
Urban population	35%
Under 5 mortality rate/1000	111
Infant mortality rate/1000	71
Life expectancy at birth	62
Access to health services	80% *
Per capita GNP (in US$)	740
Women's literacy	75%

Nutrition Data	
Infants with low birth weight	14%
Children exclusively breastfed 0-3 months	47%
Children under 5 stunted	N/A
Children under 5 wasted	N/A
Children under 5 underweight	40%
Measles coverage rate (1 year olds)	92%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

Over the past 20 years, the Government has solidly advanced the control of micronutrient deficiencies, especially vitamin A and iodine. Micronutrient interventions form a part of the Government's five-year development plans (Repelita) under the MOH's Nutrition Directorate.

The strategies for VAD control that have been adopted in Repelita VI include i) continued high-dose vitamin A supplementation to preschool children through the Posyandu (health service post), ii) high-dose vitamin A supplementation to postpartum mothers, iii) food fortification, and iv) food diversification and nutrition education. Coverage of preschool children with vitamin A capsules in 1993-94 was 60-70%. Dosing of women postpartum and adolescent girls is being piloted in Central Java. Although MSG fortification with vitamin A was not adopted, food fortification is still being considered as an intervention using foods like wheat flour noodles.

The national anemia control program includes iron supplementation of pregnant women in the third trimester, nutrition education to increase consumption of iron-rich foods, and fortification of foods with iron. Iron supplementation may have little benefit, especially during pregnancy, without adequate dosage and compliance. Other constraints to program effectiveness include intermittent supplies of iron pills and low awareness of the anemia problem among women and health staff. Recently, the health and manpower ministries and the private sector are working to control anemia through weekly distribution of iron tablets to female factory workers.

With the goal of eliminating cretinism by the year 2000, a national IDD committee was established in 1990 to oversee the distribution of iodinated oil capsules in severely endemic areas, iodization of salt for human consumption, and iodination of the water supply to communities in high-risk endemic areas. Although initial progress was made with salt iodization during Repelita II (1974-79), salt iodization efforts have stalled in recent years due to problems related to decentralized salt production, cost, access, lack of legal enforcement, and inadequate iodine content in the salt. However, the Government's commitment to control IDD is strong, as reflected in its 1995 budget, which singles out IDD control as a national priority.

Current Status - *cont.*

East Java are 49%[5] and 37%,[4] respectively. VAD may also contribute to anemia related to pregnancy, and an improvement in vitamin A status may be important in the control of IDA in women.[8] IDA is also common among children, with prevalences of 40% in preschool and 31% in school age children.[6]

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. Goiter reflects significant IDD in a population. The national goiter rate declined from 37% in 1982 to 27.7% in 1988, although rates in Bali, Nusa Tenggara, and Central Sulawesi continue to be high (62%, 59%, and 47%, respectively).[9] Aceh, Kalimantan, Jambi, and West Sumatra also continue to harbor high goiter rates (>30%). More than 50 million Indonesians are affected by IDD and twice as many may be at risk of being deficient.

Key Sources

1 Sommer A, West KP Jr. Vitamin A deficiency. Health, survival and vision. Oxford University Press, New York, 1996.
2 Muhilal, Tarwotjo I, Kodyat B et al. European J Clin Nutr 1994; 48:708-14.
3 WHO and UNICEF. Global prevalence of vitamin A deficiency. MDIS Working Paper #2. 1995.
4 Kusin JA, Suryohudoyo KP, De With C. Trop Geogr Med 1980; 32:30-39.
5 Suharno D et al. Am J Clin Nutr 1992; 56:988-93.
6 Matulessy PF et al. Southeast Asian J Trop Med & Pub Hlth 1992; 23 suppl 3:3-16.
7 WHO. The prevalence of anaemia in women: A tabulation of available information. 2nd ed. WHO, Geneva 1992.
8 Suharno D, West CE, Muhilal, Karyadi D, Hautvast JG. Lancet 1993; 342:1325-8.
9 WHO, UNICEF, and ICCIDD. Global prevalence of iodine deficiency disorders. MDIS Working Paper # 1. July 1993.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Kenya
1996

micronutrient facts
COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

A recent assessment of the micronutrient situation in the country has revealed **vitamin A deficiency** (VAD) to be a problem of public health significance, with xerophthalmia rates higher than the WHO minimum levels. Biochemical data also suggest that VAD may be high among children. **Iron deficiency anemia** (IDA), based on small studies, is found among women of reproductive age, especially among pregnant women (20-45%), and young children (70%). Low iron intake and poor bioavailability due to the high phytate, fiber, and tea consumption in the diet, and malarial and parasitic infections, contribute to IDA in the population. A national survey is required to assess the extent and magnitude of IDA in the country. Evidence from different regions of the country suggests the presence of **iodine deficiency disorders** (IDD) in the country, especially in the highlands, east and west of the Rift valley. Based on several small studies, the estimated goiter rate is 7%, although the prevalence rate in the endemic regions is much higher. Goiter prevalence of 16% has been reported in pregnant women and school-age girls.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and risk of mortality. A representative sample survey of approximately 6,500 children, 6-72 months of age from 14 districts, found prevalence of clinical VAD to be 1.1%.[1] Bitot's spots were found in 0.2%, conjunctival xerosis in 0.1%, corneal xerosis in 0.8%, and corneal scars in 0.05% of the children. The problem was mainly found in a few districts, reflecting the clustering of VAD. Subclinical VAD, based on biochemical data, was found to be high; 35% of children had serum retinol levels < 20 μg/dl.[1] A small study of vitamin A status of a sample of pregnant and lactating women in Machakos found mean serum retinol levels of women to be similar to those reported for well-nourished women, suggesting that VAD may not be a problem in these groups.[2] Large seasonal differences have been found in the intake of dietary vitamin A among lactating rural Kenyan women,[3] which may lead to short-term deficiency during part of the year. Similarly, season has been shown to have an important influence on the vitamin A intake of preschoolers from low income rural households.[4]

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. There are no national data available for the prevalence of IDA in Kenya, although small studies suggest that IDA may be prevalent among children and pregnant women.

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Government Policy and Micronutrient Interventions

Kenya may have the best developed IDD control program in East Africa. The iodization of salt started in 1970 in response to the findings of a national survey in the early 1960s showing high levels of goiter in the population. In 1978, iodization of salt was legislated, although it allowed uniodated salt to be sold as long as it was labeled correctly. At present, all salt manufacturers and distributors are required to iodate salt. Samples of salt purchased from small stores or markets in 1988, although labeled as containing iodine, contained a much lower concentration of iodine than desirable. Long storage at high temperatures decomposes iodine and decreases its content in salt. The Task Force for the Prevention and Control of Iodine Deficiency Disorders in Africa recommended that salt in African countries should contain 100 mg iodine/kg salt due to this reason, a level five times higher than that specified in Kenya. In 1988, UNICEF successfully advocated the use of higher iodization levels. A recent survey to monitor and evaluate the extent of salt iodation in 1990-91 found mean content of 799 samples was 151 mg/kg, with a majority of the samples having too much or too little iodine content.[14] Although many salt manufacturers exist in Kenya, 83% of all salt comes from five manufacturers, which should facilitate the salt monitoring and quality assurance process.

USAID

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JSI

General Data	
Total population (millions)	27.3
Urban population	27%
Under 5 mortality rate/1000	90
Infant mortality rate/1000	61
Life expectancy at birth	56
Access to health services	77%*
Per capita GNP (in US$)	270
Women's literacy	62%

Nutrition Data	
Infants with low birth weight	16%
Children exclusively breastfed 0-3 months	17%
Children under 5 stunted	33%
Children under 5 wasted	6%
Children under 5 underweight	22%
Measles coverage rate (1 year olds)	73%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Current Status - *continued from front*

Anemia was found in 72% of preschool children in Embu district of Kenya during the USAID Nutrition Collaborative Research Support Program (CRSP).[5] The prevalence of inadequate iron intakes among children was 13%.[6] Bioavailability of iron is poor because of the high phytate, fiber, and tea content in the diet.[7] A supplementation trial to examine the effect of iron on appetite and growth of primary school children found baseline prevalence of anemia (hemoglobin [Hb] < 12 g/dl) to be approximately 70-80%.[8] Virtually all the children were infected with hookworm and trichuris. Malarial parasitemia may also contribute to anemia among children; hematological parameters improved among children whose parasitemia was cleared.[9] Prevalence of anemia (Hb < 11g/dl) in women was 45% among primigravidae and 37.5% among multigravidae in the last trimester of pregnancy.[10]

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. No recent large-scale studies of IDD in Kenya have been done, but the estimated goiter prevalence based on small surveys is 7%.[11] High goiter rates (15-72%) were reported in the early 1960s, with the highest rates in the highlands of the Rift Valley, as well as in Nyanza and Western Provinces. Estimates based on urinary iodine excretion have indicated that 63% of the population of Kenya is at risk.[12] Studies of endemic goiter in 1984 in Kiambu, Kericho, Nairobi, and Mombasa demonstrated a decrease in goiter rates from previous rates found in the country.[13] While no one was detected with goiter in Mombasa, 55% at Kericho and approximately 20% each in Kiambu and Nairobi were found to have goiter. Moreover, goiter prevalence of 16% was reported in pregnant women and school girls in Embu district during the CRSP study. Thus, IDD remains an important public health problem in parts of Kenya.

International Cooperation

UNICEF has actively supported salt iodization for many years. DANIDA and Task Force Sight and Life support vitamin A supplementation of sick children and educating mothers about local vitamin A-rich foods at the Family Life Training Program centers in 13 districts.

Key Sources

1 Ngare DK. Vitamin A deficiency in Kenya. Abstract, XVII IVACG Meeting 18-22 March, Guatemala, 1996.

2 Kusin JA et al. Vitamin A status of pregnant and lactating women as assessed by serum levels in Machakos area, Kenya. East Afr Med J 1985; 62:476-9.

3 Kigutha HN et al. Maternal nutritional status may be stressed by seasonal fluctuations in food availability: evidence from rural women in Kenya. Int J Food Sci Nutr 1995; 46:247-55.

4 Kigutha HN et al. Child malnutrition in poor smallholder households in rural Kenya: an in-depth situation analysis. Eur J Clin Nutr 1995; 49:691-702.

5 Calloway DH et al. Estimated vitamin intakes of toddlers: predicted prevalence of inadequacy in village populations in Egypt, Kenya, and Mexico. Am J Clin Nutr 1993; 58:376-84.

6 Murphy SP, Beaton GH, Calloway DH. Estimated mineral intakes of toddlers: predicted prevalence of inadequacy in village populations in Egypt, Kenya, and Mexico. Am J Clin Nutr 1992; 56:565-72.

7 Neumann CG, Harrison GG. Onset and evolution of stunting in infants and children. Examples from the Human Nutrition Collaborative Research Support Program. Kenya and Egypt Studies (Review). Eur J Clin Nutr 1994; 48(suppl 1): S90-102.

8 Lawless JW et al. Iron supplementation improves appetite and growth in anemic Kenyan primary school children. J Nutr 1994; 124:645-654.

9 Keuter M et al. Parasitological, clinical and haematological response of children with plasmodium falciparum to 4-aminoquinolines and to pyrimethamine-sulfadoxine with quinine in western Kenya. Trop Geogr Med 1992; 44:1-8.

10 Brabin BJ, van den Berg H, Nijmeyer F. Folacin, cobalamin, and hematological status during pregnancy in rural Kenya: the influence of parity, gestation and Plasmodium falciparum malaria. Am J Clin Nutr 1986; 43:803-15.

11 WHO, UNICEF, and ICCIDD. Global prevalence of iodine deficiency disorders. MDIS Working Paper #1. July, 1993.

12 Hanegraaf AC. Endemic goiter in Kenya: the pattern of iodine excretion. Trop Geogr Med 1978; 30:429-38.

13 Gitau W. A review of idoine deficiency disorders in Kenya. East Afr Med J 1988; 65:727-33.

14 Muture BN, Wainaina JN. Salt iodation in Kenya for national prophylaxis of iodine deficiency disorders. East Afr Med J 1994; 71:611-3.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

micronutrient facts

COUNTRY SERIES

Malawi

1996

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

WHO considers **vitamin A deficiency** (VAD) in Malawi to be a clinical public health problem. Interventions to eliminate this deficiency in the country include vitamin A capsule distribution, increasing cultivation and consumption of vitamin A-rich foods, and food fortification. **Iron deficiency anemia** (IDA) is one of the leading causes of morbidity and mortality among children under five years of age in Malawi. Nutrition education is the major strategy for combating IDA, through clinics, women's groups, and radio. According to the WHO classification, all 24 districts in Malawi have some degree of **iodine deficiency disorders** (IDD), with widely scattered, severely endemic areas. Although legislation in 1987 required that all imported salt be iodized, this has not been enforced.

