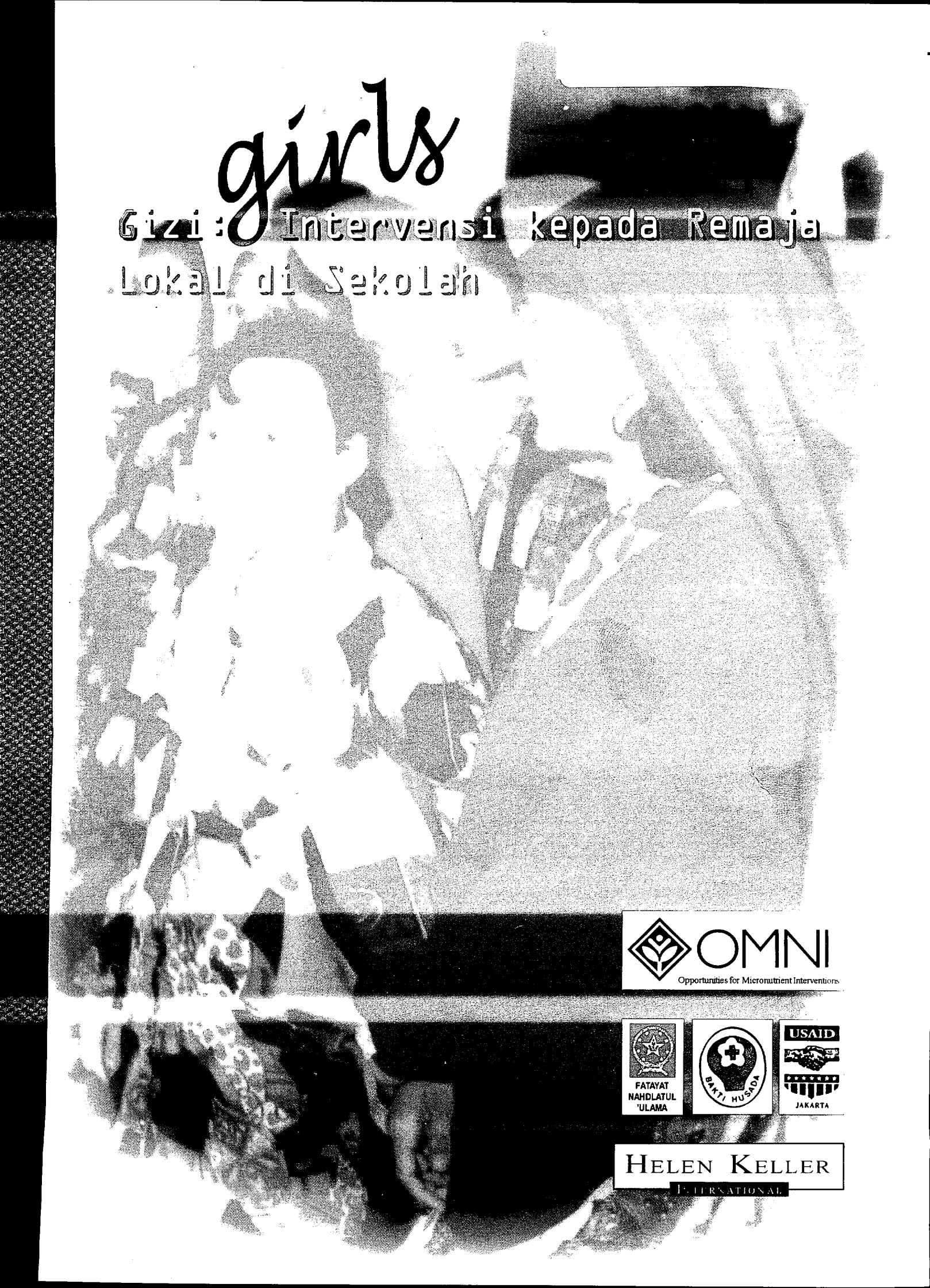

girls

Gizi: Intervensi kepada Remaja Lokal di Sekolah

OMNI
Opportunities for Micronutrient Interventions

FATAYAT NAHDLATUL 'ULAMA

BAKTI HUSADA

USAID
JAKARTA

HELEN KELLER
INTERNATIONAL

Preface

Indonesia has a long history of implementing successful strategies to combat vitamin A deficiency. Since 1974, high-dose vitamin A capsules have been distributed to children younger than 5 years old. While a nationwide survey in 1977 had found a prevalence rate of xerophthalmia of 1.3%, indicating that vitamin A deficiency was a public health problem, the survey of 1992 found a prevalence rate of only 0.3%. Thus, nutritional blindness caused by vitamin A deficiency was no longer a public health problem. However, low vitamin A status, which increases mortality risk, was still highly prevalent. Approximately 50% of the children had serum retinol levels < 0.70 mol/L.

