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THE
NUTRITION
AND
LIVES
OF
ADOLESCENTS
IN
DEVELOPING
COUNTRIES



FINDINGS FROM
THE NUTRITION OF
ADOLESCENT GIRLS
RESEARCH PROGRAM



Kathleen M. Kurz
and
Charlotte Johnson-Welch



INTERNATIONAL CENTER FOR RESEARCH ON WOMEN

*The Nutrition and
Lives of Adolescents in
Developing Countries:*

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Charlotte Johnson-Waich

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■ INTRODUCTION

World interest in adolescent health issues has grown dramatically in the past decade, beginning with the International Year of Youth in 1985 and the World Health Assembly in 1989, when discussions focused on the health of youth. The reasons for this burgeoning interest are varied and include the number of adolescents alone, which makes them a formidable group. Youth 10-24 years old comprise about 30 percent of the world's population, and their proportion is rising relative to other age groups. Between 1960 and 1980, world population increased by 46 percent while the population of youth increased 66 percent (Blum 1991). An overwhelming proportion of young people live in developing countries, and this percentage is rapidly expanding. While in 1980 77 percent of young people in the world lived in developing countries, it is estimated that this will grow to 83 percent by the year 2000 (Blum 1991).

A second reason for the growing interest in adolescents is the problem of adolescent sexual activity. Because there has been a dramatic increase in this behavior over the past few decades, there has been a consequent rise in the incidence of adolescent pregnancy and sexually transmitted diseases, including HIV infection. Evidence from survey data around the world indicates that a substantial proportion of unmarried adolescents are sexually experienced and that in many countries the age at first intercourse has declined (Senderowitz 1995). Factors explaining this are earlier sexual maturation, decreasing consensus about acceptable adolescent behavior, lack of accurate knowledge of sex and reproduction, declining cultural and religious influence, urbanization, and late marriage (Koetsawang 1990).

A third reason is that health services are not meeting the needs of adolescents, focusing instead on children 0-5 years old and pregnant women, especially in developing countries. While these two vulnerable groups indeed deserve much attention, the lack of attention to

adolescents leaves several important questions unanswered. Do adolescents have health problems or concerns that are left unaddressed? And, looking to the future, could investments in promoting health during adolescence, such as reducing adolescent pregnancy, sexually transmitted diseases, and the early stages of chronic disease, decrease health problems and costs during the adult years?

Finally, because behavioral issues are often the key to good health, and adolescence is a key period in which many behaviors are formed, this period can be viewed as a window of opportunity. Helping adolescents to develop skills that include constructive behaviors is a way of opening this window and helping them build better futures with more education and job skills, and with more confidence and life skills to withstand negative events in their lives.

As a result of these factors, attention has focused on developing strategies for assessing and correcting adolescent health problems, and taking advantage of this window of opportunity. Perhaps the most interesting development is recognition that the focus on adolescents should be on the development of the whole adolescent, including social development (Friedman 1993). Implementors of adolescent programs endorse this emphasis, and the most effective and sustainable programs for adolescent health and development offer a variety of services, including counselling, family life education, training in life and job skills, as well as physical examinations, treatment for diagnosed conditions, and contraceptive services.

In the context of this broad approach toward adolescents, the ICRW/USAID Nutrition of Adolescent Girls Research Program was established in 1990 through a cooperative agreement with the Office of Nutrition, U.S. Agency for International Development. Because little information was available to guide the formulation of policies and programs, the program sought to provide information on the factors that affect, and are affected

by, nutritional status (Kurz, Peplinsky, and Johnson-Welch 1994). The studies described nutritional status and other aspects of adolescents' lives, such as health, educational factors, activities, and self-perceptions. A strength of the research program was that it contributed information on nutrition, which is often left out of the broader view of adolescents' lives. The program supported eleven research projects: five in Latin America and the Caribbean (Ecuador, Mexico, two in Guatemala, and Jamaica), four in Asia (Nepal, India, and two in the Philippines), and two in Africa (Benin and Cameroon).

The eleven studies had a variety of designs (Table 1). The Ecuador study sample was nationally representative, whereas the other samples were chosen from within certain villages or urban areas, usually low income areas. Sample sizes ranged from 24 to almost 2,000 adolescents. Two studies were extensions of longitudinal supplementation trials — one in Guatemala (based at the Instituto de Nutrición de Centro América y Panamá) and one in Mexico (based at the Instituto Nacional de la Nutrición). In both cases, the children, who are now adolescents, were born into the study and received food supplementation from about 3 months to 7 or 10 years of age. Eight studies were cross-sectional in nature; that is, adolescents were studied only in the past 2 years. Finally, one study was an intervention during adolescence, evaluating whether food supplementation increased growth hormone levels. Only a small portion of the findings could be summarized here, and readers are encouraged to read the individual reports, as cited in Table 1.

Nutrition results are presented in the first five sections on anemia, stunting, undernutrition, catch-up growth, and dietary intakes. These are followed by sections on morbidity and reproductive health. The next sections present factors related to school attendance and achievement, and findings on adolescents' respon-

sibilities and physical activities. The last section summarizes findings on adolescents' self-perceptions. This is followed by a discussion and recommendations based on discussions held during an ICRW conference in Washington, DC in May 1994, during which the research teams presented their major findings.