Government Policy and Micronutrient Interventions

As part of its 1992-1996 Statement of Development Policies, the government adopted a Food Security and Nutrition Policy that encompasses all issues and sectors relevant to improving the food security and nutrition situation.

Interventions to eliminate VAD include the distribution of vitamin A capsules to children under five years of age every six months and, in those areas where VAD is most prevalent, to mothers soon after delivery. High-dose capsules are also given through health centers to children with severe malnutrition, chronic diarrhea, measles, and signs of active VAD.[8] Vitamin A food fortification efforts include locally manufactured margarine (by Lever Brothers Malawi Limited), a weaning food (Likuni Phala), and some maize, while sugar is under consideration.

A major strategy for nutritional anemia is nutrition education, provided through clinics, women's groups, and radio.[9] In principle, all pregnant women are supposed to receive iron/folic supplements in all health facilities and from traditional birth attendants (TBAs). However, because supply is very erratic, distribution is limited to only some health facilities and TBAs. Malaria prophylaxis is prescribed to all pregnant women attending health facilities. Iron supplement coverage has risen from 71% to 90% of the women receiving prenatal care.

From 1984 to 1987, approximately 200,000 people with goiter received iodized oil injections through campaigns.[10] In 1990, the policy changed to giving iodized oil capsules to all females under 45 years old and to males under 16 years old in the affected areas. Traders have been instructed to sell only iodized salt. Legislation passed in 1987 requires that all imported salt be iodized, but it has not been enforced. The government is currently redrafting legislation to codify and enforce recent salt iodization decisions.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and risk of mortality. An estimated 1% of the total population is blind, and 15% of this blindness is associated with VAD and measles. A 1983 survey conducted in the Lower Shire Valley found that 75% of all monocular blindness and 30% of all bilateral blindness were caused by cornea-related blindness, most likely due to interactions among vitamin A deficiency, measles, malnutrition, and trachoma (a long-term, infectious disease of the eye).[1] The prevalence of severe xerophthalmia (clinical eye lesions leading to nutritional blindness) was 3.9%, night blindness was five times higher, and corneal scars were ten times higher than the WHO cutoff indicating VAD as a public health problem. This survey also showed that the consumption of vitamin A-rich foods was very low. More recent survey results from two districts in the central region indicated a high prevalence of subclinical VAD (22%).[2] VAD was also found to be a significant problem in some areas of the Mzimba district in the northern region and in Nkhotakota.[3] WHO considers VAD in Malawi to be a clinical public health problem.

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. Anemia is one of the leading causes of morbidity and mortality among children under five years of age. In 1970, surveys in the lower

(continued on back)

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General Data	
Total population (millions)	10.8
Urban population	13%
Under 5 mortality rate/1000	221
Infant mortality rate/1000	140
Life expectancy at birth	46
Access to health services	80% *
Per capita GNP (in US$)	200
Women's literacy	37%
Nutrition Data	
Infants with low birth weight	20%
Children exclusively breastfed 0-3 months	3%
Children under 5 stunted	49%
Children under 5 wasted	5%
Children under 5 underweight	27%
Measles coverage rate (1 year olds)	98%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

International Cooperation

With support from USAID's VITAL and VITAP Projects, The International Eye Foundation (IEF) managed a vitamin A project designed to distribute vitamin A capsules to children and postpartum mothers, improve infant and child feeding practices, and identify and treat eye diseases in the Lower Shire Valley. USAID has also supported a variety of PVO activity including: Project Hope, to work on a vitamin A capsule distribution program, and the Adventist Development and Relief Agency, Save the Children, and World Vision Relief and Development to promote the consumption of vitamin A-rich foods through home gardening initiatives.

UNICEF is supporting the procurement of two iodization plants, training of staff, and is supplying the iodate and packaging materials. This program needs to be strengthened with laboratory capacity for monitoring iodine levels in salt and with technical expertise to assist in establishing a monitoring and evaluation system. A World Bank education project beginning in FY96 supports iron, vitamin A, and iodine supplementation or fortification through the schools. Another Bank project finances iodized oil capsules and monitoring and evaluation activities. FAO/UNDP have supported the project to increase cultivation and consumption of vitamin A-rich foods.

Current Status - *cont.*

Shire Valley and in Nkhotakota showed that 75% and 42%, respectively, of children under five were anemic.[4 5] In 1986, 14% of all hospital admissions of children under five had anemia, and in 1989, anemia was the second largest cause of hospital admissions for children under five. In 1990, anemia accounted for 12.8% of all pediatric mortality in health facilities throughout the country. A more recent study conducted in Zomba district in 1991 showed that 70% of antenatal women were anemic.[6]

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. Goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. According to WHO classification, all 24 districts in Malawi have some degree of IDD.[7] Seven high-altitude districts in the north and central regions have severe IDD. Based on hospital reports, nine districts have moderate IDD, and eight districts have mild IDD. In 1984, a survey of 18,077 people in six districts found that 66% had goiter and 1.1% were cretins. This extrapolated to a countrywide estimate of 15,000 to 25,000 cretins and 1.5 to 2.5 million people at risk of IDD. In three more mountainous regions, a 1987 survey found goiter rates similar to those in the previously surveyed districts. A 1989 survey of ten districts (approximately half the country) found a total goiter rate of 12.7%, with widely scattered, severely endemic areas.

Key Sources

1 Tielsch JM et al. Am J Epidemiology 1986; 124:561-8.
2 Escoute AJ et al. Internat J Vit Nutr Res 1990; 61:10-6.
3 WHO and UNICEF. Global Prevalence of Vitamin A Deficiency. MDIS Working Paper #2. 1995
4 Burgess HJL, Burgess AP, Driessen F. Trop Geogr Med 1975; 27:375-82.
5 Ministry of Health. "Lower Shire and Nkhotakota Nutrition Surveys. Malawi," 1992.
6 Ahlgren E. "Maternal Reproduction in Malawi: With Special Reference to Reduction of Anemia Among Pregnant Women," Malawi, 1991.
7 WHO, UNICEF, and ICCIDD. Global Prevalence of Iodine Deficiency Disorders. MDIS Working Paper #1. July 1993.
8 Berger RA et al. Am J Public Health 1995; 85:718-9.
9 Ministry of Agriculture. "Food and Nutrition Situation, Policies and Programmes in Malawi - A Review," 1992.
10 UNICEF. "Universal Salt Iodization (USI) Update, No. 2, 1995." New York.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Madagascar
1996

micronutrient facts
COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

WHO characterizes Madagascar as having a mild **vitamin A deficiency** problem. However, recent nightblindness rates suggest there may be a greater problem than WHO reports. Although there are no data concerning the prevalence of **iron deficiency anemia** among young children, it is estimated that 60% of all pregnant women in the third trimester are anemic. **Iodine deficiency disorders** are present in many parts of the country. It is estimated that half of the population lives in endemic areas and over 10% live in severely endemic areas. Progress is being made toward salt iodization with assistance from UNICEF and the World Bank.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common cause of preventable blindness in children and leads to increased morbidity and risk of mortality. WHO considers Madagascar to have a mild subclinical VAD problem.[1] Nationally, 31 of the 111 administrative districts have been identified as vitamin A deficient, based on a survey of night blindness among two to six year old children conducted in 1994. Cases of xerophthalmia (clinical eye lesions leading to nutritional blindness) have been observed during the drought in the south in 1992 and following the cyclone that hit the east coast in 1994.

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. Sixty percent of all pregnant women in the third trimester are estimated to be anemic in Madagascar. Although there are no data concerning the prevalence of IDA among young children, it is also believed to be a serious problem.

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. A 1990 national survey found a total goiter rate (TGR) of 24.1%.[2] It is estimated that half of the population lives in endemic areas, and over 10% live in severely endemic areas (TGR > 30%), due to the lack of adequate iodine in the diet which may be aggravated by consumption of goitrogenic foods, such as cassava, certain green leaves, and cabbage, that interfere with utilization of iodine in the body.

International Cooperation

The World Bank's Madagascar Food Security and Nutrition Project (SECALINE), operational since mid-1993, contains an iodine deficiency disorders (IDD) program which is jointly financed and executed with UNICEF.[3, 4] The IDD program oversees the distribution of iodized capsules and provides equipment and support to the private sector to iodize salt. It is estimated that as a result of the program, almost 80% of the total salt supply in Madagascar will be iodized. The project also launched an information, education, and communication (IEC) campaign to promote the use of iodized salt, primarily through radio spots and newspaper stories. A salt monitoring system is currently being developed.

USAID's OMNI Project, in conjunction with the BASICS Project, has been requested to provide micronutrient support to the government's Service Nutrition Alimentaire (SNA). Following BASICS' approach, OMNI would target households, communities, and health workers to analyze and pilot test dietary modification methods through nutrition education. At the national level, OMNI may assist SNA and UNICEF to develop national strategies to increase the access to and coverage of micronutrient services.

USAID

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JSI

General Data	
Total population (millions)	14.3
Urban population	27%
Under 5 mortality rate/1000	164
Infant mortality rate/1000	100
Life expectancy at birth	56
Access to health services	65%*
Per capita GNP (in US$)	220
Women's literacy	73%

Nutrition Data	
Infants with low birth weight	17%
Children exclusively breastfed 0-3 months	47%
Children under 5 stunted	51%
Children under 5 wasted	5%
Children under 5 underweight	39%
Measles coverage rate (1 year olds)	54%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

Vitamin A supplement distribution has begun in the 31 districts determined to have a public health problem. UNICEF is providing the capsules and the government's Service Nutrition Alimentaire (SNA) is responsible for their distribution to all regional health centers and hospitals. UNICEF is also providing iron supplements to pregnant women.[4]

In 1992, the Government established the basis for an IDD control program. An IDD prevalence map was published, a salt distribution study was completed, and a feasibility study for salt iodization was carried out. Based on these data, the Ministry of Health, with support from UNICEF, developed a national IDD control program in November 1992 and appointed a National IDD Coordinator. The Ministry of Industry has established a National Standards Commission which will serve on the joint IDD committee, along with the Ministry of Health, and its Division of Food Safety Control.

Iodized oil has been provided to over 800,000 people living in severely endemic areas (TGR > 50%). In 1995, seven salt iodization plants were inaugurated at Toliary. Additional salt iodization plants are expected to be installed in other salt producing districts such as Morondava and Antsiranana.

A decree making salt iodization compulsory is also planned for the near future. An information, education, and communication (IEC) campaign has recently been launched, aimed at government decision makers, salt manufacturers, health personnel, and the population in general.

Key Sources

1 WHO and UNICEF. Global Prevalence of Vitamin A Deficiency. MDIS Working Paper #2. 1995.

2 WHO, UNICEF, and ICCIDD. Global Prevalence of Iodine Deficiency Disorders. MDIS Working Paper #1. July 1993.

3 The World Bank, Population and Human Resources Division. "SAR. Democratic Republic of Madagascar. Food Security and Nutrition Project." WWB-11301 MAG. February 18, 1993.

4 UNICEF. Plan d'Action National 1996, Republique de Madagascar. Projet Nutrition à Assise Communautaire. January, 1996.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Morocco
1996

micronutrient facts

COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

There are no recent data available on the vitamin A status of Moroccans. However, a nutrition survey is currently underway to assess biochemical and clinical deficiencies in the population, the results of which are expected in late 1996. **Iron deficiency anemia** (IDA) is prevalent among young children and women. Endemic goiter, which reflects **iodine deficiency disorders** (IDD) in a population, is localized in the Rif and Atlas mountains affecting 19-38% of the population living in this area.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common cause of preventable blindness in children and leads to increased morbidity and risk of mortality. The World Health Organization (WHO) states that a VAD problem probably exists in Morocco, but that there are insufficient data to know this for certain. A 1971 national survey indicated a xerophthalmia (clinical eye lesions leading to nutritional blindness) rate of 1% among children under four years of age.[1] Another study which examined the prevalence and causes of blindness, found two out of 1,165 children under five years of age to suffer from corneal lesions, while a later study found only two cases of blindness out of 1,000 children likely to be due to keratomalacia (the physical destruction of the eye caused by VAD).[2] A VAD assessment survey, which is currently underway, will estimate both clinical and subclinical VAD in the country, and results are expected in late 1996.