To further improve the vitamin A status of the population and to reduce mortality related to poor vitamin A status, more groups of the population are currently being targeted. This includes giving high-dose vitamin A capsules to women within one month after delivery. Also, some food industries have recently started to fortify foods, such as noodles, with vitamin A. However, for women with a relatively low vitamin A intake, the period between the last vitamin A supplement during their first five years of life and their next possible dose, after their first delivery, appears to be too long. Therefore, additional strategies should be developed which provide women with adequate vitamin A stores before pregnancy. This will benefit both them and their newborns. One approach to reach adolescent girls is through schools.

The situation for iron deficiency is very similar to that for vitamin A deficiency. Iron deficiency anemia is found in approximately 70% of pregnant and 50% of non-pregnant women in Indonesia. Therefore, iron supplementation should also be provided to women, preferably before they become pregnant.

This report describes the development and monitoring of several school-based interventions to improve the vitamin A and iron status of adolescent girls. The interventions are: weekly supplementation with iron and/or vitamin A, dietary supplementation and nutrition education. Deworming medication is given to half of the schools in every group. Apart from the adolescent girls, the boys at school are also enrolled in the activities of the program. These school-based programs are being evaluated for their impact on nutritional status, health, school performance and physical fitness.

The monitoring of these programs will provide vital information about feasibility as well as possible impact of school-based programs for improving the health of adolescent girls. If successful, the adolescent girls will be able to cope much more effectively with the nutritional demands of pregnancy and breastfeeding, and ensure a good start of life for their newborns.

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United States Agency for International Development (USAID)

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The Girls study is a collaboration among the Department of Health of Indonesia, Opportunities for Micronutrient Interventions (OMNI), the United States Agency for International Development (USAID), Fatayat Nahdlatul 'Ulama and Helen Keller International.

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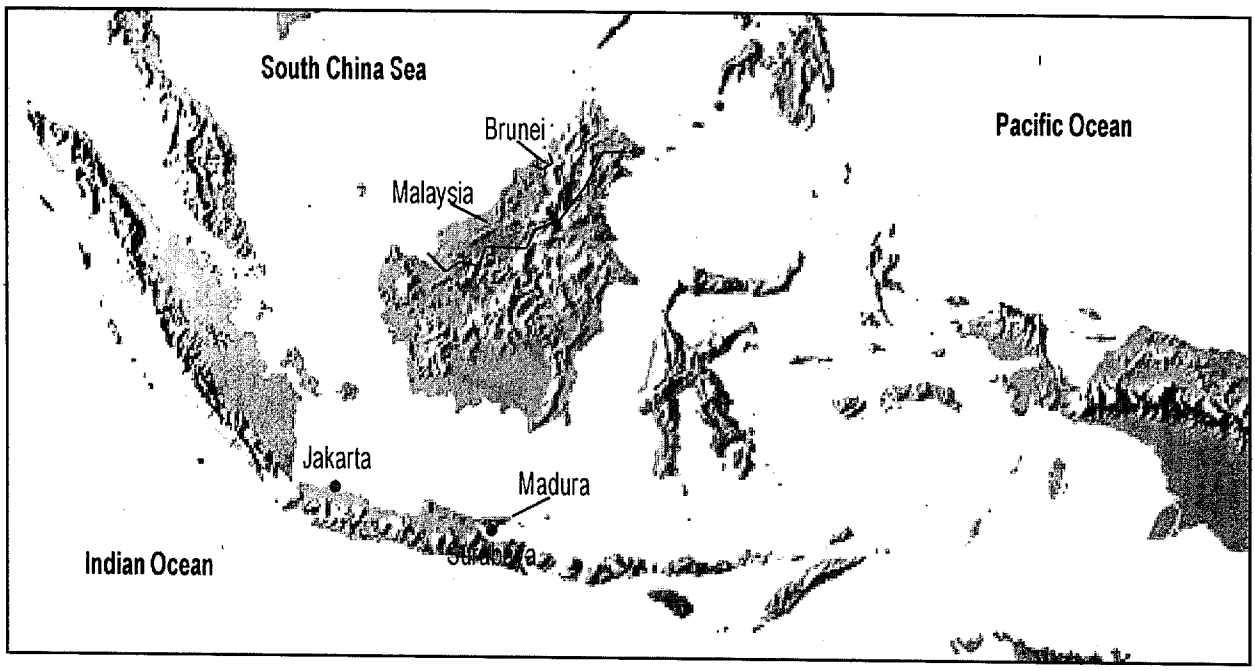
Introduction

There is growing evidence that enhancing the intake of iron and vitamin A among populations deficient in these micronutrients can result in improved growth and development. Women with adequate iron levels are less likely to have low-birth-weight babies or undergo premature delivery, and they tend to be more economically productive. According to a recent study, vitamin A deficiency (VAD) has functional and possible health consequences for women in their reproductive years and may also affect the fetus and young infant.[1]

However, female adolescents are assumed to be a more relevant target group for interventions than pregnant women, who form the current target group for the prevention of low birth weight, control of anemia and VAD. This assumption arises from the following factors:

- Adolescents are more accessible, as coverage of antenatal care is far lower than school enrollment
- VAD is already prevalent in adolescence
- It is probably most feasible to intervene during adolescence, as they are subject to fewer cultural constraints and food taboos than are pregnant women
- The most rational approach to reduce problems in pregnancy is to intervene before reproduction

Programs for adolescents are also mentioned as a goal in REPELITA VI, the Indonesian government's sixth Five-Year Development Plan. This plan is part of the government's second national Long-Term Development Program, whose objective is to improve the health and nutrition status of the adolescent in order to increase the quality of Indonesian human resources. It is certain that different approaches are needed for rural and urban communities, as underlying causal factors as well as availability and utilization of health services and educational facilities will vary within the country.