Table 1. Study Design Features

STUDY COUNTRIES AND REFERENCES	SAMPLE SIZE	AGE RANGE (Y)	DESIGN	LOCATION	YEARS OF DATA COLLECTION	INSTITUTION
India (Potdar et al., unpublished)	69 males 69 females	10-19	School-based, girls & their brothers	Bombay urban slums	1992-1993	Streehitakarini Institute of Primary Health Care for Urban Slums
Nepal (Regmi and Adhikari 1994)	555 males 668 females	10-18	Community-based	3 villages, western rural Nepal	1992-1993	New ERA
Benin (Inoussa et al. 1994)	179 males 171 females	12-18	Community-based	4 villages, southern rural Benin	1992-1993	Centre Régional pour le Développement et la Santé (CREDESA)
Philippines—Cebu (Roldan, Bautista, and Manalo 1994)	94 males 96 females	12-19	School-based	Cebu City, urban Vigan, rural 4 schools	1992-1993	University of the Philippines
Ecuador (de Grijalva and Grijalva 1994)	865 males 1092 females	11-18	Nationally representative	Coast & highlands; urban & rural	1992-1993	Centro de Estudios e Investigaciones en Salud y Nutrición (CEISAN)
Philippines—Mindanao (Bouis et al. 1994)	290 males 208 females	12-19	Community-based	Bukidnon rural	1984-1985 & 1992	International Food Policy Research Institute (IFPRI) & University of the Philippines & Research Institute for Mindanao Culture
Cameroon (Kurz and Ngo Som 1994)	163 males 302 females	12-19	School-based & 50 not in school	Forest & Sahel zones; urban & rural	1993	ICRW & Centre de Nutrition
Mexico (Chávez et al. 1994)	41 males 41 females	12-19	Longitudinal, food supplementation from birth to 10 years	1 village, rural Puebla	1968-1993	Instituto Nacional de la Nutrición
Guatemala—metabolic (Torún et al., unpublished)	24 females	10-12	Food supplementation (600 kcal/d) at age 10-12, crossover design, stunted girls selected	Guatemala City urban secondary schools	1992-1993	Instituto de Nutrición de Centro América y Panamá (INCAP) & University of California—Berkeley
Guatemala—longitudinal (Martorell, Rivera, and Melgar 1994)	849 females	9-23	Longitudinal, food supplementation from birth to 7 years	4 villages; rural eastern highlands	1969-1977 & 1992-1993	Emory University & INCAP
Jamaica (Walker et al. 1994)	452 females	13-14	School-based	Kingston; 9 urban secondary schools	1991-1993	Tropical Metabolism Research Unit, University of the West Indies

ANEMIA

It is estimated that over two billion people suffer from anemia, which is largely due to iron deficiency (WHO 1991). In children, anemia compromises physical growth (Latham et al. 1990) and mental development (Pollitt 1987). In women, the consequences are reduced levels of energy and productivity, impaired immune function, reproductive failure (miscarriage, stillbirths, prematurity, low birthweight, perinatal mortality), and maternal death during childbirth (Levin et al. 1993). It is well known that women of reproductive age have poor iron status (an estimated prevalence of 47% across developing countries), and that it worsens to 59 percent during pregnancy (DeMaeyer and Adiels-Tegman 1985). Among women who have one or more children, poor iron status is considered largely due to pregnancy.

Adolescence is an ideal time to study pre-pregnancy iron status because many girls around the world (at least

25%) will have had their first child by age 19, and a great many more shortly thereafter (Senderowitz 1995). Furthermore, adolescents themselves, both boys and girls, may be developing iron deficiency anemia because of rapid growth and the start of menstruation (Brabin and Brabin 1992). Despite strong reasons for focusing on anemia during adolescence, little research has been done on it. Of the 523 studies reviewed by DeMaeyer and Adiels-Tegman (1985), only 39 had anemia data on adolescents. Thirty-two of these were done in developing countries—eight in Africa, twelve in Latin America and the Caribbean, eight in Asia, and four in Oceania. The estimated prevalence of anemia in adolescents in developing countries was 27 percent, as opposed to 6 percent in developed countries, and the overall prevalence was similar for males and females. This is not surprising because the iron requirements in adolescence are equally high for girls and boys, largely because of the rapid growth that both experience. Estimates across studies in each region indicate that the prevalences of anemia is quite high in both Africa (45% for girls and 57% for boys) and Oceania (45% for girls and 43% for boys), and lower but still substantial in both the Latin America and Caribbean region (12% for girls and 22% for boys) and Asia (19% for girls and 17% for boys). It is also clear from these statistics that more boys suffer from anemia than girls in both the African and the Latin America and Caribbean regions, though the reasons for this are not clear.

In the ICRW/USAID studies, anemia among adolescents was quite high in Nepal (42%), India (55%), the Guatemala metabolic study (48%), and Cameroon (32%) (Table 2). There was a moderate level in two other studies: Ecuador (17%) and Jamaica (16%). Anemia appeared not to be a problem in the Guatemala longitudinal study in which only 5 percent of the sample was anemic. The reasons for this large variation are not clear.

STUDIES	ANEMIA PREVALENCE ^a (%)		
India	55	n.s. ^b	n.s.
Nepal	42	—	Girls only
Ecuador	17 ^c	20	15
Cameroon	32	n.s.	n.s.
Guatemala (metabolic)	48 ^d	—	Girls only
Guatemala (longitudinal)	5 ^e	n.s.	n.s.
Jamaica	16	—	Girls only

^aHemoglobin cutoffs are males 11-15 y < 12.0 g/dl; females 11-15 y < 11.5 g/dl; males > 15 y < 13.0 g/dl; females > 15 y < 12.0 g/dl (INACG 1985). Exceptions noted below.

^bn.s. means that prevalence differences between the sexes were not statistically significant. "Girls only" means that data were obtained only for girls.

^cAnemia assessed by hematocrit. Cutoffs from INACG (1985) were adjusted for altitude. Difference in prevalence between the sexes is statistically significant; chi-square, $p < 0.05$.

^dPrevalence assessed as percentage of participants who experienced >0.5 g/dl hemoglobin increase after 3 months of iron supplementation, based on $n=24$.

^eData on 355 girls and 392 boys based on Murdoch et al. (forthcoming). Prevalence cutoffs from Yip et al. (1984).

Boys and girls had similar prevalences of anemia in three of the four studies which included both (Table 2), but in Ecuador more boys were anemic than girls (20% of boys and 15% of girls). The higher prevalence among boys is consistent with results from DeMaeyer and Adiels-Tegman (1985) for Latin America. Girls are often expected to have higher rates of anemia than boys because of iron lost during menstruation, but because they are developing muscle mass, boys also have high iron requirements. As the growth of adolescents slows, boys' iron status is thought to improve. It is the norm for older boys and men to have large stores of iron. It is not known whether there are functional consequences of transient anemia among boys during adolescence. Thus, the long-term benefit of intervening to try to

improve iron status among boys is not known. On the other hand, if an iron intervention is administered in schools, as is recommended below, the benefits of supplementing boys as well as girls could be tested.

To explore the response of iron status to intervention, in the Guatemala metabolic study a food intervention was given that contained 18 mg of iron, 100 percent of the recommended daily allowance. The researchers gave supplements and then placebos in alternate 3-month segments over 1 year. Hemoglobin levels increased upon intake of the iron supplement, but then fell when only the placebo was taken. This suggests that while iron status can improve rapidly with supplementation, additional interventions are needed to maintain the improved status.

STUNTING

Stunting (short stature) among adolescents is of interest for several reasons that reflect future risks. First, a short woman tends to have a small pelvis, and is therefore more likely to have obstructed labor during childbirth. Second, 25 percent of a person's attained height is achieved during adolescence, which marks the end of growth in height. Stunting in adolescence is considered an indicator of past undernutrition, and is a cumulative indicator of nutritional status. Stunting is defined as height-for-age less than the 5th percentile of the NCHS/WHO reference data (WHO 1995; Hammill et al. 1979).