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. A small WHO-sponsored study of 43 pregnant women found 46% of women to be anemic.[3] A similar rate (47%) was also observed among children, 12-36 months old, in a clinic based study done in 1979 in the suburbs of Casablanca, while a national survey found over 30% of women of reproductive age to be anemic . Prevalence rates were as high as 80% in some areas. According to a World Bank report, cereal-based diets and high fertility levels are suggestive of an IDA problem among women of reproductive age, as well as among children.[4]

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. Data from the Atlas mountains indicate that IDD is endemic in this region with a goiter rate of 29%.[5] Goiter was detected in 19% of the population in Skoura and 38% in the Toundoute areas

(continued on back)

International Cooperation

USAID's OMNI Project is providing technical assistance to the MOH and USAID/Morocco to assess the vitamin A situation in the country and plan appropriate intervention steps. Since there does not appear to be an acute problem of nutritional blindness or other ocular manifestations, the MOH is most concerned with the public health consequences of mild to moderate subclinical VAD, and developing a strategy to assess vitamin A status among at-risk groups.

The World Bank has been funding a number of preparatory activities for more concerted efforts against micronutrient malnutrition. Iron intervention activities are funded by the World Bank and a loan from the Government of Japan. The World Bank and the MOH are discussing the feasibility and cost of fortifying wheat and pasta with iron. UNICEF and several NGOs are also collaborating on IDD control efforts, including the 1993 survey of goiter prevalence, which was largely supported by the local office of UNICEF. UNICEF is equipping salt producers with mixers, potassium iodate, and testing kits, and has undertaken training of personnel who will interact with both producers and consumers of iodized salt.

USAID

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JSI

General Data	
Total population (millions)	26.5
Urban population	48%
Under 5 mortality rate/1000	56
Infant mortality rate/1000	46
Life expectancy at birth	63
Access to health services	70%*
Per capita GNP (in US$)	1,040
Women's literacy	26%

Nutrition Data	
Infants with low birth weight	9%
Children exclusively breastfed 0-3 months	65%
Children under 5 stunted	23%
Children under 5 wasted	2%
Children under 5 underweight	9%
Measles coverage rate (1 year olds)	N/A

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

At the World Summit for Children in 1990, Morocco committed itself to the "Declaration on Children" and targeted the year 2000 for both virtual elimination of vitamin A deficiency and iodine deficiency, and a one-third reduction in the number of women affected by iron deficiency anemia. As a result, Morocco completed a national survey on the prevalence of iodine and iron deficiencies in 1993 and is putting into place the pieces of a micronutrient strategy. The Ministry of Health has implemented broader nutrition programs that include the delivery of vitamin A and iron supplements, distribution of a fortified complementary food (Actamine) to children whose growth was faltering, and nutrition education.

A National IDD Conference, held in March 1995, was attended by officials from the Government, NGOs, WHO, and UNICEF. The Ministry of Health announced the Government's commitment to eliminating IDD, and in November 1995, Morocco signed legislation mandating and setting standards for iodization of all salt for human consumption. This is a challenging goal considering that 43% of all salt produced in Morocco comes from small-scale producers. Iodized salt is not yet widely available and there is little consumer awareness of the benefits of switching to this product. With assistance from UNICEF, salt iodization was recently begun. The Ministry is also considering a plan to iodize wells in order to target nomadic populations living primarily in the mountains.

Pregnant women receive iron supplements through the Ministry of Health's maternal and child health program, although only an estimated 60% of women are covered nationwide, with only 3% of women in some rural areas receiving prenatal care. Iron supplements are also distributed to women through family planning outreach services. Many women may also receive the indirect benefits of taking oral contraceptives, which both reduce fertility and lower menstrual blood losses.

Current Status - *cont.*

of the mountains. Goiter prevalence was higher among females (56-75%) than males. A recent study found urinary iodine levels among goitrous and non-goitrous individuals from the endemic Skoura-Toundoute to be lower compared to those of individuals from the non-endemic region of Casablanca.[6] Moreover, analysis of the iodine content of cereals, drinking water, sea and rock salt, and cow and breast milk was found to be low. A 1993 survey found prevalence of goiter among children to be 22%. More than 26% of 281 urine samples had iodine levels indicating deficiency. Cretinism was also present in some endemic areas.

Key Sources

1 WHO and UNICEF. Global prevalence of vitamin A deficiency. MDIS Paper #2. 1995.

2 Prevalences et causes de la cecite et de la baisse de vision au Royume du Maroc: Resultats de l'enquete nationale sur les causes et al prevalence des deficiences visuelles (ENCPDV), Rapport final, Ministere de la Sante Publique, Royaume du Maroc et Organization Mondiale de la Sante, 1993.

3 World Health Organization. The prevalence of anaemia in women: A tabulation of available information. WHO, Geneva 1992.

4 The World Bank, Population and Human Resources Division. "Kingdom of Morocco. Nutrition and National Development. Issues and Options." Report No. 10674-MOR, January 4, 1994.

5 WHO, UNICEF, and ICCIDD. Global prevalence of Iodine Deficiency Disorders. MDIS Working Paper #1. July, 1993.

6 Aquaron R et al. J Endocrinol Invest 1993; 16:9-14.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Nepal
1996

micronutrient facts

COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

In Nepal, micronutrient deficiencies lead to tens of thousands of needless disabilities and deaths each year. His Majesty's Government (HMG) is committed to controlling micronutrient deficiencies, and is enacting policies, including a National Vitamin A Program featuring mass vitamin A supplementation, nutrition education programs, and an iodized oil campaign targeting control of iodine deficiency disorders by the year 2000. However, sustained nongovernmental and international assistance will be needed in the foreseeable future to achieve success in combating micronutrient deficiencies in Nepal.

Current Status

Vitamin A Deficiency (VAD)

It is estimated that VAD is related to the deaths of 14,000 to 20,000 Nepalese children annually. During 1989-1992, three studies were conducted in Nepal to look at the impact of vitamin A on child health and mortality: the Vitamin A Child Survival Project (VACSP),[1] Jumla,[2] and the Nepal Nutrition Intervention Project-Sarlahi (NNIPS).[3] The VACSP was implemented in seven districts in the plains regions, while the other two studies were implemented in single districts in the plains and hills regions, respectively. The findings of all three studies showed a significant decline in vitamin A mortality rates among children aged 6-60 months through vitamin A supplementation using high-dose (200,000 IU) capsules.

Consistent with two earlier national surveys, these studies also found a high prevalence of VAD in the study sites. An unacceptably high prevalence of VAD was consistently found in the plains region of the country where nearly 50% of the target population lives. The findings have led WHO to classify VAD in Nepal as a clinical public health problem. Subclinical VAD is likely to be five to ten times these rates.[4] VAD in pregnant and lactating women is a problem in Nepal, with night blindness affecting 6% to 16% of women in Sarlahi district[5] and 8% to 46% of women during any pregnancy in the far and mid-western districts of the country.[6]

Iron Deficiency Anemia (IDA)

Population-based information on hemoglobin (Hb) levels is presently sparse but emerging data suggest anemia to be a major nutritional problem among women and children in Nepal. A 1975 iron survey found prevalence of 19.6% among 6-23 month olds, 25.6% among 24-72 month olds, and 78% among women of childbearing age. A large survey in 1986 found a 79.3% anemia prevalence among 1-5 year old children and 83.5% among children 6-16 years old. A Joint Nutrition Support Programme study in 1986 found 70% to 80% anemia prevalence among women, and a 1987 study found 68% for the same group. Preliminary data from population-based studies in the plains show 86% of pregnant women (N=117) to be anemic (Hb < 11.0g/l) with 8% severely anemic (Hb < 7.0g/l). Among hospitalized children through 14 years of age, half or more are reported to be anemic.[7] Ascaris and hookworm infection may also be important causes of low Hb levels and IDA in children 6 months to 10 years of age, and in women of reproductive age.[8]

Adequate supplemental iron and possibly antihelminthic treatment during pregnancy may be the most realistic program responses to anemia in the near term.

Iodine Deficiency Disorders (IDD)

Nepal harbors the highest prevalence of IDD in South Asia, with an estimated ten million persons nationwide, or one in every two people, exhibiting palpable goiter. Significant levels of cretinism also exist.

A total goiter rate (TGR) of 44% in school age children observed in a 1986 national survey of 15 districts emphasizes the extent and severity of IDD in Nepal.[9] The same survey found 0.4% of children to be cretins, or 82,000 nationally, representing only the "tip of the IDD iceberg" in Nepal. A TGR of 46% was also observed in a survey of 900 school children in the hilly district of Ilam.[10] Milder iodine deficiency can affect vast numbers of people, leading to impaired physical, neurological, and mental development that can lessen the ability of Nepal's people to achieve full development capacity for themselves and as a nation.

USAID

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JSI

General Data	
Total population (millions)	21.4
Urban population	13%
Under 5 mortality rate/1000	118
Infant mortality rate/1000	84
Life expectancy at birth	53
Access to health services	N/A*
Per capita GNP (in US$)	190
Women's literacy	11%
Nutrition Data	
Infants with low birth weight	N/A
Children exclusively breastfed 0-3 months	N/A
Children under 5 stunted	69%
Children under 5 wasted	14%
Children under 5 underweight	70%
Measles coverage rate (1 year olds)	57%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

A strong political will exists in Nepal to address VAD, under the coordination of a National Planning Commission that consists of Ministries (Health, Agriculture, Education, and Local Development), non-governmental organizations (NGOs), private voluntary organizations (PVOs), and donor agencies.[11] The clear child survival benefit of vitamin A has prompted HMG to concurrently pursue vitamin A capsule distribution as a way of addressing the problem in the short-term, while striving to develop appropriate food-based strategies to improve local diets over the long term. The National Vitamin A Prevention and Control Program, which integrates national and NGO capability, was launched in 1992 and is headed by the Ministry of Health/Child Health Division (MOH). USAID/Nepal recognizes VAD as HMG's priority and this is reflected in the earmarking of funds to support the National Vitamin A Program. Additionally, the USAID-supported OMNI Project's present activities focus on the prevention and control of VAD.

A massive iodized oil campaign, implemented since 1979, has reduced IDD in highly endemic areas. Over seven million people, primarily children under fifteen and women of reproductive age, were provided with injectable iodized oil in 28 districts. Salt iodization is underway, but UNICEF estimates that currently only 18% of salt on the market is iodized. Assuring access to iodized salt in iodine-deficient hilly and mountainous regions will remain a challenge, and will likely require short-term reliance on iodized oil in some areas if HMG is to reach its target of IDD control by the year 2000.

Key Sources

1 Vitamin A Child Survival Project Report. University of Michigan, Ann Arbor, MI. March 1993.
2 Daulaire NMP, Starbuck ES, Houston RM, Church MS, Stukel TA, Pandey MR. Childhood mortality after a high dose of vitamin A in a high risk population. Br Med J 1992; 304:207-10.
3 West KP Jr., Pokhrel RP, Katz et al. Efficacy of vitamin A in reducing preschool child mortality in Nepal. Lancet 1991; 338:67-71.
4 Humphrey JH et al. Bull WHO 1992; 70:225-32.
5 Katz J et al. J Nutr 1995; 125:2122-7.
6 Linehan M, Shrestha A, Ban B, Rycus P. Xerophthalmia prevalence in 10 districts of the far and mid-western regions of Nepal. Abstract. XVII IVACG meeting, Guatemala 18-22 March 1996.
7 Baral MR et al. Nep Paed Soc J 1985; 4:101-4.
8 Curtale F et al. Panminerva Med 1993; 35:159-66.
9 WHO, UNICEF, and ICCIDD. Global prevalence of iodine deficiency disorders. MDIS Working Paper #1. July 1993.
10 Vaidya K et al. J Nep Med Assoc 1993; 31:340-7.
11 National Nutrition Policy Coordination Committee, National Planning Commission, Country Paper on Nutrition Programme in Nepal, Kathmandu, 1991.

A list of additional resources is available from OMNI upon request.

International Cooperation

As of March 1, 1995, Helen Keller International (HKI), as part of USAID's OMNI Project, is providing technical assistance to the National Vitamin A Prevention and Control Program. The Ministry of Health/Child Health Division, USAID/Nepal, and HKI's Country Representative signed an amended Memorandum of Understanding formalizing the agreement. The National Vitamin A Program targets 32 priority areas in Nepal, and is being phased in over a four-year period. These districts were selected as priority districts based on xerophthalmia data from seventy-five districts. The Program has three strategies to address VAD: capsule distribution, nutrition education, and case management.

The National Vitamin A Program is implemented through the Vitamin A NGO (VAN) Program and the Technical Assistance Group (TAG), which was established in 1993 to assist the Ministry of Health in the implementation, monitoring, and evaluation of the National Vitamin A Program. VAN was initiated by OMNI/HKI to implement the long-term strategy of the National Vitamin A Program by introducing small-scale sustainable innovations. Some NGOs have developed extensive and effective health care delivery networks that could be used as entry points for the distribution of vitamin A capsules, education of mothers about the importance of vitamin A, and increased production, preservation, and consumption of foods rich in micronutrients.