Indonesia

Capital city: Jakarta
Study areas: Surabaya and Madura

Geographic background

Indonesia is an island nation with more than 17,000 islands and a population of 193 million people, making it the country with the fourth largest population in the world. About 75% of the population lives in rural areas, and 70% of Indonesians live on the island of Java, which makes up only 7% of the country's land. Indonesia is rich in cultural, religious and ethnic variation, and it gains its strength from this diversity. Yet throughout its history there have been certain chronic nutritional problems associated with some of the traditional diets of the country's regions. These problems include micronutrient deficiencies, including iron deficiency in Indonesia's young women.

Indonesia has gone through many changes during the past few years, and its improving economics is moving it from the ranks of the world's Less Developed Countries (LDC) towards the category of Newly Industrializing Countries (NIC). With its growth steadily climbing, Indonesia's economy is moving from being based predominantly on agricultural and natural resources to being one that adds value to these resources through application of higher technologies. Indonesia succeeded in slowing down its population growth rate from 2.32% in 1971–80 to 1.97% in the following decade. The dependency rate also dropped from 71.1% to 67.8% during the same period.

Iron deficiency

Iron deficiency is the most common cause of nutritional anemia in Indonesia, affecting the majority of Indonesian women. The 1985–86

National Household Survey of 3,349 pregnant women showed that 73.7% of the respondents were anemic.

The recent survey, however, found 55% of pregnant women to be anemic, a considerable improvement over the previous seven years. A study in the eastern islands in 1991 showed an anemia prevalence of about 50% among preschool children.

Vitamin A deficiency

The 1992 national survey showed that the prevalence of xerophthalmia was 0.3%, a substantial decline from the 1.3% found in the 1977 national survey.[2] This indicates that nationally the elimination of blindness as a consequence of VAD has been achieved. However, despite this enormous achievement of the Indonesian government, there remain three provinces where nutritional blindness can be considered a public health problem: Maluku, South Sulawesi and Southeast Sulawesi.

Studies in West Java have shown that subclinical VAD is still endemic and that vitamin A intake is still not adequate among a large segment of the population. There is also an array of evidence which points to an interaction between vitamin A and iron [see box on page 5].[3]

Adolescence

The pubertal growth spurt is the period of most rapid growth, after infancy, that humans experience. Adolescents have unique nutritional needs from the biological, psychological and social points of view. Their diet must contain larger amounts of protective nutrients — including proteins, vitamins and minerals — per unit of energy consumed than the diets of prepubertal children and adults. Changes in physiological function after sexual maturity also alter nutrient needs, as illustrated by the increase in a girl's requirement for iron after her first menstruation, or the menarche, as a result of menstrual losses.

Physical growth during adolescence consists of pubescence, during which linear growth is rapid, and a later and slower period of growth after the menarche or adrenarche is reached. Females reach their full height about two years before males — the average age at peak-height velocity is 13.5 years for males and 11.5 years for females. During a year of peak-height velocity, females may grow 8.3 centimeters while males grow up to 9.5 centimeters, resulting in an average height difference of 13 centimeters.

The onset of the menses begins about one year after the peak-height velocity. Thereafter, increases in height are minimal. The menarche is followed by a deceleration in the rate of growth, along with an increase in the deposition of adipose tissue if the adolescent girl has enough energy intake. This development is indicated by an increase in the tricep-skinfold measurement and a decrease in lean body mass as a percentage of total body weight.

Why iron supplementation should start before pregnancy

It is well known that maternal anemia is a common problem in developing countries. Maternal anemia increases the risk of maternal mortality and pre-term delivery and, therefore, child survival. The cornerstone intervention for maternal anemia is supplementation with iron tablets during pregnancy. Unfortunately, evidence of the effectiveness of this approach has so far not been encouraging. In part, this problem has to do with limited availability of iron tablets, inadequate basic maternal health service and lack of compliance by those women who actually received iron tablets. Another reason is that pregnancy is a relatively short period with a very high iron requirement; thus, it is not always possible to obtain adequate iron through supplementation, especially for those women who were already iron-deficient before pregnancy. In essence, to catch up on iron intake during pregnancy is "too little, too late."