Stunting was highly prevalent, and was found in 27 to 65 percent of adolescents in nine of the studies (Table 3). Short stature among adolescents is caused in large part by infection and inadequate dietary intake during

the first 3 years of life. It is during these early years when rapid growth is supposed to occur, that diarrheal disease and other infections to which young children are highly vulnerable cause growth to be slowed. Height is difficult to make up during the later childhood years, and so these children are still short when they reach adolescence. Only in Jamaica and Cameroon, where nutritional status is known to be relatively good, was there little stunting (2% and 12%, respectively).

There were gender differences in the prevalence of stunting in only three of the eight studies in which a sex comparison was possible: Benin, Cameroon, and India (Table 3). In Benin and Cameroon, boys were worse off than girls, and this disadvantage was maintained throughout adolescence (Figures 1 and 2). In fact, the Benin data show that girls improved somewhat relative to the reference data, but boys fell further behind. This finding was not expected. Further investigation, however, suggests a possible explanation based on early childhood data from other African countries. Boys 0-5 years old in some sub-Saharan African countries appear to have higher rates of stunting than girls. In Senegal, Togo, and Uganda, for example, boys have stunting rates 5 percentage points higher than girls (Summerfelt and Stewart 1994). One possible explanation discussed informally is that boys may be encouraged to be independent at a younger age than girls. They may, therefore, be allowed to crawl more, contract more diarrheal disease, and become more undernourished.

In the Indian study, the gender difference was in the opposite direction. More girls were stunted than boys (45% girls and 20% boys). A possible explanation lies in the deeply embedded sociocultural and economic practices that often discriminate against females of all ages in South Asia. Girls are known to be less frequently immunized; they are taken for health care less often than their brothers; and there is some evidence that girls are less well fed, and less well cared for (Ravindran 1986).

Table 3. Prevalence of Stunting

STUDIES	STUNTING PREVALENCE (%) (<5 th percentile height-for-age ^a)		
India	32	20 ^b	45
Nepal	47	n.s.	n.s.
Benin	41	55	27
Philippines (Cebu)	43	n.s.	n.s.
Ecuador	50	n.s.	n.s.
Philippines (Mindanao)	65	n.s.	n.s.
Cameroon	12	19	8
Mexico	62	n.s.	n.s.
Guatemala (metabolic)	27 ^c	—	Girls only
Guatemala (longitudinal)	57	—	Girls only
Jamaica	2	—	Girls only

^aWHO height reference data from Hammill et al. 1979.

^bWhere prevalences are reported for males and females, the difference between the sexes is statistically significant; chi-square $p < 0.05$. Where n.s. is reported, this difference is not significant. "Girls only" means that data were obtained only for females.

^cBased on $n=360$ who were screened for study.

Figure 1: Height of adolescent girls by age - Benin

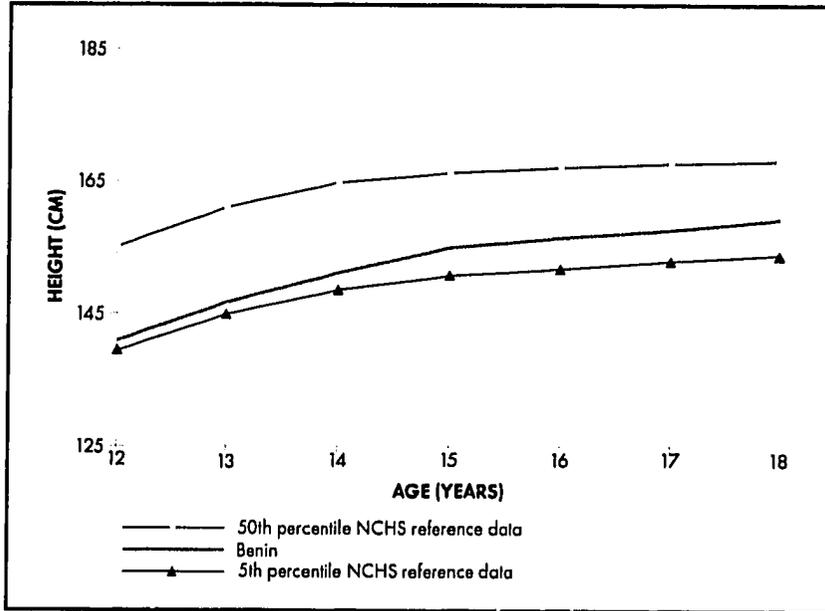
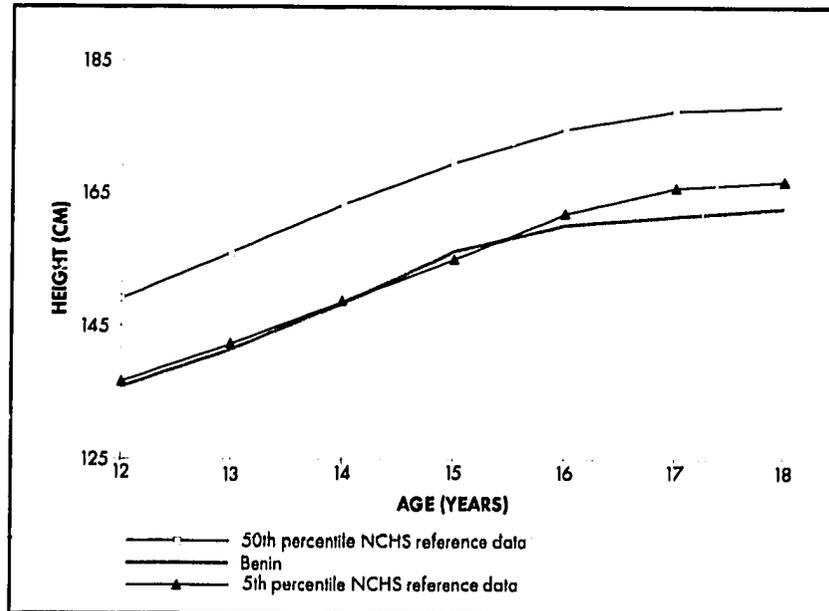