In October 1995, 14,000 Female Community Health Volunteers distributed capsules to an eligible population of 1.4 million children 6 months to 60 months old in 23 districts and 14 municipalities. Their efforts were supported with training and supervision by the MOH in 16 districts and the TAG in seven districts. UNICEF supplied all the vitamin A capsules and also offered valuable assistance with regional radio broadcasts and the printing of information, education and communication materials in local languages. Surveys have shown the coverage of the capsule supplementation to be about 86% in the target areas.

OMNI Opportunities for Micronutrient Interventions

Nicaragua
1996

micronutrient facts
COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

A national micronutrient survey conducted in 1993 found vitamin A and iron deficiencies to be prevalent at levels that represent a public health problem. Nicaragua has the second highest rate of **vitamin A deficiency** (VAD) in Central America and the Caribbean. Subclinical VAD is present in 31% of children one to five years of age, based on serum retinol levels < 20 μg/dl. The same survey found **iron deficiency anemia** (IDA) in 30-55% of young children and women. Iodized salt legislation has been in place for a long time and its effective implementation has been able to control **iodine deficiency disorders** (IDD) in the country to a large extent. A survey in 1989 showed that goiter prevalence declined from 32% in 1966 to 4.3% in 1981, although prevalence in the Pacific region reached 7.6%.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and risk of mortality. The 1993 National Micronutrient Survey found Nicaragua to have a severe clinical VAD problem; 31% of preschool age children had serum retinol <20μg/dl.[1] The prevalence of low serum retinol was higher among children belonging to low income groups (49%), as compared to those from higher income groups (25%). Dietary data reveal that vitamin A intake of children was less than 80% of the recommended daily requirements for 84% of the children in rural areas.[1] The VAD situation does not appear to have improved, and may even have deteriorated since 1966 when 20% of children, nationally, were found to have serum retinol <20μg/dl.[1]

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. According to the 1993 National Micronutrient Survey, prevalence of anemia was highest among children 12-23 months of age (55%), with a total for those 24-59 months old of 28.5%.[1] The average intake of iron among children was 6.4 mg; 57% have iron intakes less than the recommended daily amount.[1] Approximately one third of the iron was of animal origin. In rural areas, the iron intake was slightly higher (7.2 mg), but since an even smaller proportion of it comes from an animal source (20%), its iron bioavailability is likely to be poor. Among adult women, the preva-

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Government Policy and Micronutrient Interventions

The Ministry of Health (MOH) developed a comprehensive five-year micronutrient action plan. In two national health rallies per year, children 6 months to 10 years of age received vitamin A supplements with an average coverage of 69%. In addition, iron supplements are given to pregnant and lactating women, and antihelminthics to children 2-10 years of age. The MOH is willing to integrate iron and vitamin A supplementation activities into routine health services. Sugar fortification with vitamin A is being negotiated with sugar producers. Wheat flour fortification with iron is also being considered as a potential intervention for improving the iron status of women and children. A school biscuit program initiated in 1994 and currently serving 250,000 young school children, will begin fortifying the biscuits with iron and vitamin A by late-1996.

Iodized salt legislation was passed in 1969, and as much as 96% of the salt was being iodized until the political turmoil of the 1980s. The MOH, which regulates and enforces salt fortification, has set up periodic controls to improve salt quality. In 1993, 95% of all salt was iodized.[4] Despite the past setbacks, goiter prevalence has steadily declined over the years.

USAID

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JSI

General Data	
Total population (millions)	4.3
Urban population	62%
Under 5 mortality rate/1000	68
Infant mortality rate/1000	49
Life expectancy at birth	66
Access to health services	83% *
Per capita GNP (in US$)	340
Women's literacy	65%

Nutrition Data	
Infants with low birth weight	15%
Children exclusively breastfed 0-3 months	N/A
Children under 5 stunted	24%
Children under 5 wasted	2%
Children under 5 underweight	12%
Measles coverage rate (1 year olds)	74%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Current Status - *continued from front*

lence of anemia (hemoglobin <12g/dl) was 33.6%. The magnitude of IDA in pregnant and lactating women is not known but is expected to be high, since iron requirements increase during this time.

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in the population. A 1989 national survey found goiter prevalence to be 4.3% in school children 6-14 years of age.[2] The rates varied by region, with the highest prevalence found in the Pacific region (7.6%), followed by the Central region (3.1%) and the Atlantic region (1.8%). Goiter prevalence in school girls 13-14 years of age from the Pacific region, was as high as 20%. A 1993 survey in Tola (Pacific region) found a total goiter rate of 33.7% due to consumption of non-iodized salt.[3] Consequently, women and school children in Tola received iodized oil capsules. Thus, while the total goiter rate has declined considerably over the years, some regions may still be at risk for iodine deficiency. Salt for animal consumption is not iodized.

International Cooperation

USAID's OMNI Project recently supported the formulation of a Five-Year (1996-2001) National Micronutrient Plan. The lines of action for this plan are: supplementation, fortification, IEC (information, education, and communication), public health measures, training, monitoring and surveillance systems, and operations research.

The World Bank's health sector reform project funds the distribution of micronutrients for children and pregnant and lactating women. UNICEF has a revolving fund for the purchase of iodate for salt iodization.

Negotiations are being made with food producers for the vitamin A fortification of sugar. A school biscuit program using micronutrient fortified biscuits is supported by the World Food Program which provided financial support for an expansion of the program to 250,000 children in 1996.

Key Sources

1 Ministerio de Salud. Encuesta Nacional sobre Deficiencia de Micronutrientes en Nicaragua. Managua, 1993.
2 Ministerio de Salud. Prevalencia de Bocio en Escolares. Managua, 1990.
3 Navas, GE, et al. Estudio de prevalencia de bocio, excreción urinaria de yodo y disponibilidad intrafamiliar de sal yododa en Tola, Rivas. Nicaragua, 1993.
4 Navas, GE, Zelaya, M. Estudio de consumo intrafamiliar de sal yododa. Ministerio de Salud, Dirección de Nutrición. Managua, 1993.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Niger
1996

micronutrient facts
COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

Vitamin A deficiency (VAD) is a public health problem in Niger. Several studies, including a national survey done in the late 1980s, have found the prevalence of xerophthalmia to exceed the WHO minimum criteria for a public health problem. Xerophthalmia rates have ranged from 2 to 5%, and dietary data indicate wide variation in the consumption of vitamin A-rich foods by region, suggesting that VAD may cluster geographically. Few data are available on **iron deficiency anemia** (IDA) in preschool children. The prevalence of anemia is ~60% in pregnant women and school children. The cause of IDA is not clearly known, but malarial and schistosomal infections, along with poor dietary intakes and low bioavailability of iron may be potential causes. National estimates of **iodine deficiency disorders** (IDD) and goiter prevalence are not available, although small surveys have found high prevalence in some regions.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and risk of mortality. A 1986 survey in three southern provinces of Tahoua, Maradi, and Zinder found high prevalence of xerophthalmia (clinical eye lesions leading to nutritional blindness) in children below five years of age: 4% for night blindness, 0.7% for Bitot's spots, and 0.2% each for corneal xerosis/ulcers and corneal scars.[1] A national prevalence survey in 1988 found 2% of children, 6-72 months of age, to have night blindness. More recently, data from several regions showed that VAD was widely distributed with night blindness rates > 3% in Tera, Tillaberi, and Ouallam provinces. Ethnographic research suggests that pregnant women may also suffer from night blindness.[2] Subclinical VAD may also be widespread, but biochemical data are not available to examine this problem. Dietary surveys found 69% of children, 2-4 years of age, in Bouza and 28% in Ouallam to have vitamin A intakes less than the recommended amount (< 250 μg retinol equivalents/day).[3] Green leafy vegetables and animal sources were noted to be the principal sources of vitamin A in each respective district. Measles is a precipitating factor for xerophthalmia in Niger.

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. A clinic-based survey in Dosso province found 47% of 340 pregnant women to be anemic (hemoglobin [Hb] < 11g/dl), with 56% affected in the third trimester.[4] IDA may have multiple etiologies including low dietary content of iron, malarial infections, sickle cell trait (in ~20%), and parasitic infestation.[4] The Ministry of Health estimates that 60% of children are also anemic. In a village near Niamey, anemia

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International Cooperation

FAO, with financial assistance from UNDP, and in collaboration with USAID's VITAL Project, supported the Promotion of Production and Consumption of Vitamin A-Rich Foods Project in the Bouza region from 1992-1994. This successful pilot project was implemented by the Ministry of Agriculture in collaboration with the Ministry of Health and Education in six villages. The project had four main components — cultivation of vitamin A-rich foods, nutrition education and communication, food preservation and related activities, and monitoring and evaluation. UNICEF has been supplying micronutrient supplements.

Helen Keller International (HKI) operates a project in the Maradi and Tahoua regions that has reached 380,000 preschool children and 95,000 postpartum women. The project promotes consumption of vitamin A-rich foods through participatory learning activities and distributes vitamin A capsules. USAID's VITAL Project also assisted the Ministry of Health to develop a vitamin A strategy and to integrate vitamin A capsule distribution into the government's immunization program.

The international donors have been encouraging the Government of Niger to pass legislation requiring that iodized salt imported from Ghana and Senegal be iodized.

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General Data	
Total population (millions)	8.9
Urban population	17%
Under 5 mortality rate/1000	320
Infant mortality rate/1000	191
Life expectancy at birth	46
Access to health services	39% *
Per capita GNP (in US$)	270
Women's literacy	5%
Nutrition Data	
Infants with low birth weight	15%
Children exclusively breastfed 0-3 months	N/A
Children under 5 stunted	32%
Children under 5 wasted	16%
Children under 5 underweight	36%
Measles coverage rate (1 year olds)	19%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

Both vitamin A capsule distribution and horticultural interventions have been undertaken to combat VAD in the country. In a 1994 evaluation of two project zones in south-central Niger, where vitamin A supplementation had been underway since July 1994, coverage rates were approximately 8% among children 12-72 months of age and 5-15% among women after birth.[8] Vitamin A supplementation is recommended for all measles cases to reduce case fatality and prevent xerophthalmia.[9] A pilot home gardening project with the objective to increase production and promote consumption of locally available vitamin A-rich foods, using women as principal production and behavioral change agents, appeared to decrease the proportion of children in the VAD groups in the project areas as compared with non-project areas.[10] An HKI nutrition education and home gardening project in Tahoua and Mardi, showed an improvement in the frequency of consumption of vitamin A-rich foods in intervention areas.[11] USAID has financed the second phase of a vitamin A/social marketing project that uses innovative communication channels to promote the consumption of vitamin A-rich foods.[12]

Salt iodization has not been undertaken in Niger and most of the salt for consumption is imported from Ghana and Senegal. Only 1% of salt consumed in Niger is iodized. Iron supplements are provided to pregnant women seeking antenatal care.

Current Status - *continued from front*

(Hb < 12g/dl) was observed in 60% of 174 school children.[5]

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. Based on limited data from small surveys, a national estimate of the total goiter rate in Niger is 8.5%.[6] However, regional variability is high and surveys undertaken in Niamey in 1987 have shown prevalence rates ranging from 77% to 95%. A nationwide survey is required to assess the problem of IDD in the country. Determination of low urinary iodine in 293 goitrous school children and adolescents from Niamey suggests iodine deficiency to be the major causative factor for goiter endemicity.[7] A single injection of iodized oil caused a decrease in volume or complete disappearance of the goiter in 80% of the subjects. Iodine content of milk and salt was found to be low in the endemic areas.

Key Sources

1 WHO and UNICEF. Global prevalence of vitamin A deficiency. MDIS Working Paper #2. 1995.

2 Blum LS, Pelto GH. Beliefs and behavioral factors affecting vitamin A deficiency in Niger. Abstract, XVII IVACG Meeting Guatemala city, Guatemala, 18-22 March, 1996.

3 Delisle H, Bakari S. Green leaves are the main food source of vitamin A for children in some areas of Niger. Abstract, XVII IVACG Meeting Guatemala city, Guatemala, 18-22 March, 1996.

4 Gyssens IC, Meheus AZ. Ann Soc Belge Med Trop 1986; 66:257-64.

5 Prual A et al. Am J Trop Med Hyg 1992; 47:291-7.

6 WHO, UNICEF, and ICCIDD. Global prevalence of iodine deficiency disorders. MDIS Paper #1. July, 1993.

7 Aquaron R et al. Ann Endocrinol 1990; 51:231-40.

8 Baker S. Assessment of the consumption of vitamin A-rich foods, capsule coverage and related knowledge, attitude and practice in Niger using Helen Keller International Food Frequency method. Abstract, XVI IVACG meeting, Chiang Rai, Thailand, 24-28 Oct, 1994.