Faced with this dilemma, what are the options? One is to consider improving the iron status prior to pregnancy. This can be achieved by periodic iron supplementation under supervised conditions. The non-pregnant state is a far longer period for supplementation, and lower iron requirements make occasional supplementation — such as once a week — an approach that could make a difference. Supervised supplementation at schools and work sites assures that the iron tablets are properly utilized, and the potential gain in work productivity related to correction of iron-deficiency anemia can justify the investment for such an effort. In addition to supplementation, in areas where intestinal helminth infections are common, periodic deworming — perhaps once a year — can contribute to the improvement of iron status, as blood loss due to hookworm is a major reason for severe iron-deficiency anemia.

Iron supplementation and deworming of non-pregnant women does not represent a shift in strategy for the reduction of maternal anemia. Rather, it is an enhanced strategy to the current approach of iron supplementation during pregnancy.

— Dr. Ray Yip, UNICEF Jakarta

Adolescent perception of service providers

There is limited information on adolescents' perceptions of service providers in general. This project has many service-delivery components. It is, therefore, very important to learn about the perceptions of the adolescents.

The vitamin A generation cycle

VAD is considered one of the most prevalent micronutrient deficiencies in the world. This deficiency has always been associated with xerophthalmia, an eye disease which leads to blindness. However, it was not until the revolutionary work of Dr. Alfred Sommer and his Indonesian colleagues, including Dr. Tarwotjo and Dr. Muhilal, that the view on vitamin A changed. It was found that xerophthalmia was only the tip of the iceberg representing micronutrient problems. VAD was found to be associated with an increased risk of morbidity and mortality.[4]

An important aspect of VAD which has been ignored for the last 20

years is how it affects women in their reproductive years. It is well known that, when a person with normal liver reserves of vitamin A is put on a diet without vitamin A, it takes one to two years for the individual to develop night blindness. Night blindness in adults, would, therefore, reflect a total inadequate vitamin A status. Several reports also show that VAD in women is associated with anemia, low vitamin A content in breast milk, and an increased transmission rate of the human immunodeficiency virus (HIV) from the mother to her newborn child.

The degree to which maternal VAD and, therefore, deficiency *in utero* contributes to fetal wastage, intrauterine growth retardation and early infant mortality in humans is not known. However, animal experiments show a direct correlation between maternal and fetal liver retinol stores at all gestational ages, and particularly in late gestation.[5] Fetal lung viability depends in part on maternal vitamin A adequacy. Maternal VAD restricts the growth and development of fetal lung and other organ systems.[6] Maternal repletion of vitamin A stores during pregnancy increases the birth weight and hematologic status of the newborn and influences the mother's breast milk concentration of vitamin A during lactation.[7]

In humans, premature, low-birth-weight infants are born with low levels of liver vitamin A and circulating vitamin A. These low levels are the result of a deprived transplacental acquisition, which normally occurs in the third trimester.[8] Fetal autopsy studies among low-income groups in India show a significant association between fetal liver retinol levels and fetal growth, corrected for gestational age.[9] In poor populations where infant mortality is typically high, maternal serum retinol fails to show a characteristic rise during lactation. In addition, children of mothers suffering from night blindness were five to 11 times more likely to develop night blindness, and they had a significantly greater risk for diarrhea, respiratory infections and fever.[10]

The study established that older women were more malnourished and had a greater risk of being night-blind than younger women. There are also indications that a low intake of vitamin A in the form of beta-carotene in foods is associated with stillbirths. The evidence then shows that, apart from its importance in a child's health, vitamin A seems to be crucial for women's health and safe motherhood.

What we see here is, in fact, a clustering among generations. In countries where VAD is endemic, children are being born to mothers with low vitamin A status, resulting in low liver reserves from birth onwards. Nevertheless, during the first few months of a child's life, the vitamin A content of breast milk is enough to prevent further reduction of vitamin A.

The next stage, when the infant is between 6 months and 59 months old, is the period during which the biannual distribution of vitamin A capsules takes place in many countries where VAD is prevalent. Even assuming 100% coverage, the effect

A previous study on adolescents

In a recent study, adolescent Indonesian girls from middle-income families were given vitamin A and iron supplements. According to authors Werner Schultink and Imelda Angeles, the findings revealed that, to boost hemoglobin levels, weekly doses of iron were as effective as daily doses and 60 milligrams of iron was as effective as 120 milligrams. They also found that the most effective intervention was 20,000 IU of vitamin A combined with the iron dose.[11]

of the capsules lasts for a period of four to six months only, which is certainly not enough to increase the child's liver reserves.

The final and complete breakdown in interventions takes place in the 6-to-20-years age group, where there are essentially no projects on the improvement of the diet in relation to vitamin A. It is in the latter part of this age group when major life changes take place: a girl will be married by the time she is 18 years old and will have given birth to her first child within the next two years. This child will be born with low liver reserves of vitamin A. Every new pregnancy and subsequent lactation will further deplete both the mother's and her child's health.