Figure 2: Height of adolescent boys by age - Benin



■ UNDERNUTRITION

Adolescence is an important time for gains in weight as well as height. Both muscle and fat increase, with girls gaining relatively more fat, and boys relatively more muscle. Undernutrition (low weight) is of particular interest because it results in poor pregnancy outcomes, in particular low birthweight (Kramer 1987). Low birthweight, in turn, is a major contributing factor to infant mortality. Undernutrition may also limit school achievement and work productivity, as has been shown in other age groups, but this has not been investigated among adolescents. Undernutrition is used as an indicator of current nutritional status, and is defined as a body mass index (BMI, weight/height²) that is less than the 5th percentile of the NCHS/WHO reference data (WHO 1995).¹

Undernutrition was highly prevalent in the studies in India (53%), Nepal (36%) and Benin (23%) (Table 4), but was less of a problem in the other eight countries (3-13%). Even when prevalence was high, BMI-for-age tended to improve over the course of adolescence, as illustrated by the Benin data (Figures 3 and 4). Late maturation may be an explanation for this "improvement." That is, Beninese adolescents probably started their growth spurt later than the U.S. reference population, and thus appeared to be undernourished at age 12 and to "improve" throughout adolescence until age 18. In fact, they may have been growing normally but at a different rate that corresponds to a pattern of later maturation.

In seven of the eight studies with both boys and girls, at least twice as many boys as girls were undernourished (Table 4). This was not the case only in the Mexico study, where the sample size may have been too small to detect a difference that was statistically significant. The gender difference was sustained throughout the adolescent years, as illustrated by the Benin data (Figures 3 and 4). The disproportionate number of boys suffering from undernutrition was a surprise. Owing to difficulties accounting for maturation when calculating BMI-for-age, the possibility of differential maturation in girls and boys has not been ruled out. Another possibility that warrants investigation involves the high rates of anemia. Although both the boys and the girls experienced similar prevalences, anemia may affect the weight gain of boys more than girls because boys are gaining more muscle, which requires relatively more iron than the fat gain by girls.

Table 4. Prevalence of Undernutrition

STUDIES	UNDERNUTRITION PREVALENCE (%)		
	(<5th percentile BMI-for-age ^a)		
India	55	69 ^b	37
Nepal	36	49	25
Benin	23	32	14
Philippines (Cebu)	13	19	7
Ecuador	9	13	6
Philippines (Mindanao)	6	9	1
Cameroon	4	7	2
Mexico	3	n.s.	n.s.
Guatemala (metabolic)	6 ^c	—	Girls only
Guatemala (longitudinal)	4	—	Girls only
Jamaica	3	—	Girls only

^aWHO Body Index Mass reference data from Must, Dallal, and Dietz(1991).

^bWhere prevalences are reported for males and females, the difference between the sexes is statistically significant, Chi-square $p < 0.05$. Where n.s. is reported, this difference is not significant. "Girls only" means that data were obtained only for females.

^cBased on $n=360$ who were screened for study.

¹WHO only recently (1995) recommended BMI as the indicator of choice for undernutrition among adolescents and adults. By controlling for height, BMI is considered an indicator of weight that is independent of height. WHO has also recently recommended reference data for its comparison (Must, Dallal, and Dietz 1991), and less than the 5th percentile as the cutoff for being considered undernourished.

Figure 3: BMI of adolescent girls by age - Benin

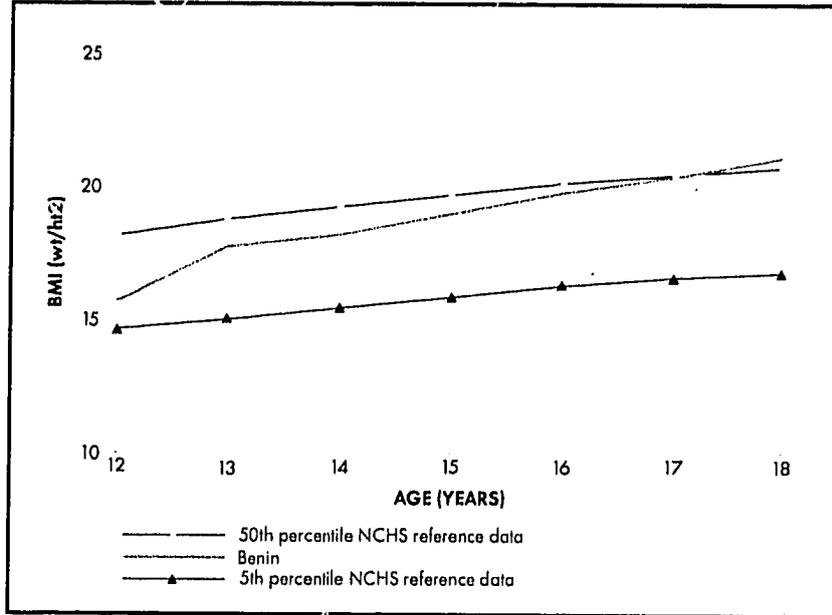
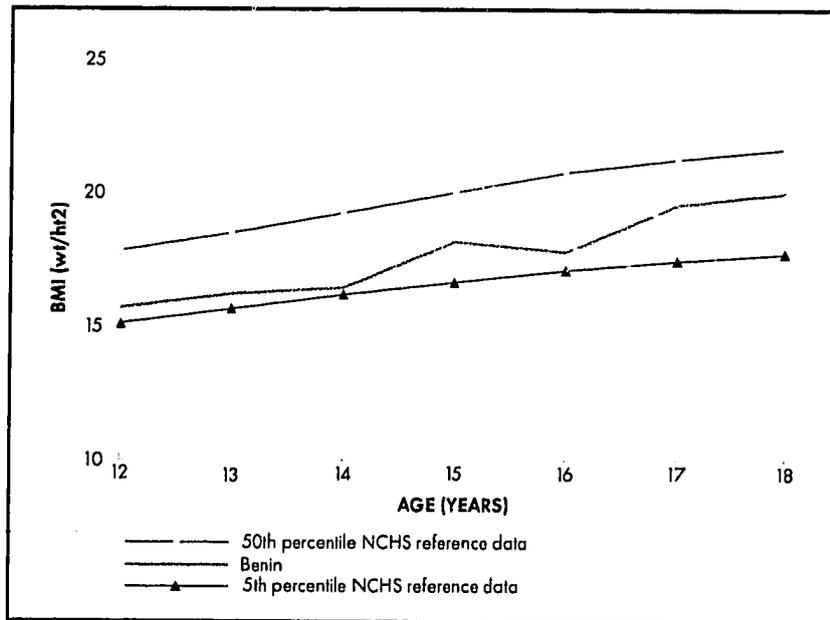


Figure 4: BMI of adolescent boys by age - Benin



✓ CATCH-UP GROWTH

Adolescents undergo rapid growth, after which final adult height is attained (Tanner 1972). Growth in girls is most rapid prior to menarche, and growth of the pelvic bones, critical for preventing obstructed labor during childbirth, occurs for several more years after height is complete (Moerman 1982). This rapid growth has caused some advocates to suggest that additional growth may be encouraged by intervening during adolescence (Rohde 1990). Unfortunately, evidence confirming the potential for catch-up growth in height during adolescence is limited. Although no studies address whether intervention during adolescence could promote a greater gain in height, studies of adopted children suggest that catch-up growth can be quite marked. Four studies reviewed by Martorell, Khan, and Schroeder (1994) show that the final height of children who were undernourished before adoption was greater than that of the comparison group, although it was still well below normal compared with the international reference data. This suggests that not all growth can be recovered, even under optimal conditions.