9 Malfait P et al. Pediatr Infect Dis J 1994; 13:38-45.

10 Mansour M et al. Piloting diet diversification through home gardens: the Niger experience. Abstract, XVI IVACG Meeting, Chiang Rai, Thailand, 24-28 Oct, 1994.

11 Burger SE et al. A simple method to evaluate whether consumption of vitamin A-rich foods increased and if so which foods: from nutrition interventions activities in two regions of Niger. Abstract, XVII IVACG Meeting Guatemala city, Guatemala, 18-22 March, 1996.

12 Mamadoultaibon A. Village theatre: use traditional communications technique to promote vitamin A food consumption in Niger. Abstract, XVI IVACG Meeting, Chiang Rai, Thailand, 24-28, Oct, 1994.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Peru
1996

micronutrient facts

COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

Vitamin A deficiency (VAD) has recently been recognized as a public health problem in Peru, with approximately one-fourth of all children having low serum retinol levels. **Iron deficiency anemia** (IDA) is significant both among children and women, especially during pregnancy. The prevention of **iodine deficiency disorders** (IDD) has received priority attention from the MOH over the past decade, with a comprehensive plan that includes iodization and marketing of salt, iodized oil administration in areas with severe IDD, and ongoing surveys for estimating IDD prevalence in the country. Based on recent surveys, the national goiter rate of 36% in 1986, has declined in recent years.[1]

Current Status

Vitamin A Deficiency (VAD)

A 1987 WHO report on clinical VAD listed Peru as a category 3 country that had sporadic cases but a prevalence that did not constitute a significant health problem.[2] However, based on a regional biochemical survey, Peru is now classified in category 1 among Latin American countries.[3] Low serum retinol levels (<20 μg/dl) were found in 33% and 14% of preschool children in the provinces of Piura and Puno, respectively.[4] The prevalence of low serum retinol levels in an urban population in the southern highlands and in shanty towns of Lima was 24%.[5]

While the above survey included only selected areas, during 1992-93 a nationally representative survey of children under four years of age showed the prevalence to be 3%, 7%, and 24% for the high, middle, and low income strata in Lima, and 21% and 24% for the coast and highland cities, respectively.[6] Stunting and low socioeconomic status were strongly associated with VAD in Lima. Earlier dietary surveys showed that families from several provinces had marginal vitamin A intake and in Puno, one of the more deficient areas, all assessed families consumed <50% of their recommended allowance for vitamin A.[4] Diarrhea has also been associated with low serum retinol among Peruvian children 6 to 18 months old, a likely reflection of the impact of infection on vitamin A status of children.[7]

Iron Deficiency Anemia (IDA)

Approximately 54% of pregnant women and 18-37% nonpregnant women living in Lima are anemic, based on small studies in 1987-88.[8] Also, 71% of all women in the northern Amazon area and 21% of pregnant women in Oroya and Puno had anemia. The last national survey on iron status, completed in 1975, found 64-75%

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International Cooperation

USAID's OMNI Project is providing technical assistance in micronutrient situational analysis and policy planning, and OMNI Research has given a grant for field testing iron fortification analysis methods in Peru. USAID has arranged for the upcoming Demographic and Health Survey (DHS) in Peru to include IDA as part of its larger DHS survey. Adding iron to the ongoing survey will be a quicker, more cost effective way of obtaining information on IDA, for which no national data are currently available.

UNICEF and PRONEDDI in collaboration with the MOH provide technical assistance and training on iodized salt production and consumer education.

The World Bank supports improved distribution of iodized salt where access is poor, iron supplementation, vitamin A supplementation for children, nutrition education to increase utilization of foods high in vitamin A, and may support iron fortification in the future. Supplementary funds for nutrition projects have been provided by the Canadian Government through a debt-swap operation and by the Subregional IDD Control Programme based in Quito, with financial support from the Belgian Government.

USAID

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JSI

General Data	
Total population (millions)	23.3
Urban population	72%
Under 5 mortality rate/1000	58
Infant mortality rate/1000	41
Life expectancy at birth	66
Access to health services	75% *
Per capita GNP (in US$)	1490
Women's literacy	80%
Nutrition Data	
Infants with low birth weight	11%
Children exclusively breastfed 0-3 months	40%
Children under 5 stunted	37%
Children under 5 wasted	1%
Children under 5 underweight	11%
Measles coverage rate (1 year olds)	75%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

The National Program for IDD Eradication (PRONEDDI) was established in 1986 to promote the use of iodized salt and the distribution of iodized oil capsules. The program has promoted the establishment of decentralized iodized oil factories, increased iodized salt production, and improved commercialization and promotion of iodized salt to consumers. Health personnel training and social communications have supported program activities. In the last five years, over 1.2 million people received iodized oil in high-risk areas (52 priority provinces). Iodized salt production has increased to cover most needs, with two plants installed recently. Estimates from the World Bank and UNICEF are that 60-90% of salt is iodized, and a bill for mandatory use of iodized salt is being considered by the National Congress. There is no nationwide vitamin A program in place currently, but increasing evidence of widespread subclinical VAD suggests the need for food fortification and other strategies to combat the problem.

Current Status - *cont.*

of 3-11 month old infants, 32-43% of preschoolers, and 20-30% of school children to be anemic. Iron absorption studies from typical Peruvian meals indicate that poor bioavailability of iron may be an important cause of anemia.[9] Megaloblastic anemia associated with diarrhea appears to be on the rise.[10] Among Indian children, ages 2-10 years, living in the Amazon, sideropenia related to parasitosis may also be an important cause of anemia.[11]

Iodine Deficiency Disorders (IDD)

IDD impairs physical and mental development, including intellectual capacity. Goiter reflects significant IDD in a population. A national survey conducted by the Unit of Control of IDD in the MOH showed a national goiter rate of 36%, and a goiter rate of 25% in jungle regions and 38% in sierra regions.[4] The highest prevalence of 54% was found in the Sierra Norte. Based on the national prevalence rate, 8 million Peruvians may be affected with IDD. While older surveys reported 3.6% cretinism, there was no evidence of its occurrence during the recent survey. Based on 834 urine sample analyses for iodine, 22% were below 25μg, 12% were between 25-50μg, and 44% were between 50-100μg iodine/g creatinine,[12] indicating levels of severe, moderate, and mild IDD, respectively, in the population.

Key Sources

1 International Council for Control of Iodine Deficiency Disorders, IDD Newsletter, Volume 12, #2, May 1996.
2 DeMaeyer EM. The geographical distribution of xerophthalmia in 1987, Map. NUT/WHO, Geneva 1987.
3 Mora JO. Vitamin A deficiency in Latin America and the Caribbean, 1994. Nutriview, Special issue 1994.
4 WHO and UNICEF. Global prevalence of vitamin A deficiency. MDIS Working Paper #2. 1995.
5 Encuesta Bioquimica del Estado de Hierro y Vitamin A. Regiones Lima y Libertadores-Wari, 1992-93. Informe final, PRISMA, Lima 1993.
6 Segura L, Cordero L, Benavente L, Marin C, Lescano A, Contreras S, Gilman J, Prisma AB. Prevalence and risk factors for low vitamin A in Peruvian children. Abst, XVII IVACG Meeting, Guatemala 1996.
7 Salazar-Lindo E, Salazar M, Alvarez JO. Association of diarrhea and low serum retinol in Peruvian children. Am J Clin Nutr 1993; 58:110-3.
8 WHO. The prevalence of anaemia in women. A tabulation of available information. 2nd ed. WHO, Geneva 1992.
9 Acosta A, Amar M, Cornbluth-Szarfarc SC et al. Iron absorption from typical Latin American diets. Am J Clin Nutr 1984; 39:953-62.
10 Frisancho O, Ulloa V, Ruiz W et al. Megaloblastic anemia associated with chronic diarrhea. A prospective multicenter study in Lima. Revista de Gastroenterologia del Peru 1994; 14:189-95.
11 Jeri A, Leroy M, Quinoz G. Mechanism of anemia seen in children living in the Amazon forest of Peru. Biomedicine & Pharmacotherapy 1987; 41:406-8.
12 Pretell EA, Dunn JT. Iodine deficiency disorders in the Americas. In: The prevention and control of Iodine Deficiency Disorders. BS Hetzel, JT Dunn, Stanbury JB eds. Elsevier Science Publishers 1987, pp 237-47.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Philippines
1996

micronutrient facts

COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

Over the past decade, National Nutrition Surveys show a steady decline in the prevalence of xerophthalmia due to **vitamin A deficiency** (VAD) among children. However, VAD remains endemic in the regions of Southern Tagalog, Eastern and Western Mindanao, and to the disadvantaged urban areas of Manila, where xerophthalmia affects 1.5% to 3% of children. National vitamin A supplementation campaigns have been underway since 1993.

Iron deficiency anemia (IDA), the most pervasive of micronutrient deficiencies, increased from 27% in 1982 to 37% in 1987, particularly affecting infants, young children, and pregnant and lactating women, but declined again according to the 1993 National Nutrition Survey, particularly among infants.

The prevalence of **iodine deficiency disorders** (IDD) varies widely by region. The 1993 National Nutrition Survey showed goiter had increased among school girls and pregnant women, prompting massive distribution of iodized oil and intensified efforts to iodize salt. In the endemic mountain regions, the prevalence of iodine deficiency is as high as 90% and cretinism has been reported.

Current Status

Vitamin A Deficiency (VAD)

VAD causes blindness and leads to increased risk of mortality and morbidity in children. It has long been identified as a significant public health problem in the Philippines. The 1993 National Nutrition Survey data indicate that xerophthalmia (clinical eye lesions leading to nutritional blindness) among preschool children declined steadily over the past decade, from 3.5% to 0.9%.[1] However, subclinical VAD persists; 35% of preschool children in the national survey had deficient plasma vitamin A levels.[2] In three underserved provinces, Quezon, Samar, and Zamboanga, survey data show clinical signs of VAD in preschool children to a degree that indicates a significant public health problem.[3] Vitamin A intakes are below recommended levels for pregnant (34%) and lactating (59%) women, among whom 0.5% to 1.6% report night blindness.[1]

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcomes including prematurity, low birth weight, and maternal mortality. The 1993 National Nutrition Survey reported IDA among 43% to 49% of older infants, pregnant and lactating women, and the elderly. These rates were practically identical to those for pregnant women in the

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International Cooperation

USAID's OMNI Project is working with the National Micronutrient Action Team, along with Helen Keller International (HKI), the Program for Appropriate Technology in Health (PATH), and the Programme Against Micronutrient Malnutrition (PAMM), on fortification and social marketing projects and advocacy. USAID has been an active supporter of micronutrient control initiatives in the Philippines, especially in vitamin A activities.

World Bank projects support iron supplementation of infants, children, and pregnant women, distribution of iodine supplements to women, and vitamin A supplementation for children. UNICEF has budgeted over $9 million during 1994-98 for micronutrient supplements and equipment for salt iodination. A women's health and safe motherhood project, supported by the Asian Development Bank, provides a package of services to women, including iron supplements.

HKI's VITEX Project, with USAID support, is working with the Nutrition Service of the DOH in three provinces to train health workers in micronutrient deficiency prevention and to develop a comprehensive weaning education package. HKI's Project MATA provides NGOs with nutrition education materials and information. HKI is also developing and testing a low-cost provincial micronutrient deficiency surveillance system.

USAID

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JSI

General Data	
Total population (millions)	66.2
Urban population	53%
Under 5 mortality rate/1000	57
Infant mortality rate/1000	44
Life expectancy at birth	66
Access to health services	76%*
Per capita GNP (in US$)	850
Women's literacy	93%
Nutrition Data	
Infants with low birth weight	15%
Children exclusively breastfed 0-3 months	33%
Children under 5 stunted	37%
Children under 5 wasted	6%
Children under 5 underweight	34%
Measles coverage rate (1 year olds)	87%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

The Philippines, as a signatory to the 1992 World Declaration on Nutrition and Global Plan of Action for Nutrition, has prepared a Philippines Plan of Action for Nutrition (PPAN). Coordinated by the National Nutrition Council, the PPAN aims to virtually eliminate iodine and vitamin A deficiencies, reduce malnutrition by 30%, and reduce IDA by 10%.[2] It calls for: periodic supplementation of vitamin A and iodine, and regular iron supplementation for infants and young children and women; fortification of staple foods such as rice and wheat, and condiments like salt, and possibly sugar; and a community-based nutrition program for improving dietary diversity and micronutrient intakes through education.