Conclusion

From the above observations we can draw the following conclusions:

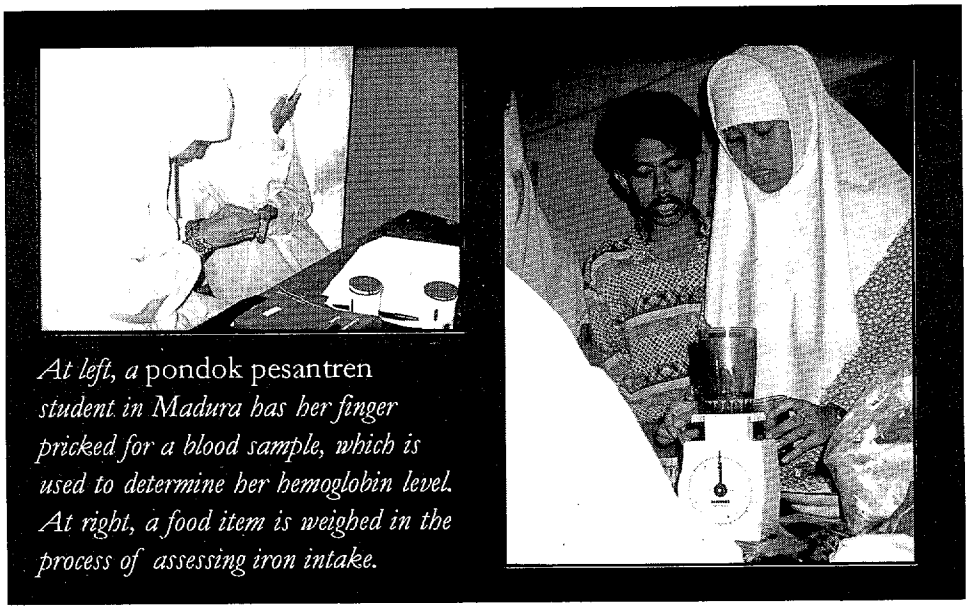
- VAD is prevalent among women in areas where VAD is endemic.
- VAD has negative effects on the health status of both a mother as well as her offspring; therefore, programs should improve the vitamin A status of women from early childhood and continuing during the reproductive years.
- Improvement of iron nourishment in combination with vitamin A supplementation will exert a greater impact against the prevalence of anemia than the individual application of each strategy.
- Vitamin A is essential for normal health and survival.
- VAD increases mortality among children aged 6 months through 6 years; thus, improving the vitamin A status of children suffering from VAD dramatically increases their chances of survival. Intervention by vitamin A supplementation reduces childhood mortality in populations where diarrhea and ARI are leading causes of death.

Supplementing and fortifying the adolescent diet

For many students in Indonesia, lunch or recess time often means a trip to the nearest *warung,* one of the roadside booths that serve as convenience stores, or the closest *warteg* or food stall. Anything from a quick snack of Jetz crackers or Indomie to a more elaborate *nasi rames* from these stalls will satisfy the midday stomach rumbles.

However, the adolescent years call for a diet containing more protective nutrients than the diets of childhood and adult years — and this requirement is often not met. This is especially true for girls in the age range of 12 to 15 years, who particularly need a lot of iron as well as vitamin A in their diets. Adolescent girls must maintain high levels of these nutrients in preparation for their future role as mothers. A woman with low stores of iron and vitamin A passes these deficiencies on to her children; therefore, the consequences of an adolescent diet low in iron and vitamin A do affect others and may create a cycle of deficiencies.

To solve this problem — aside from establishing supplementation programs for adolescents — the Indonesian government, together with the country's food industry, is conducting the fortification of staple foods. One project, implemented by the Bogor Center for Nutrition Research and Development in 1995, involves the fortification of instant noodles with iron and vitamin A.[12] Instant noodles was chosen because it is a popular food item across all ages, and is featured in the menus of many warungs and wartegs.



At left, a pondok pesantren *student in Madura has her finger pricked for a blood sample, which is used to determine her hemoglobin level. At right, a food item is weighed in the process of assessing iron intake.*

Project description

Goals

This project will assess the impact of various strategies of improving iron and vitamin A nutriture in female adolescents. It will serve the long-range goal of improving reproductive health by reducing micronutrient deficiencies.

The specific objectives of the study are:

- To quantify the prevalence of iron and vitamin A deficiencies among female adolescents in rural and urban communities
- To assess the direct causes and underlying factors, as well as the processes, which lead to the quantitative and qualitative inadequacy of habitual diets of female adolescents in rural and urban communities
- To assess the appropriateness of the school as a channel through which the nutritional problems of adolescents can be addressed
- To test the effectiveness of several interventions for female adolescents

Population and location

This intervention study is being performed in Surabaya and Madura, both in the East Java province. The school system, with its nine years of compulsory education for all, provides us with the opportunity to reach adolescents through the school. Both state and private schools — including the *pondok pesantren* or Islamic boarding schools in Madura — are involved, and a total of 32 schools have been selected. Thus, the population of the study consists of all pupils aged 12 to 15 years in the selected schools, making a total of approximately 8,000 children. These pupils are in grade levels I, II and III in the state schools.