Three ICRW/USAID studies—Philippines-Mindanao, Mexico, and Guatemala-longitudinal—have contributed to knowledge about the extent of catch-up growth in height, but only the Guatemala metabolic study investigated the effects of supplementation during adolescence. There is no other study known to have intervened during adolescence to assess how much actual height could be gained. In the Philippines-Mindanao study, the height of persons aged 11-20 in 1992 was compared with their height 8 years earlier (in 1984). There was no food supplementation between 1984 and 1992. The authors found that older adolescents from lower income households had completely caught up to those in the higher income group, suggesting that full catch-up growth in height occurred.

Findings from the Mexico study in one rural com-

munity indicated that children who received food supplementation from 3 months to 10 years of age were taller than their nonsupplemented peers throughout childhood. During adolescence, the nonsupplemented children gained more height and reduced the extent of their stunting more than the supplemented adolescents did, suggesting that catch-up growth occurred. However, the nonsupplemented children were still shorter at age 18 than the supplemented adolescents, indicating that this growth had been only partial.

Conversely, the Guatemala longitudinal study compared three groups of rural Guatemalan adolescents at age 18 according to their degree of stunting at age 5, and found that the gaps in height among the three groups were similar at both ages (Martorell, Rivera, and Kaplowitz 1990). This meant that the shortest group lagged behind the other two groups to the same degree at age 18 as it did at age 5, and the authors concluded that no catch-up growth occurred during adolescence. Further analysis under the ICRW/USAID program showed that diet, health status, and socioeconomic status were not related to growth in height, suggesting that growth was not constrained by environmental factors.

The authors of the Guatemala metabolic study found that levels of plasma insulin-like growth factor were somewhat higher among the 24 premenarcheal participants when four cookies and a drink providing about 600 extra kilocalories per day were consumed, although this result was observed during only the second half of the intervention period. This study suggests that only small gains in height may be possible with intervention; however, this suggestion should be considered tentative because there is no knowledge on how to translate changes in growth hormone levels in the short term to changes in stature in the long term.

DIETARY INTAKES AND FOOD SECURITY

Needless to say, adequate dietary intakes are critical for good nutritional status, and so were reported in seven of the studies. The adequacy of dietary intakes was assessed in two ways, either quantitatively comparing the self-report of the food eaten by the adolescent in the previous 24 hours with recommended daily allowances (RDAs) for the major nutrients — energy, protein, iron, and vitamin A — or qualitatively by assessing the food security of the households or the adolescents themselves.

Dietary intakes of energy, protein, and iron from 24-hour recall or weighed intake data were compared with recommended allowances in the Philippines-Cebu, Guatemala longitudinal, Benin, and Cameroon studies, and with energy intake in the Nepal study. Energy and protein intakes were generally adequate — between 70 percent and 100 percent of recommended values — except in one of the three Nepali villages where energy intake was inadequate, as well as in Benin during the season of low food availability. Iron intake tended to be low in the Philippines-Cebu, Guatemala longitudinal, and Cameroon studies. In addition, vitamin A intake appeared to be low in the Cameroon study. Adequacy of intake relative to recommended levels did not differ significantly by sex.

Diet adequacy was also assessed qualitatively as food security at the household level in the Ecuador and Benin

studies by asking if there was not enough food in the household at any time in the past month, the past three months, or at certain times during the year. Food security at the individual level was also assessed in Jamaica. Food security was a problem in the Ecuador study, particularly for low socioeconomic groups. Only 73 percent of Ecuadorean families in the lower socioeconomic group reported always having enough food, whereas 96 percent of those in the highest socioeconomic group always did. Among lower income families, 17 percent did not have enough food to eat in the month prior to the study, but only 8 percent of middle income, and 3 percent of upper-income families had the same problem. In the Benin study, the extent of the food security problem was greater. A full 86 percent of the households surveyed, including food-producing households, reported food security problems. These problems were aggravated by seasonal variations, particularly for energy-dense foods, and these insufficiencies were common to both girls and boys. Food security, assessed as hunger among the adolescent girls themselves, was also a problem in the Jamaica study, despite good anthropometric values in this sample of girls. Among them, 36 percent reported missing breakfast at least once a week, and 33 percent reported going to bed hungry at least once a week.

MORBIDITY

Adolescence is typically characterized as a time of being relatively healthy, with low prevalences of infectious and chronic diseases. Morbidity and mortality trends for young people in developing countries are becoming increasingly similar to those of industrialized countries (Blum 1991, Maddaleno and Silber 1993). As infectious causes of mortality diminish, unintentional injuries, suicide, homicide, war, and maternal mortality become the primary causes of mortality, and the prevalence of reproductive health problems increases. Violence and its implications in the lives of adolescents were assessed only in the Jamaica study (see box).

Given this characterization of adolescent health, the high rates of self-reported infectious diseases² or their symptoms in some of the studies were surprising, if not alarming. Diarrhea was reported by fully 49 percent of the Cameroonian adolescents in the previous 6 months of the study, and by an average of 15 percent in Nepal during the previous 2 weeks, depending on village (ranging from 40% to 5%), sex, and age. Respiratory infections were also reported by 30 percent of the sample

in Nepal during the previous 2 weeks, and 31 percent of adolescents in Ecuador during the previous 3 months, which was the rainy season when the expected prevalence is highest in the year. Fever was reported by fully 60 percent of the Cameroonian adolescents in the previous 6 months, with the same incidence of malaria, and the fever was experienced by a greater proportion of girls than boys (64% vs. 52%). Fever was also reported by the mothers of 5 percent of the adolescents in the Philippines-Mindanao study during the previous 2 weeks.