A National Micronutrient Action Team representing public and private agencies coordinates and promotes micronutrient initiatives. Prophylactic vitamin A capsule distribution to young children and (in some areas) iodine supplements for women have been added to the National Immunization Day campaigns, during which 8-9 million children receive vitamin A. Coverage rates have been high, ranging from 86% to 93% for targeted children and women. A three-year national campaign known as *Araw ng Sangkap Pinoy* ("A Day of Micronutrients") was launched in 1993, supporting vitamin A and iodized oil supplementation, and the distribution of nutrient-rich plants and seedlings, such as *malunggay* (horseradish) cuttings. The primary control strategy for anemia has been to provide iron supplements to pregnant women beginning in the second trimester of pregnancy as part of the MCH program. One area of particular concern is the ability to provide the *barangay*, or local government areas, with a continuous supply of vitamin A supplements. Currently, local government units do not have the infrastructure in place to procure the 200,000 IU vitamin A capsules available through UNICEF, nor is there a local surveillance system in place to flag provinces where levels of VAD warrant continued universal supplementation. DOH is currently developing a system for continuous coverage at the *barangay* level. Several fortification schemes have been undertaken, including fortification of a commercial margarine with vitamin A. Additional potential "carriers" include sugar (vitamin A) and drinking water (iodine) in several provinces. Legislation, advocacy, the private sector, and public education are recognized as key components to micronutrient deficiency prevention.

Current Status - *cont.*

1987 national survey[4] and are consistent with estimates of inadequate dietary iron intakes in 40% to 45% of pregnant and lactating women.[5] Hemoglobin levels decrease with advancing pregnancy, with apparent low iron stores affecting an estimated 80% of women in the third trimester.[6]

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The 1993 National Nutrition Survey found that about 40% of the population (or 25 million Filipinos) were living in iodine-deficient areas. Goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. Goiter of all grades was present in 6.9% of individuals seven years old and older, with the highest prevalence found among pregnant women. The regions with the highest prevalence of goiter for all grades were Bicol (8.6%), followed by Eastern Visayas (7.8%), and Metro Manila (7.0%). Since this survey was completed, salt iodization has increased and massive distribution of iodized oil capsules has taken place.

Key Sources

1 WHO and UNICEF. Global Prevalence of Vitamin A Deficiency. MDIS Working Paper #2. 1995.
2 National Nutrition Council, Department of Agriculture, Manila. 1993-1994.
3 Klemm R et al. Southeast Asian Journal of Tropical Medicine and Public Health 1993; 24:617.
4 Kuizon M et al. Southeast Asian Journal of Tropical Medicine and Public Health 1989; 20:461.
5 Solon FS et al. American Journal of Clinical Nutrition 1978; 31:360.
6 Perlas LA et al. Southeast Asian Journal of Tropical Medicine and Public Health 1992; 23:691.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

South Africa
1996

micronutrient facts
COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

Recent data show that **vitamin A deficiency** (VAD) is a serious public health problem in South Africa. Nationally, 12% of children 6-71 months of age have been reported to have night blindness. Biochemical data also show 18-43% of children in the same age group to have low serum retinol levels, suggesting that VAD may be more widespread. One in five children 6-71 months of age has anemia, with the highest prevalence of **iron deficiency anemia** (IDA) in those 6-23 months of age. Prevalence of anemia among pregnant women from different areas of the country ranges from 25-37%. While there are no national data to show that **iodine deficiency disorders** (IDD) are a public health problem in South Africa, indirect evidence suggests that IDD may be endemic in some regions of the country.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and risk of mortality. A national survey was conducted in 1994 in response to the paucity of data on the micronutrient status of South African children.[1, 2] Xerophthalmia (clinical eye lesions leading to nutritional blindness) rates among approximately 11,000 children, 6-71 months of age, were found to be surprisingly high since clinical VAD was not considered to be a problem previously in the country. Night blindness was prevalent in 12%, Bitot's spots in 0.4-0.8%, corneal xerosis in 0.2-0.7%, and keratomalacia or corneal scarring in 0.1%. Subclinical deficiency (serum retinol levels < 20 μg/dl) was found in an average of 33% of children, ranging from 18% in Northern Cape to 43% in the Northern Province. Prevalence of low serum retinol was higher in the rural areas (38%) than in the urban areas (25%). Serum retinol levels were found to be low in 44% of preschool age children, living in poor settlements near Durban,[3] suggesting that these groups should be targeted for vitamin A interventions. Among 189 children hospitalized for measles complications, 92% had low serum retinol levels, reinforcing WHO guidelines that vitamin A supplements should be given to children with measles.[4] Another group that may be targeted is the children of HIV-infected mothers. Vitamin A supplementation, in a randomized, clinical trial was shown to reduce diarrheal morbidity among children of HIV-infected mothers.[5]

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. A 1994 national survey found prevalence of anemia (Hemoglobin [Hb] < 11g/dl) to be 21% in children 6-71 months of age.[2] Prevalence rates of anemia were similar in urban and rural areas, as well as in boys and girls. However, low iron stores were more common in the urban areas (12%) as compared to the rural ones (8%). Using various hematological parameters, almost 30% of males and 60% of females in the baseline survey for an iron fortification trial had iron deficiency.[6] In a rural area in northern Natal, prevalence of anemia in a population with ages ranging from 6-74 years was reported to be 42% for males and 52.5% for females.[7] IDA is also common among pregnant women, especially among women of Indian origin living in South Africa. Prevalence of anemia (Hb < 11g/dl) in the third trimester of pregnancy was reported in 47% Indian and 29% black South African women attending an antenatal clinic in Durban.[8] Anemia rates increased progressively with advancing pregnancy. A number of small studies report the prevalence of anemia in pregnancy,[9] including 22-35% in Durban, 27-37% in Johannesburg and 33% in Gazankulu. In Chatsworth, 20-42% of nonpregnant Indian women were anemic.[9]

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. Very little is known regarding iodine deficiency and goiter prevalence in South Africa. A study conducted in the 1970s found mild levels of goiter in people attending a hospital in Sekhukhuneland,[11] while another small study in KwaZulu found 10% goiter prevalence in those attending a clinic.[12] Indirect evidence indicating that goiter may be prevalent in

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General Data	
Total population (millions)	40.6
Urban population	51%
Under 5 mortality rate/1000	68
Infant mortality rate/1000	52
Life expectancy at birth	63
Access to health services	N/A*
Per capita GNP (in US$)	2890
Women's literacy	79%

Nutrition Data	
Infants with low birth weight	N/A
Children exclusively breastfed 0-3 months	N/A
Children under 5 stunted	25%
Children under 5 wasted	N/A
Children under 5 underweight	N/A
Measles coverage rate (1 year olds)	76%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

In March 1995, the first meeting of the Iodine Deficiency Disorders Control Program Committee was held and attended by participants from the public sector, industry, consumer groups, and UNICEF. Legislation which took effect on December 1, 1995, requires that all salt intended for human or animal consumption be iodized. It also increased the iodization levels from 40 to 60 ppm and specified labeling procedures that require appropriate labels on packages containing iodized salt. This legislation will have implications for neighboring countries in southern Africa, since South Africa exports salt to these countries. A subcommittee has been formed to prepare for a sentinel-site IDD survey.

Based on the findings of the nutritional survey conducted by the South African Vitamin A Consultative Group (SAVACG), several recommendations have emerged for programmatic activities to be undertaken. These include a national three-year program for high dose vitamin A distribution to children 6-72 months of age and to lactating mothers within the first two months of giving birth; administration of high-dose vitamin A to all children with malnutrition, measles, or diarrhea; and a national three-year program for high-dose distribution iron sulfate syrup to all children between 6-24 months. Other recommendations include implementing measures to improve nutrition knowledge and awareness of mothers and health workers, and investigating the feasibility of various food-fortification programs. UNICEF actively supports program activities to control IDD, including IDD assessment, training, advocacy, and social mobilization.

Current Status - *continued*

parts of South Africa can be found in the distribution of this condition in the neighboring countries of southern Africa, such as Namibia, Zimbabwe, and Mozambique.[10] Although iodized salt is widely distributed, it may not reach the very isolated rural areas of the country.

Key Sources

1 SAVACG. The vitamin A status of South African children 6-71 months of age: results of a national survey, 1994. Abstract, XVII IVACG Meeting, 18-22 March, 1996.

2 Nutritview. Child malnutrition in South Africa. Issue No 1. 1996.

3 Coutsoudis A, et al. Vitamin A deficiency among children in a periurban South African settlement. Am J Clin Nutr 1993; 57:904-7.

4 Hussey GD, Klein M. A randomized, controlled trial of vitamin A in children with severe measles. N Engl J Med 1990; 323:160-4.

5 Coutsoudis A et al. The effects of vitamin A supplementation on the morbidity of children born to HIV-infected women. Am J Public Health 1995; 85:1076-81.

6 Ballot DE et al. Fortification of curry powder with NaFe(111) EDTA in an iron-deficient population: initial survey of iron status. Am J Clin Nutr 1989; 49:156-61.

7 Mayet FGH, Schutte CHJ, Reinach SG. Anaemia among the inhabitants of a rural area in northern Natal. S Afr Med J 1985; 67:458-62.

8 Mayet FGH. Anaemia of pregnancy. S Afr Med J 1985; 67:804-9.

9 WHO. The prevalence of anaemia in women: A tabulation of available information. 2nd ed. WHO, Geneva 1992.

10 Jooste PL et al. Does iodine deficiency exist in South Africa? (editorial) S Afr Med J 1995; 85:1143-4.

11 Edginton ME, Hodkinson J, Seftel HC. Disease patterns in a South African rural bantu population. S Afr Med J 1972; 46:968-7.

12 Roodt JEM, Kloppers PJ. Prevalence of goiter in the Masebuko area of KwaZulu. S Afr Med J 1980; 58:693-4.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Sri Lanka
1996

micronutrient facts

COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk. Micronutrient deficiencies on the island exist at moderate levels among children and women of reproductive age, especially in rural areas and plantation communities where about 80% of people live.

Clinical **vitamin A deficiency** (VAD) is not a public health problem nationally. A national survey of children under five years is currently underway to assess the extent of subclinical VAD.

Iron deficiency anemia (IDA) is widely prevalent among pregnant women in rural and plantation communities despite the availability of antenatal iron-folate supplements and treatments for intestinal parasites. Nationally, 35% to 58% of children and nonpregnant women have low hemoglobin (Hb) levels. Parasitic infections, especially hookworm, have been identified as a major contributing factor to anemia in women and children. Low dietary bioavailability accounts for much of the inadequate iron levels. A high intake of tea, a strong inhibitor of iron absorption, may also contribute to high levels of IDA.

Iodine deficiency disorders (IDD), clinically evident as goiter (enlargement of the thyroid gland), are endemic in the western and southwestern rural provinces of the island. This area is characterized by high rainfall and continuous leaching of the soil, depleting its iodine content. Although salt iodization seems to be the intervention of choice and has full government support, it has yet to achieve significant coverage or impact.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and risk of mortality. Night blindness was not found among children two to five years old in the most recent National Nutrition and Health Survey (NHS3).[1] The prevalence of clinical signs of VAD in children was 0.3%,[2] but the prevalence of clinical signs was 0.7% in Kegalle and Kurunegala. Nevertheless, these rates are lower than previous national estimates (1975-76)[3] suggesting that there has been an improvement in the vitamin A status of children. VAD, however, also affects women. Serum vitamin A levels measured in 496 pregnant women living in five districts were lowest among women during late pregnancy.[4] The prevalence of low serum vitamin A was highest (28%) in Galle district, and higher among low-income women. VAD is

(continued on back)

International Cooperation

USAID's OMNI Project is assisting the Government to determine the efficacy and cost-effectiveness of wheat flour fortification with iron. A national consultation was held in 1993 to develop guidelines for a national strategy for preventing anemia during pregnancy. Approaches being considered include: more effective screening for anemia, iron-folate supplementation, control of parasitic infections, and dietary modification through information, education, and communication activities.[8]

A biannual, mass deworming program, launched in January 1994, reaches approximately 200,000 children, 3-14 years of age, and pregnant women after 3 months. The program, funded by the Plantation Housing and Social Welfare Trust, is based on a study of soil-transmitted infections among children and women living on plantations.

The MOH, with support from WHO and Helen Keller International, is implementing a National Plan for the Prevention of Blindness and Visual Impairment.

USAID

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JSI

General Data	
Total population (millions)	18.1
Urban population	22%
Under 5 mortality rate/1000	19
Infant mortality rate/1000	15
Life expectancy at birth	72
Access to health services	93% *
Per capita GNP (in US$)	600
Women's literacy	85%
Nutrition Data	
Infants with low birth weight	25%
Children exclusively breastfed 0-3 months	14%
Children under 5 stunted	24%
Children under 5 wasted	16%
Children under 5 underweight	38%
Measles coverage rate (1 year olds)	84%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Current Status - *continued from front*

therefore a likely problem, at least in certain areas of Sri Lanka.