Although the study is focused on adolescent girls, the setting in schools automatically means that boys present will also join in all activities, including those concerning the intervention as well as the monitoring. This provides us the opportunity to obtain information on adolescent boys as well.

People behind the study

The program manager

Damayanti Soekarjo, a 29-year-old Dutch-trained medical doctor, is the project manager of the study. After completing her medical education in 1994, Dr. Soekarjo spent several months working in the hospitals of the United Kingdom before moving to Surabaya with her husband. She joined HKI in January 1996, and has been running the adolescent program ever since.

As project manager, Dr. Soekarjo is responsible for the planning and execution of all activities in the field. She is also the program's liaison officer for the governmental and non-government institutions involved in the study, such as the Islamic women's organization Fatayat NU [see below].

After selecting the schools to be observed in the study, Dr. Soekarjo supervised the mid-October baseline data collection in the *pondok pesantren* in Madura. Approximately 1,400 students were surveyed within two and a half weeks, and the preliminary results were interesting as well as encouraging for the study [see box on page 10]. "We plan to finish the survey before the end-of-the-year holidays so that we can start on the interventions, especially the supplementation, immediately after the holidays," said Dr. Soekarjo. She added that the qualitative data collection is slated for the second week of January 1997, which begins the fasting month when the schools will have a reduced schedule and be closed part of the time.

The director of Fatayat Nahdlatul 'Ulama

Fatayat NU had been conducting an extensive adolescent program in Madura for 10 years before lending its assistance to HKI for the Girls study. According to Dra. Ermalena MHS, director of Fatayat NU's central office, Madura contains the majority of the organization's members.

A 1984 survey revealed the membership of Fatayat NU to be as large as 5 million, comprising women aged 15 to 35 years from 26 provinces throughout Indonesia. Established "to address the concerns of the young women of the organization in particular and the women of Indonesia in general," according to its mission statement, Fatayat NU today consists of departments in several areas, including health, education, socio-economics, communications, research and development, and the arts and athletics. All its members are volunteers.

Dra. Ermalena has been with Fatayat NU for 16 years and has been an HKI employee for six years. Recently she set up the *Yayasan Binaswadaya Wanita*, a foundation for women that will conduct large-scale programs such as economic intervention and informal education, aimed at increasing the quality of women's lives in Indonesia. She also has plans of stepping into the political world next year by becoming a parliamentary candidate. "With politics I would be involved in decision making," Dra. Ermalena said. "Outside politics, no one hears women's voices, but inside, they will hear us and changes can happen."

Timeline of the study

Preparations
(October 1996)

In this first stage, the data entry system, as well as the questionnaire and a brochure for the parents of the pupils to be selected, were developed and finalized. The brochure was designed by a staff member of the *Dinas Kesehatan*, the Provincial Office for Health Services. It contained many illustrations and as little text as possible, and was used to explain the study to the parents and to get their consent for blood sampling of their children.

Meeting with school headmasters
(October 1996)

The brochures were distributed at a meeting with the headmasters of the schools that could potentially be used in the study.

The criteria for selecting the schools are the number of students enrolled and the location of the school. The average number of students in each school should be 250; and no two schools of the same type in one *kecamatan*, or sub-district, will be selected. The urban schools selected are the ones located in the outskirts of the towns in the project area, and the rural schools are at *kecamatan* level and reachable by motorcycle.

In each project area, the headmasters of all the schools were invited to a meeting in the Provincial Office of the Department of Education, where the study was introduced to them and they were asked to participate. Of the 24 schools invited, 21 sent representatives. Representing HKI were the program manager and her two assistants as well as all 15 field supervisors. After an introduction by officials from the Department of Education, the program manager explained the study to the headmasters. All agreed to take part in the activities. It was also agreed that the study administrators should meet with the parents of each school's students at each school's regular grade-report meetings, as it is difficult to call a special meeting with the parents.

Meeting with parents
(November 1996)

The parent meetings were scheduled to take place on Nov. 2 and Nov. 9. At each of these meetings the parents were asked to consent to the taking of blood samples from their children for study purposes. Each school in which more than 50% of the parents consent will be included in the study. This process is repeated until the required number of schools is obtained.

Schools were selected for the study only after informed consent was obtained from the pupils' parents for both peripheral and venous blood sampling. Students found to have severe anemia were advised to get medical help. After the study, all pupils involved will receive a single dose of the deworming drug Albendazole.

Baseline survey
(October–December 1996)

To assess the impact of the interventions, data will be collected on three occasions: baseline, midterm (after approximately six months) and post-intervention. Both qualitative and quantitative

Preliminary results of the baseline survey

Preliminary results of the mid-October survey of 1,400 *pondok pesantren* students are showing a mean anemia prevalence of 29% among the girls and 23% among the boys. Meanwhile, the anthropometric measurements show many cases of stunted growth among the girls, which shows lack of nutrient intake on their part.