Regarding overall illness patterns, 50 percent of the Ecuadorean adolescents studied reported suffering some illness or not feeling well in the previous 3 months. In the Guatemala longitudinal study, adolescents spent an extremely high percentage of their time being ill (39 percent) in the previous 2 weeks—50 percent had illness considered mild (a complaint without fever), 45 percent had moderate (complaint with fever), and 5 percent were severely ill (requiring bed rest). Only 8 percent of adolescents in the Philippines-Mindanao study, however, were reported by their mothers to have been ill in the previous 2 weeks, and the illness was experienced for an average of 6 days. Girls were more likely to be reported ill than boys and to have more severe illnesses, and adolescents in the remote barrios had a higher incidence of illness, as did those in larger families.

Interestingly, in the Ecuador and Philippines-Mindanao studies, more morbidity was reported by adolescents from the upper socioeconomic strata than the lower. A possible explanation is that wealthier people may be more aware of mild illness. They are often more educated, and therefore, perhaps more effective in detecting illness. Consequently, they report more symptoms and use health care services more often for treatment.

In addition to morbidity data, the Nepal study offered some unique insights into health care preferences. While most adolescents preferred to consult

Violence in Jamaica as a Public Health Concern

The Jamaica study, in which 13-14-year-old girls were included, was the only one to report on experiences of violence. Coming out in the capital city of Kingston, the extent of violence to which the adolescents were exposed in the home, school, and community was indeed a major health concern in this study. There was a high incidence of sexual abuse, including rape: Of the 150 girls, 18 had been raped. Three had been raped more than once. About half were raped before the age of 12, and most knew their attackers. An additional 16 percent experienced rapes.

One-third were also sexually abused, but affected more girls. One-third had been sexually abused without physical contact, and one-third had been harassed verbally. Virtually everyone saw violence, and many said that they had been afraid to come to school. A disturbing 64 percent of the researchers found one-third—adolescents' own involvement in home—violence, including physical or sexual abuse. The girls' own involvement in home violence was highly related to the amount of beatings in the home and by 64 percent of which were alarmingly frequent (53% had experienced beatings in the home and 65% by teachers).

²The incidence of self-reported diseases often does not closely match the incidence according to clinical diagnoses. Self-reports may overestimate or underestimate clinical diagnoses, depending largely on the level of health awareness in the population of interest. Self-reported morbidity rates were estimated in the ICRW studies because clinical diagnoses were not possible, but their low reliability should be kept in mind when interpreting results.

formal health care providers at health posts, most girls in one village and half the girls in another preferred to consult faith healers. The main reason cited for preferring the health post was quick recovery after treatment

with medicines. The reason for preferring faith healers was adolescents' proximity to them, and hence easy access.

REPRODUCTIVE HEALTH

Sexual activity among adolescents has been increasing dramatically worldwide, and with it rates of unwanted pregnancy and sexually transmitted diseases, including HIV infection. Many aspects of adolescent reproductive health have been investigated (as reviewed in Senderowitz 1995), and the information presented here is generally confirmed by the research of others. Findings from the ICRW/USAID studies on reproductive health are predominantly qualitative. They provided information on determinants of pregnancy and sexually transmitted diseases, such as knowledge of reproductive health, communication with parents on sexual matters, and sexual activity levels. Actual reproductive morbidity rates were not obtained. It should be noted that not many girls in the studies were pregnant, since the studies were designed to learn more about girls and boys before first pregnancy. Six of the studies contributed information on reproductive health.

Relatively few (50%) of the 13-14-year-old girls in the Jamaica study knew about condoms or the contraceptive pill as a method of contraception and 20 percent of them could not name any method. In Nepal, it was interesting to note that knowledge of family planning was quite high among boys (80-100% depending on the age and community), but lower among girls (35-70%). Fully 85 percent of the Jamaican adolescents knew about HIV/AIDS, though only 55 percent knew about gonorrhea, and few knew about other sexually transmitted diseases. Although adolescents may be knowledgeable about how to prevent unwanted pregnancy, and how HIV infection is transmitted, they often expressed a need for a more thorough understanding of how their bodies work. In focus groups in the Ecuador study, adolescents throughout the country strongly and consistently wanted more information about reproductive health. They wanted to know more about how their bodies functioned, and wanted opportunities to talk about their sexuality and fertility. These findings are

consistent with what others have found.

The Philippines-Mindanao study found that parents and children rarely discussed sexual matters. None of the adolescents reported having discussed sexual intercourse with their parents, and only one-third of mothers had talked to their daughters about menstruation. There did not appear to be other adults whom these adolescents consulted. Adolescents often face an enormous gap when it comes to having someone to talk to about sexual matters. They talk to friends, but this can be unsatisfying, because friends are similarly uninformed, and reliable and trustworthy adults may not be accessible.

Regarding sexual activity, 20 percent of the 13-14-year-old girls in the Jamaica study reported having sexual intercourse, 92 percent with a special, not a casual, friend. Of these 90 girls, the average age of first sexual intercourse was 12.7 years, and their partner's was 15.3 years. In Ecuador, adolescents were not asked if they were sexually active, but sexual activity was inferred given the marriage and childbearing rates. Seven percent of girls but only 1 percent of boys were married by age 18, with somewhat greater proportions among the lower socioeconomic groups and among people from the coastal area. Six percent of girls but less than 1 percent of boys reported having children. The youngest mothers were 15 years old, and some girls had as many as three children by age 18.

An unexpected finding was that fewer girls in the Nepal study were married during adolescence compared with the national average. Marriage occurred well after menarche. This was despite low education levels—girls attended fewer than 2 years of school and boys fewer than four. Given the heavy toll adolescent childbearing can exact, delayed marriage and therefore delayed childbearing in a country with high rates of adolescent marriage is a positive finding indeed. The researchers recommended that reasons for delaying marriage be

investigated and applied elsewhere in Nepal, where appropriate.

In the Benin study, marriage was triggered by menarche, and parents often arranged the marriages. Girls tended to drop out of school after marriage. It is interesting to note that marriage was not linked to menarche in the other studies.³ In the India study, this may have been because the sample consisted of secondary school students, whose parents by definition had chosen to delay their daughters' marriages so that they might continue their schooling. In rural Mexico, where

the recent tradition had been for girls to marry at menarche, informal discussion with parents suggested this practice had gradually been abandoned.

The Cameroon study provided information on preference and intentions for family size, with the adolescents preferring relatively large families. Fully 24 percent preferred 5 or 6 children, and 54 percent preferred 3 or 4. Slightly less than half (44%) said they would use family planning methods and 23 percent said they would consult with their doctor or partner.