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. Results from the NHS3 showed that the prevalence of anemia was 45% among children below 5 years, 58% among children 5-10 years and 36% among those 11-19 years.[1] Prevalence of anemia among nonpregnant women was 45%. IDA among women was more strongly associated with living on tea estates (59%) than with living in urban (40%) or rural (46%) areas.[1, 5] There was a trend showing anemia increased with increasing parity.

Evaluation of two interventions to combat anemia among workers on estates revealed the impact of iron supplements and treatment for intestinal parasites on hemoglobin levels and iron status to be greater than the impact of iron supplements alone,[6] indicative of a role for parasitic infections in causing IDA. Unpublished data indicate a high prevalence of mild hookworm infection (41%) among female plantation workers.

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The endemic goiter belt in Sri Lanka is densely populated, encompassing nearly 70% of the island's population. In 1986, a 17-district survey of about 60,000 school children, aged 5-20 years, revealed a total goiter rate (TGR) of 19%.[7] TGR was higher in rural (21%) than in urban areas (16%), among girls than among boys (23% versus 14%), and in inland (21%) than in coastal (13%) areas. The magnitude of IDD varied by district, from 7% in Matale to 30% in Kalutara. Goiter prevalence was also high (63%) among 1,641 pregnant women examined during a survey conducted by the Colombo Medical Research Institute in 1987-89 in Kalutara district.

Government Policy and Micronutrient Interventions

A joint proposal of the MOH and the National Salt Corporation to iodize all salt produced in Sri Lanka was approved in 1990 by the National Health Council. However, at present only an estimated 4% of salt in Sri Lanka is iodized. The Third National Nutrition and Health Survey found only 35% of women using iodized salt, more so in urban areas (44%) than in rural areas (28%).[1]

Key Sources

1 Mudalige R, Nestel P. "Preliminary Results of the Third National Nutrition and Health Survey". Sri Lanka, Ministry of Health, 1994.
2 WHO and UNICEF. Global Prevalence of Vitamin A Deficiency. MDIS Working Paper #2. 1995
3 Brink EW et al. Am J Clin Nutr 1979; 32:84-91.
4 Jayasekera JP et al. Asia Oceania Journal of Obstetric Gynecology 1991; 17:217-24.
5 Atukorala TMS et al. Am J Clin Nutr 1994; 60:286-92.
6 UNICEF. Children and women in Sri Lanka: a situation analysis. Sri Lanka, 1991.
7 WHO, UNICEF, and ICCIDD. Global Prevalence of Iodine Deficiency Disorders. MDIS Working Paper #1. July 1993.
8 A national strategy and broad plan of action for the prevention and control of anemia in pregnancy. Sri Lanka: Ministry of Health and Women's Affairs, 1994.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Tanzania
1996

micronutrient facts
COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

All three micronutrient deficiencies are highly prevalent in this tropical African country where malaria, worm infestation, and iodine deficiency are endemic. The World Health Organization classifies **vitamin A deficiency** (VAD) in Tanzania as a clinical public health problem. Countrywide, an estimated 10,000 children are likely to suffer from VAD-related blindness at any one time. **Iron deficiency anemia** (IDA) is the most widespread nutritional disorder in Tanzania affecting 45% of children under five and 80% of pregnant and lactating women. Malaria and parasitic infections, combined with poor diet, are the major contributing factors. **Iodine deficiency disorders** (IDD) are severe in several regions of the country, especially in the southern highlands. Salt iodization, which was legislated in 1994, and iodized oil capsule supplementation are the two major national IDD control strategies.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and risk of mortality. WHO classifies VAD in Tanzania as a clinical public health problem.[1] The Tanzania Food and Nutrition Centre has estimated that xerophthalmia leads to 2,000 to 4,000 new cases of blindness every year.[2] A hospital-based xerophthalmia (clinical eye lesions leading to nutritional blindness) surveillance system and several community-based nutrition surveys suggest that VAD is particularly prevalent in the drought-prone, semi-arid areas of Dodoma, Shinyanga, Tabora, and Mwanza. A 1984 national survey conducted in eight provinces found a xerophthalmia rate of 1.5%, with VAD a problem of public health significance in Iringa province where the Bitot's spots rate was 1.6%.[1] Bitot's spots are white or gray triangular deposits on the white of the eye indicating clinical VAD. Data from the Tabora region indicated that 0.6% of 3,177 preschool children had Bitot's spots and 45.3% had serum retinol (vitamin A) levels below the cutoff point (20 μg/dl).

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. On a general population basis, nutritional anemia is the most widespread nutritional disorder in Tanzania. It affects 7.2 million people (32% of the population), 45% of children under five years, and 80% of pregnant and lactating women. A 1991 hospital-based study of 14 regions in mainland Tanzania indicated that anemia was present in 20-80% of the admissions of children under five and 18-87% of the admissions of pregnant women.[3] Also, anemia was the direct cause of 5% of maternal mortality and an underlying factor in 63-73% of maternal deaths.[3] Even so, these estimates greatly underestimate the problem because the hemoglobin (Hb) cutoff point used (Hb <8.5 g/dl) was much less than the WHO definition of anemia in pregnancy (Hb <11 g/dl). Geographically, the coastal belt and other lowland areas have the highest prevalence of anemia, with the rates decreasing inland in moderate and high altitude areas.

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. Goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. Ongoing surveys begun in 1980 indicated that nearly 40% of the population (10 million people) lived in iodine-deficient areas and are therefore at risk.[4] About 30% of prenatal mortality in the country was attributed to IDD. IDD is most severe in highland areas with persistent rainfall and in lowland areas prone to floods. The severely affected areas are also the most agriculturally productive and export food to the iodine-sufficient areas.[5, 6] However, food exported from the affected areas may be low in iodine due to leaching of the soil which depletes its iodine content.

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General Data	
Total population (millions)	28.9
Urban population	24%
Under 5 mortality rate/1000	159
Infant mortality rate/1000	105
Life expectancy at birth	52
Access to health services	80% *
Per capita GNP (in US$)	90
Women's literacy	50%
Nutrition Data	
Infants with low birth weight	14%
Children exclusively breastfed 0-3 months	32%
Children under 5 stunted	47%
Children under 5 wasted	6%
Children under 5 underweight	29%
Measles coverage rate (1 year olds)	75%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

A multi-sectoral National Vitamin A Consultative Group exists to coordinate five-year control programs. Health services, community organization, and political commitment are all well developed, and there is a sentinel xerophthalmia surveillance system. The two main approaches are (1) disease-targeted supplementation through PHC centers, with supplements supplied through the Essential Drugs Program, and (2) programs aimed at improving consumption of vitamin A-rich foods through combined communications/nutrition education and horticultural initiatives, such as school seedling nurseries and solar drying for preservation of vitamin A in certain foods.[7] Further emphasis is being placed on promoting red palm oil consumption, deworming of children, and fortification of margarine, vegetable oil, and tea with vitamin A.[8]

The nutritional anemia control program began in the early 1980s and achieved a completely funded national program in 1991. It promotes consumption of dark green leafy vegetables, animal products, and vitamin C-rich fruits, avoidance of tea and coffee with or immediately after meals, and targeted iron and folate distribution to pregnant women attending antenatal clinics.

Coordinated by the Tanzania Food and Nutrition Centre and the National Council for the Control of IDD, IDD control efforts began in 1979. Starting in 1992, imported and locally produced iodized salt has gradually become available. In April 1994, the national salt iodization program was officially inaugurated. An estimated 30-40% of salt in Tanzania is now iodized. Iodized oil capsules have been distributed to about 5 million persons 1-45 years old in severely endemic areas. A 1991 evaluation of iodized oil capsule distribution in three districts found that visible goiter rates had decreased by over 50% and the total goiter rate by over 25%.[5]

International Cooperation

A World Bank project supports the government's five-year programs for vitamin A and iron deficiencies, specifically training for assessment, production of foods rich in iron and vitamin A, supplement distribution, surveillance, and IEC. Since August 1986, SIDA has supported iodine capsule procurement and distribution in a growing number of districts.

The Royal Netherlands Government has funded the salt iodization component through UNICEF, while WHO and ICCIDD also contribute. The World Bank, SIDA, UNICEF, WHO, FAO, DANIDA, IASC, and Netherlands Government all support VAD-control efforts. The World Bank, UNICEF, WHO, DANIDA, SIDA, IPICS, and SAREC all support activities to reduce nutritional anemia.

USAID's OMNI Research is conducting an operations study targeted toward women and the use of solar drying technology to increase vitamin A intake in the dry season when vitamin A intakes are traditionally low. USAID funded an important study in Tanzania that has shown the link between malaria control and IDA in young children — a community-based insecticide impregnation of bednets program has had a positive impact on IDA in young children. USAID has also funded the pioneering work that demonstrates the link between deworming primary school children, iron status, and growth.

Key Sources

1 WHO and UNICEF. Global Prevalence of Vitamin A Deficiency. MDIS Working Paper #2. 1995.
2 Kavishe FP. "Preventing Specific Micronutrient Deficiencies: A Case Study. Tanzania," paper presented at the Micronutrient Break-Out Workshop at the International Conference on Nutrition, Rome, 1992, December 1992. TNFC Report No. 1538.
3 WHO. The prevalence of anemia in women: A tabulation of available information. 1992.
4 WHO, UNICEF, and ICCIDD. Global Prevalence of Iodine Deficiency Disorders. MDIS Working Paper #1. July 1993.
5 Kavishe FP. "Control of iodine deficiency disorders: The Tanzanian experience," NU News on Health Care in Developing Countries 3/94 (vol. 8):27-32.
6 Greiner T. "SIDA's involvement in IDD control," NU News on Health Care in Developing Countries 3/94 (vol. 8): 33-35.
7 Kavishe FP, Mushi SS. Nutrition-Relevant Actions in Tanzania. ACC/SCN, April 1993.
8 Gillespie S, Mason J. Controlling Vitamin A Deficiency. ACC/SCN State-of-the-Art Series, Nutrition Policy Discussion Paper No. 14. January 1994.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Uganda
1996

micronutrient facts
COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition—insufficient dietary intake of nutrients such as vitamin A, iron, and iodine—affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

Although the magnitude of VAD in Uganda has not been documented nationwide, several regional research studies indicate that **vitamin A deficiency (VAD)**, leading to xerophthalmia and nutritional blindness, is a significant public health problem. Preliminary results of the 1993 Ministry of Health National Micronutrient Survey suggest that **iodine deficiency disorders (IDD)** are a significant health problem in most regions of Uganda. Population-based data on **iron deficiency anemia (IDA)** are not available, but IDA is believed to be of sufficiently high prevalence to have a real impact on the health of Ugandan women and children.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common global cause of preventable blindness in children and leads to increased morbidity and mortality. Although the magnitude of VAD in Uganda has not been documented nationwide, several research studies suggest that VAD, xerophthalmia, and nutritional blindness are likely to be significant national public health problems. The results of these smaller-scale research studies indicate that national prevalence of VAD significantly exceeds the World Health Organization (WHO) minimum criteria for public health significance by three to four times. In 1991, an assessment of blindness and vitamin A deficiency prevalence was completed in the Kamuli district, a district considered to be representative of the whole country. Approximately half of children under six years of age were reported to have an insufficient dietary intake of vitamin A. An overall xerophthalmia prevalence rate of 5.4 percent was found out of a total of 5074 children under six years of age that were examined. The survey results also indicated that 2.5 percent of these preschool children had a history of night blindness, 1.0 percent had Bitots spots, 0.3 percent had corneal xerosis, and 1.7 percent had corneal scars. These rates far exceed the WHO minimum criteria for determining VAD as a problem of public health importance in a community. According to 1995 estimates, more than 200,000 preschool age children in Uganda suffer from xerophthalmia each year, and of these children, approximately 20,000 develop corneal damage. Another 11,000 children with corneal related complications become blind every year, and almost 8,000 of these children die.