The project's supplementation component is due to start in the first week of January 1997.

data is collected at baseline and post-intervention, while only qualitative data is collected at midterm.

The baseline survey of the *pondok pesantren* students in Madura was completed in October this year, and the data will be analyzed in December. As the students in the other schools either had exams or were on vacation in October, data collection in those schools was conducted in early November. Data from *pondok pesantren* pupils were collected in two and a half weeks. Samples of blood and feces were also collected from a subsample group.

In some schools, teachers were very cooperative and the pupils easy to handle. In others, the lack of a separate room in which to conduct the data collection made for a difficult working environment. However, on the whole, no serious problems arose — for example, the question about the menarche proved to be no obstacle, especially when asked by a female enumerator.

The midterm data collection is slated between March and July of 1997, and analysis will be performed in July or August that year. Post-intervention data collection is expected to take place in September or October of 1998, and the data will be analyzed that November.

All data collection is done by field supervisors, assisted logistically by the teachers. Quality control is the task of the two assistant field managers, who will re-measure a random 10% subsample. If the difference between the two measurements exceeds 5%, all measurements will be repeated after retraining of the field supervisors.

Basic data collected from the entire population

Interview

A standardized questionnaire is used to interview the pupils on the following subjects: socio-economic data, menarche or adrenarche and intake of vitamin A through food and supplements. The socio-economic data includes maternal age and education, family size, family's main income source, sanitation and 24-hour recall of food intake. Calculations of vitamin A intake will be done using an HKI variation on the vitamin A intake assessment method developed by the International Vitamin A Consultative Group (IVACG) [see box on page 11].

Anthropometry

Anthropometric measurements consists of height, weight and mid-upper-arm circumference. Height is measured using a microtoise to the nearest 0.1 centimeter, weight is measured using a Soehnle digital weighing scale to the nearest 0.1 kilogram, and arm circumference is measured using a special measuring tape developed by the Department of Health.

Hemoglobin

Hemoglobin levels are determined using Hemocue, from peripheral blood taken from the fingertip.

Functional tests

These comprise a physical-fitness test and an assessment of the pupils' academic achievement. To assess aerobic metabolism, a modified Cooper test will be performed during which the pupils will run one and a half kilometers. Grade reports will be collected on various academic subjects, and a separate test may be developed to examine the pupils in a standardized way. These tests will provide clues to how the pupils' nutrition status affects their physical and intellectual performance.

Data collected from a subsample

Intake diary

To get a better impression of food patterns, a subsample of students are asked to keep diaries of food intake during one week.

Serum retinol and ferritin levels

From each of these students, 3 cubic centimeters of venous blood is obtained from the central cubital vein. The blood is centrifuged to obtain serum, which is then transferred to serum tubes stored in a freezer until transportation to the Center for Nutrition Research and Development in Bogor. The serum samples are analyzed for retinol and ferritin as well as other indicators of iron and vitamin A status.

Intestinal parasites

Fecal samples are collected and investigated, using the Kato-Katz kit, for evidence of hookworm and ascaris infestation.

Attitudes and factors influencing dietary behavior

Qualitative data will be collected from a subsample which will not necessarily be the same, both in

Monitoring vitamin A intake

The Girls study will be evaluated for its impact on status as well as intake of both vitamin A and iron. In the past, there was no methodology for assessing vitamin A intake that could be used on a large scale and correlated with vitamin A status. Recently, however, HKI Indonesia developed a methodology for assessment of vitamin A intake which is also being used in Bangladesh and Vietnam.[13,14]

The methodology was developed for HKI's Central Java project, where it was found to be very easy to use in the field. It also appeared possible to distinguish between subjects with serum retinol levels above the median of the population and those with levels below the median. The methodology developed for the Girls study is a refinement of the one used in Central Java.[15]

Described briefly, the methodology is semi-quantitative and consists of a 24-hour recall of food consumption with a classification of foods into 10 categories. The categories include foods with high, medium and low content of vitamin A, and are classified into animal f

oods, vegetables, fruits and fortified foods. For each food category there are seven sub-categories for the vitamin A content of the portion of food consumed. This methodology will enable an evaluation of the relative changes in amount as well as sources of vitamin A intake.

Division of the subsample group

Type of intervention	Vitamin A supplements	Iron supplements	Vit. A + iron supplements	Diet	Controls
Number of schools or grades	15 grades	15 grades	15 grades	2 schools	15 schools
Number of samples per school or grade	12	12	12	84	12

number and in the individuals involved, as the subsample used in the collection of the quantitative data above. The methods used for the qualitative data collection are focus-group discussions, diaries of expenditure and behavior, and in-depth interviews. The selection of the subsample will be based on the subgroups in the population, in order to obtain an impression of the variations in behavior that can be found in the population under study.

Subsample size

The sparse data available on anemia prevalence among Indonesian adolescent girls show an anemia prevalence of 30%, and there is no reason to assume that it should be different in the population in this study.