³The median age of menarche in the studies was Philippines-Cebu 13.0 years; Jamaica 13.1; Ecuador 13.1; Cameroon 13.4; Mexico 13.5; Guatemala-longitudinal 13.7; Nepal 14.0; Philippines-Mindanao 14.2; and Benin 14.6. It was not possible to calculate median age of menarche in the Guatemala metabolic study because only 10 percent of the sample had begun menstruating.

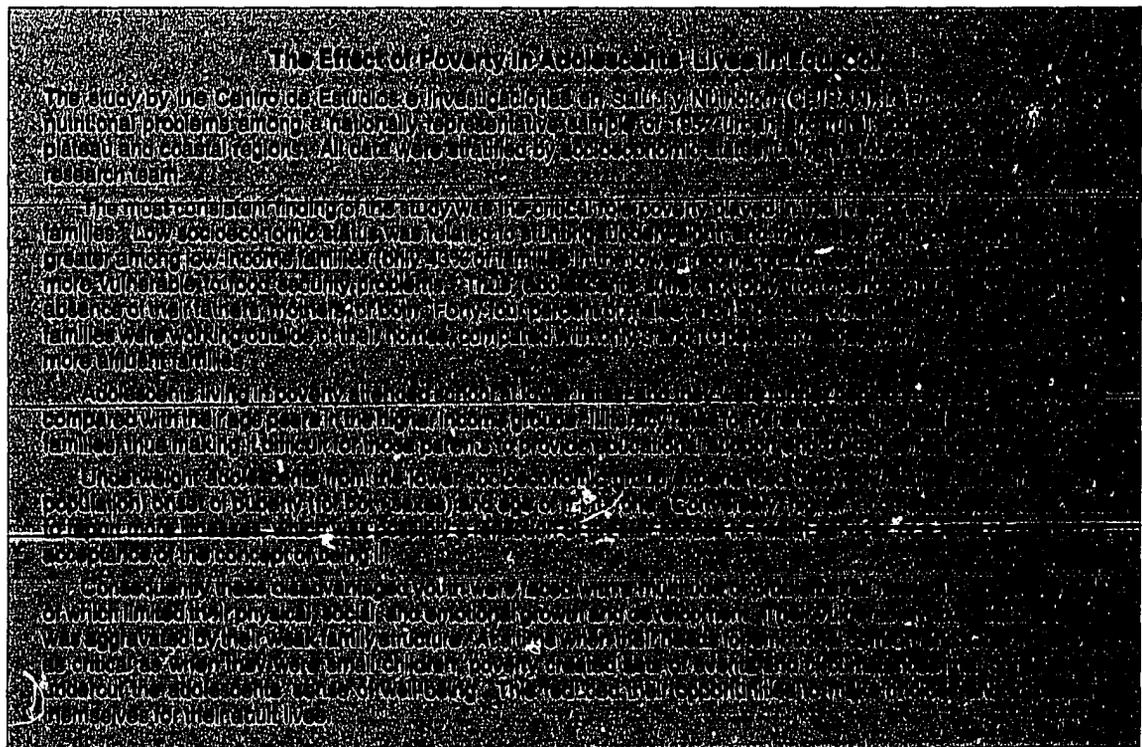
EDUCATION

The value of investing in education, particularly for girls, is well known (Bellew and King 1991). Both research and program interventions have demonstrated that education is more likely to delay a woman's marriage and first birth (UN 1987); improve her economic earning potential (Schultz 1991); and strengthen her decision-making and negotiation skills, her self-esteem, and productivity (Caldwell 1979, Hill and King 1991). Despite the importance of education to adolescents' future, many drop out of school, and girls drop out earlier than boys. Parents, or new parents-in-law, may decide they need the labor of their daughters earlier than that of their sons, and make them stay home to meet the immediate needs of the family. Six of the ICRW/USAID studies contributed to the large literature on adolescents' education by providing information on the following social and nutritional factors relating to school attendance and achievement: socio-

economic status and the prioritization of needs it imposes, limits conferred on adolescents by their social roles and expectations, sexual activity, and nutritional status.

Household socioeconomic status in the Ecuador study was clearly related to adolescent school attendance, as well as to numerous other aspects of their lives (see box). Only 57 percent of adolescents from the low socioeconomic group were in school, whereas 93 percent of upper socioeconomic adolescents currently attended. In the Philippines-Mindanao study, education increased with household wealth, more so for boys than girls and more so for older than younger adolescents. In the Jamaica study, lack of physical safety and fear of violence in their low-income Kingston neighborhoods were associated with low school attendance.

Socioeconomic status also impacts on education when families prioritize their needs, that is, when fami-



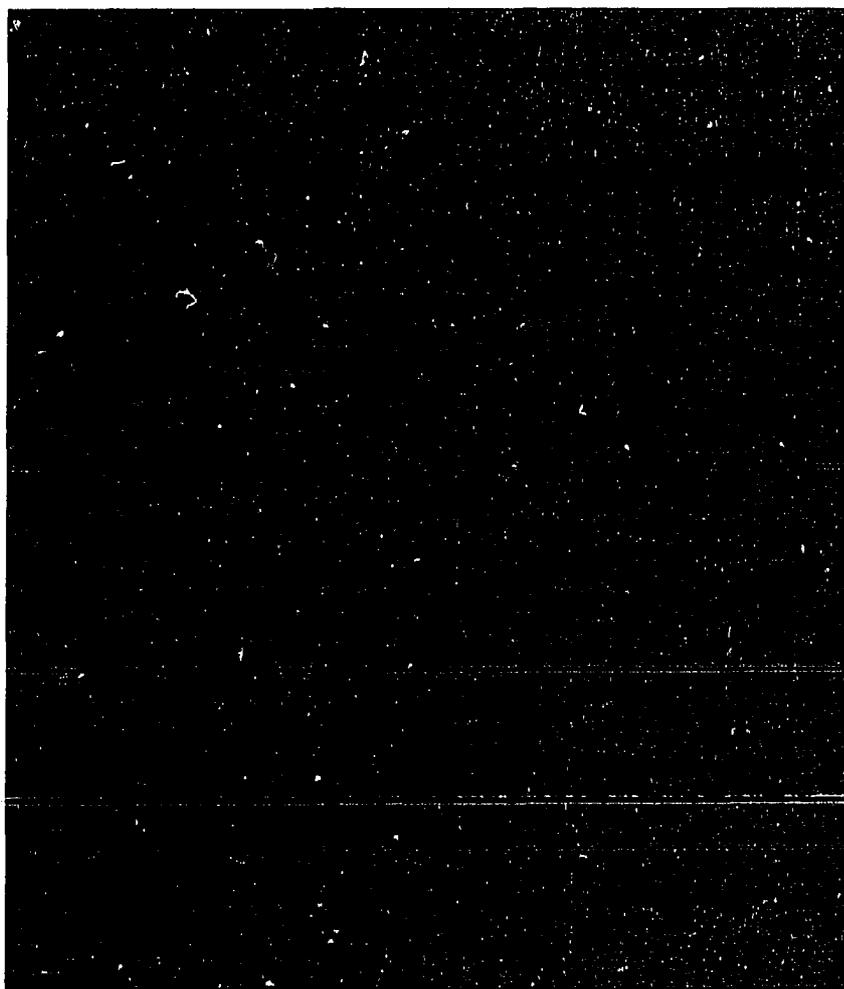
lies' immediate needs (using the labor of their adolescents) take precedence over the long term developmental needs of individual family members (ensuring that their adolescents are educated). In the Philippines-Mindanao study, families were wealthier and more food secure relative to some of the other study samples, and adolescent education levels overall were relatively higher. In this setting parents felt that schooling was a "major component of the younger generation's establishment fund," that is, parents had a moral responsibility to ensure that their children got a "good start on life." In fact, girls stayed in school longer than boys (see box). Contrary to the researchers' hypothesis about parents needing their sons to stay home, parents indicated that it was their sons who were making the decision to leave school, and that children stopped going to school either without informing their parents or over the objections of their parents.