Iron Deficiency Anemia (IDA)

Iron deficiency anemia increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. Although population-based data on IDA are not currently available, IDA is believed to be a significant problem in Uganda, primarily affecting women and children. More than twenty percent of low birth-weight babies born in Uganda can be attributedto IDA, and in 1990, twenty reporting hos-

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International Cooperation

USAID and UNICEF provided the technical and financial assistance to the Uganda Ministry of Health (MOH) for the Kamuli District Vitamin A Deficiency Baseline Survey performed in 1991. This survey documented vitamin A deficiency (VAD), and provided recommendations for preventing and controlling VAD in Uganda. Uganda's VAD Prevention and Control Program was initiated in 1993 by the MOH, in close collaboration with other ministries and the University of Makerere. Technical and financial support for this program have been provided by USAID, UNICEF, WHO, and various nongovernmental organizations (NGOs). UNICEF and WHO also assisted the MOH in conducting the Kamuli District Vitamin A Deficiency Baseline Survey in 1994, which will allow measurement of the impact of VAD interventions implemented in the district. The interventions found most effective in preventing and controlling VAD will then be implemented nationwide. USAID also funded the 1995 DHS report, *Nutrition and Health Status of Young Children and Their Mothers in Uganda*. This report provides analysis of the nutrition situation in Uganda, including evidence of micronutrient malnutrition to allow policy-makers to make informed decisions regarding the need for nutrition interventions.

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General Data	
Total population (millions)	20.6
Urban population	12%
Under 5 mortality rate/1000	185
Infant mortality rate/1000	111
Life expectancy at birth	45
Access to health services*	49% *
Per capita GNP (in US$)	180
Women's literacy	44%

Nutrition Data	
Infants with low birth weight	NA
Children exclusively breastfed 0-3 months	63%
Children under 5 stunted	45%
Children under 5 wasted	2%
Children under 5 underweight	23%
Measles coverage rate (1 year olds)	77%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

pitals cited anemia as the fifth most common cause of death for women. Malaria and some parasitic infections, e.g., hookworm and schistosomiasis, also contribute to the high prevalence of anemia in the country.

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter—enlargement of the thyroid gland—reflects significant iodine deficiency in a population. Two Uganda Ministry of Health studies conducted in 1991 in five high-risk areas of the country found a total goiter rate of 75 percent, and a visible goiter rate of 40 percent. While the prevalence of IDD varies by region, (with the highest incidence of IDD in the mountainous and flood-prone areas of the country), the preliminary results of the 1993 Ministry of Health Micronutrient Survey indicate that IDD is a significant health problem in most regions of Uganda. According to 1995 data, 16 percent of children ages 6-11 in Uganda have goiter.

Government Policy and Micronutrient Interventions

The Government of Uganda's commitment to addressing micronutrient malnutrition is illustrated in several key policy documents such as the Uganda National Food and Nutrition Policy (1993), Uganda National Plan of Action for Children (1993), Draft Uganda National Plan of Action for Nutrition (1995), MOH Three-Year Plan Frame (1993-96), and the MOH White Paper on Health Policy Update and Review (1993). These documents propose strategies to eliminate micronutrient deficiencies in Uganda, and focus on VAD. Vitamin A capsules are now on Uganda's list of essential drugs, and guidelines for vitamin A supplementation are included in the National Standard Treatment Guidelines.

In an effort to eliminate VAD in Uganda by the year 2000, Uganda's strategy includes awareness building, education and capacity building, public health measures, vitamin A supplementation, dietary diversification, and food fortification. The vitamin A deficiency actionplan was launched in 1994 in the Kamuli district to serve as a pilot project. With lessons learned from this pilot project, the vitamin A prevention and control program will be expanded nationwide. The highest priority activities of the program are vitamin A supplementation for the immediate prevention and control of VAD, and dietary approaches to provide a long-term sustainable approach to eliminating VAD. Dietary approaches include information, education and communication (IEC) activities to promote behavior change and increase the production and intake of foods rich in vitamin A. Uganda's sugar producers have expressed an interest in the potential to fortify household sugar with vitamin A.

After enactment of a government policy to support the universal iodization of salt, the Ugandan Government initiated a marketing campaign to increase the consumption of iodized salt. According to the 1995 Uganda Demographic Health Survey, iodized salt can be found in two-thirds of all households. These results indicate that to eliminate IDD nationwide, even greater efforts are needed to reach the remaining one-third of the population that is not consuming iodized salt.

Key Sources

Kawuma, Medi et al. Kamuli Blindness and Vitamin A Deficiency Survey, October-December 1991. Ministry of Health, Technical Report Series 1, Number 1, December 1992.

Lwamafa, D.K.W. The Kamuli District Vitamin A Deficiency Baseline Survey, September-October, 1994. Ministry of Health, Republic of Uganda, June 1995.

Nutrition and Health Status of Young Children and Their Mothers in Uganda: Findings from the 1995 Demographic and Health Survey. Macro International, Calverton, MD. 1996.

Uganda Country Health Profile. Center for International Health Information, Arlington, VA, 1995.

World Bank. Uganda Social Sector Strategy. Washington, DC, 1994.

A list of additional resources is available from OMNI upon request.

OMNI Opportunities for Micronutrient Interventions

Zambia
1996

micronutrient facts
COUNTRY SERIES

KEY POINTS

Micronutrient malnutrition — insufficient dietary intake of nutrients such as vitamin A, iron, and iodine — affects the health and survival of more than 2 billion people worldwide. Women and children are most at risk.

In Zambia, economic recession in the past decade and drought in 1991-92 have had major nutritional effects on its people. All three micronutrient deficiencies exist here at levels of public health significance. According to WHO, **vitamin A deficiency** (VAD) is a problem of public health significance in Zambia. Subclinical VAD is significant, with a prevalence rate of 13-17% among children ranging from 6 months to 12 years of age.

Low intake and poor bioavailability of dietary iron, is an important cause of **iron deficiency anemia** (IDA). Anemia is common among pregnant women and young children. Malarial infection and associated folic acid deficiency may also be primary causes of anemia among pregnant women. Malaria and intestinal parasites, particularly hookworm, are important contributing factors in children.

Iodine deficiency disorders (IDD) are endemic in Zambia. The most recent survey showed a marked decline in goiter rates since the early 1970s. Legislation mandates that all salt, which is entirely imported, be iodized. Although it is estimated that nearly all salt is iodized, levels of iodate were adequate in less than half of the samples tested.

Current Status

Vitamin A Deficiency (VAD)

VAD is the most common cause of preventable blindness in children and leads to increased morbidity and risk of mortality. VAD is a public health problem in several provinces of Zambia, notably Luapula Valley and Ndola. In a 1985 VAD survey in Luapula Valley of 4,275 children 6-72 months of age, prevalence of xerophthalmia (clinical eye lesions leading to nutritional blindness) was 1.9%, almost twice the WHO cut-off point.[1] Corneal scarring, which is responsible for about 70% of blindness among children in Africa, occurred in 0.7% of the children. In Ndola province, night blindness rates were even higher: 5% in rural areas, with subclinical deficiency in 13.6% of 6-12 year olds.[2]

Iron Deficiency Anemia (IDA)

IDA increases the risk of poor pregnancy outcome including prematurity, low birth weight, and maternal mortality. Studies done in the early 1970s show high prevalence (40-60%) of anemia among pregnant women. More recently, in Ndola province, 34% of pregnant women were found to be anemic.[3] Anemia was most common in women under 20 years old, in the third trimester of pregnancy, and in February-April when malarial transmission is the highest. Malaria and folate deficiency secondary to malarial infection, were the two most important causes of severe anemia in pregnant women.[3] IDA related to low intakes of bioavailable iron and possibly hookworm infection was also

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International Cooperation

The major bilateral micronutrient donor in Zambia is the German Agency for Technical Cooperation (GTZ), which supports the Integrated Rural Nutrition Project in the Zawamba District. This project focuses on training of community nutrition promoters regarding health care and nutrition. SIDA, DANIDA, and the Netherlands aid programs currently pay for essential drug kits to meet most of the country's requirements. FAO supports a pilot project for the prevention of VAD in Luapula that includes training activities in horticulture and nutrition and development of training materials for agricultural extension workers. Other nutrition-related projects are sponsored by IFAD, UNICEF, FINNIDA, WHO, and SIDA and through international PVOs such as World Vision and CARE. USAID's OMNI Project is developing a national approach to the monitoring, quality control, and logistics involved in the delivery of micronutrients through Zambia's new decentralized health system. Ongoing and planned USAID-funded health projects, in which there are opportunities for micronutrient components, include the current HIV/AIDS Prevention Project, the proposed Family Planning Services, and the Integrated Child Survival project.

USAID

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JSI

General Data	
Total population (millions)	9.2
Urban population	43%
Under 5 mortality rate/1000	203
Infant mortality rate/1000	114
Life expectancy at birth	49
Access to health services	75% *
Per capita GNP (in US$)	380
Women's literacy	65%
Nutrition Data	
Infants with low birth weight	13%
Children exclusively breastfed 0-3 months	13%
Children under 5 stunted	40%
Children under 5 wasted	5%
Children under 5 underweight	25%
Measles coverage rate (1 year olds)	88%

* the percentage of the population that can reach appropriate local health services by means of transport in less than one hour

Source: UNICEF. The State of the World's Children, 1996.

Government Policy and Micronutrient Interventions

Health reform, decentralizing health care to the district level, has been the major priority in recent years. In 1995 an agreement was signed to proceed with the USAID-supported Zambia Child Health Project and a greater nutrition component was subsequently added. Although Zambia has no national food and nutrition policy, a number of programs are being implemented through the Ministries of Health and Agriculture. A task force on VAD has been formed to play an advocacy role, review and refine government protocols, assess the extent of the problem, and monitor program activities. Serving on the task force are representatives from the Ministries of Health, Education, and Agriculture, several NGOs and parastatals, UNICEF, WHO, FAO, and WFP. Vitamin A capsules are not on the government's essential drug list, but are provided through hospitals. Mobile eye clinics service rural areas to provide primary eye care as part of the government's health care plan.

In principle, 90% of pregnant women who visit antenatal clinics at least once during pregnancy receive iron/folate tablets to last for the duration of the pregnancy as part of the IDA control program. No study has been conducted, however, to assess the demand and supply of iron tablets to eligible women, their adherence to prescriptions, frequency of side-effects, or impact on iron status. District health workers provide education on good dietary practices including breastfeeding and adding iron-rich foods to the diets of young children.

A task force on IDD has been established with members from the Ministries of Agriculture, Health, Trade and Industries; parastatals such as the National Food and Nutrition Commission and National Milling Center; PVOs/NGOs, such as Africare; and donor agencies — WHO, FAO, and UNICEF. Salt iodization was legislated in 1978 and most of the salt is imported from South Africa, with the remainder imported from Tanzania, Namibia, and Botswana. The Zambia Revenue Authority is responsible for monitoring iodine levels in salt upon entry into the country, and the Ministry of Health has set up a laboratory for this purpose. There is a need for a detailed, national assessment of the micronutrient deficiencies problem to identify endemic areas for targeting control programs.

Current Status - *cont.*

present. The University Teaching Hospital has estimated that 75% of pediatric admissions have anemia. Malaria is a major cause of anemia in very young children (less than 3 years) and thereafter iron deficiency increasingly becomes more important.[4]

Iodine Deficiency Disorders (IDD)

Iodine deficiency impairs physical and mental development, including intellectual capacity. The presence of goiter — enlargement of the thyroid gland — reflects significant iodine deficiency in a population. Zambia is grouped among African countries with severe and endemic IDD.[5] A 1971 national prevalence survey of 55,000 people found a goiter rate of 51%. Visible goiter prevalence was high, ranging from 15-30% in most regions, with the highest goiter rates observed in the Western and Northwestern regions of the country. A more current assessment of the IDD situation in Zambia in 1993 of 2,505 randomly-chosen primary school children from 25 schools showed a total goiter rate of 31.6% ranging from 9% in Luanshya to 82% in Livingstone in Southern Province.[6] This represents a marked decline. In the areas where the rate was extremely high, it is presumed iodized salt had not been available. It was also suggested that a high consumption of goitrogens (cassava, kale, and cabbage) could have played a role by interfering with the utilization of iodine.

Key Sources

1 Luapula Eye Disease Survey. TDRC/NFNC/ZFDS/Ministry of Health/ICEPO. Final Report 1985
2 WHO and UNICEF. Global Prevalence of Vitamin A Deficiency. MDIS Working Paper #2. 1995.
3 Fleming AF. Annals of Trop Med Parasitol 1989; 83:37-49.
4 National Food and Nutrition Commission. National Programme of Action for Health and Nutrition. Ministry of Health. Zambia 1995.
5 Darnton-Hill I, Foster SO, Galloway R, Steel A. Incorporating Nutrition into the Zambia Child Health Project. Joint Report to USAID. OMNI/BASICS/MotherCare/PAMM. OMNI 1995.
6 Lumbwe CM et al. Iodine Deficiency Disorders in Zambia: 1993 Survey. Draft Report. National Food and Nutrition Commission. Zambia/UNICEF. 1995.

A list of additional resources is available from OMNI upon request.