To allow detection of a 50% reduction from this prevalence, and accounting for an expected 25% dropout rate, 168 samples per cohort are needed. There is a total of five cohorts: vitamin A supplementation, iron supplementation, vitamin A and iron supplementation, dietary intervention, and controls (including education).

Therefore, the total subsample size will be 840 students. This number will be divided randomly over the schools and grade levels, as shown in the table above.

All activities in this study will be carried out in close cooperation with the departments of Health, Education and Religion at local, provincial and central levels. The intervention will be linked, as far as appropriate, to the *Usaha Kesehatan Sekolah* (UKS), or school health system.

Interventions

(January 1997–March 1998)

In order to determine the most effective interventions in the various settings, the study comprises three independent interventions: supplementation, dietary approach and education. The period of intervention will last one and a half years, during which the day-to-day activities in the schools will be performed by teachers and pupils, as far as possible, in communication with and under the supervision of the field supervisors.

The schools are randomly assigned to one of the three interventions, with the ratio shown in the table on page 13.

In addition, the pupils in half the schools in each intervention group will receive a single 400-milligram dose of the anthelminthic, or deworming, drug Albendazole.

Supplementation

Three types of supplementation will be given to the pupils in the intervention groups: vitamin A alone, iron alone, and vitamin A combined with iron. These interventions will be randomized over the grade levels rather than over the schools, to minimize the effects of dropouts. Those in the vitamin A group will receive a weekly 10,000-IU dose of of vitamin A. The iron-group students will receive a weekly dose of 60 milligrams of elemental iron combined with folate. Supplements will be taken in the presence of a field supervisor.

Dietary approach

This approach will be used in the *pondok pesantren* alone, as the nature of these schools makes them better suited for such an intervention than regular schools. The pupils in these schools will receive one free, nutritious and balanced meal a day for six consecutive months. As the dietary intervention is a cost-intensive intervention, it will be given in only two schools.

The meals will be prepared in the school canteens by school staff members using locally available and acceptable foods. Therefore, the canteens will be upgraded — that is, the staff will be trained and the quality of the kitchen will be improved. The field supervisors will act as supervisors and consultants while the actual activities will be performed by the schools, with funding provided.

Division of interventions over schools

School area	Type*	Suppl.	Diet	Educ.	Controls	Total
Surabaya	SMP	6		1	1	8
Surabaya	SMP-K	1				1
Surabaya	MT	4		2	1	7
Bangkalan	SMP	2		1	1	4
Bangkalan	PP		1	2	1	4
Sampang	SMP	2		1	1	4
Sampang	PP		1	1	2	4

* SMP = *Sekolah Menengah Pertama*
SMP-K = *Sekolah Menengah Pertama Kristen*
MT = *Madrasah Tsanawiyah*
(Junior high schools)

PP = *Pondok pesantren*
(Islamic boarding school)

The total number of selected schools in the study is 32. The table shows the number of schools subjected to the three interventions in the study and the number of schools used as control groups. These schools are located in the project areas, which are the city of Surabaya and the towns of Bangkalan and Sampang in Madura. [illegible]

Education

This intervention comes in the form of Health Education Packages (HEP). Based on the information obtained in the qualitative data collection, different types of HEPs will be developed to suit the various school settings — urban, rural, general and religious. The packages are aimed at developing awareness of the importance of micronutrients, and will take the form of one-week courses or projects incorporated into the existing school health system, UKS.

As Indonesia is preparing for the upcoming elections, this intervention will be launched only after the elections, preferably in the academic year 1997–98.

Control group

The pupils in schools in the control group will not receive any special intervention. All existing government programs will continue as before.

End report
(December 1998)

Results of the study will be reported at the end of its two-year run, after analysis of the post-intervention data.

The TAG meeting

On November 26 and 27, the TAG meeting was held in Jakarta to discuss the progress of the four components of the OMNI program in Indonesia. Representatives from HKI and PATH, which are each responsible for two of the four components, presented their results.

On the second day, HKI presented the Girls project. HKI had invited Dr. Ray Yip from UNICEF to present the study's scientific background. In his presentation, Dr. Yip explained the use of hemoglobin distribution as a tool to identify the magnitude of iron deficiency among populations at risk. He also explained that the window of supplementation during pregnancy is short in comparison with the opportunity to increase women's iron stores during adolescence and the pre-marriage period. Dr. Yip said the so-called expanded opportunities to deliver iron to women should be used and that the Girls program is a good example of how this could work.

The second speaker of the HKI session was Dr. Damayanti Soekarjo, who presented the program design and related issues (which are presented in this report).

Dr. Muhilal, who moderated this session, mentioned that the program fits very well in the Indonesian government's REPELITA VI and the upcoming REPELITA VII. The school as a channel of delivery is welcomed by the government. The program would strengthen the development of human resources, which is one of the themes in recent REPELITA programs.

During the closing presentation by Drs. Kodyat and Dr. Kumara Rai, it was mentioned that there was a need for additional coordination meetings to be held on a regular basis. Greater supervision and more involvement by the central government is also needed in the process of these four components of the OMNI program.

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