Conversely, in the Nepal and Benin studies, where families were poor and less able to meet their food needs, parents sent their children to school less, and sent the girls less often than the boys. In Nepal, between 71 and 91 percent of boys, but only 36 to 39 percent of girls were currently in school. In Benin, twice as many boys as girls had attended school (84% vs. 49%). Instead, adolescents in these studies contributed significant labor and earnings to support their families, and this was especially true for the girls. In the Benin study, up to 27 percent of a girl's day was spent in economic activities, and 75 percent of the girls earned income. In the Nepal study, working was inversely related to girls' school attendance. Where girls earned income, their school attendance was low; where girls did not earn income, attendance was higher.

Nevertheless, there were indications of a growing awareness of the value of a formal education or, at least, an increase in opportunities for adolescents to attend school. In Ecuador, Nepal, and Benin, more adoles-

cents had attended school than had their parents, and attendance by girls was positively related to parental education, particularly that of their mothers in the case of Benin.

Social roles and expectations also were shown to play a constraining role in school achievement and attendance. In the Mexico study, the cognitive development of supplemented girls, but not supplemented boys, slowed considerably from age 15, and these girls sustained a much smaller improvement over the nonsupplemented girls by the end of adolescence, when girls' mental age was on average 2.5 years lower than boys. The authors hypothesize that a "social ceiling"



exists in the community whereby girls are not expected to have as many opinions as boys, think as analytically as boys, or have conversations with adults that are as extensive as those boys are allowed, and that this lower level of stimulation slows their cognitive development.

This stereotypical pattern also was found in the Benin study. In that study, parents did not feel that the formal educational system was relevant to the tasks and roles expected of girls; therefore, they did not encourage their daughters to attend school. Rather, girls were trained either at home or in non-formal education programs to perform their productive tasks, and to comply with behaviors deemed appropriate for their sex. "She doesn't need to go to school to be a good mother and wife," said a Beninese parent. Girls were expected to be patient, and respectful of their husbands and in-laws, and, as stated by one parent, "A well-bred and respectful girl is a treasure; she appreciates in value when the time comes for her to marry." Conversely, the reality of boys was more externally focused, that is, they were trained to become the leaders of their households and their communities. For them, a formal education was supportive of that end. Thus, parents wanted their sons to go to school.

Another factor explaining poor school attendance was sexual activity in the Jamaica study, which included girls who were only 13-14 years old. Adolescent pregnancy is often cited as a determinant of school dropout. What this finding suggests is that it is sexual activity itself (and the elements of a girl's life that correlate with her having sex at such a young age), and not just the occasional outcome of that activity (pregnancy) that affects school attendance, and ultimately dropout.

Several aspects of nutritional status also were related to school outcomes. Iron status was predictive of school achievement among girls in the Jamaica study; that is, the lower the hemoglobin value, the lower their school attendance. In a surprising finding in both the Nepal and Benin studies, poor nutritional status was related to whether adolescents attended school. This may be because the adolescents attending school had to walk long distances and still complete chores at home, which required more energy. At the same time, this greater energy expenditure was not compensated by greater energy intake, probably because there were no meals at school. In the Mexico study, improved nutritional status through food supplementation in early childhood was related to higher cognitive development, a precursor of school achievement.

■ RESPONSIBILITIES AND PHYSICAL ACTIVITIES

In contrast to what is known about adolescents' education in developing countries, less is known about how these adolescents spend their time. What is known, however, is that young people bear many responsibilities in providing support to their families, and this responsibility begins in childhood with child care, household work, agricultural labor and livestock care, and economic support through paid and unpaid activities. For example, in Latin America, 40 to 50 percent of the economically active population is between 15 and 19 years old, and while labor force participation has recently decreased among males, it has increased among females (Maddaleno and Silber 1993). In addition to economic contributions, researchers have found that other supportive tasks performed by adolescents tended to be stereotypical in pattern (Friedman 1993) and gender-specific, and the specificity increased with age (Rodgers and Standing 1981). Findings from six of the ICRW studies provide additional insights into how adolescents spend their time, the contributions they make to their families' support and well-being, and gender differences in adolescents' activities as well as parents' perceptions of their contributions to the household.

Adolescents in the Benin, Cameroon, Ecuador, Jamaica, Nepal, and Philippines-Mindanao studies spent a significant proportion of their days in economic and domestic activities, which supported their families. These included income generation, agricultural and livestock production, household chores, and child care. In addition, adolescents also attended school, participated in nonformal education and skill-training programs, and participated in leisure or recreational activities with their friends. Adolescents whose families most needed their labor, however, spent less time in these latter activities. In addition, in the case of Benin, girls bore the heavier burden, and this burden increased with age. By the time girls were about 17 years old, nearly half of their

time was spent earning income, providing child care, and performing household tasks, while their brothers contributed only five percent of their time to these activities. Conversely, 40 percent of a boy's day was spent in education and leisure activities, but only 14 percent of his sister's day was spent this way. Girls, in fact, spent five times longer (almost 5 hours) earning income than did their brothers (almost 1 hour).

Unlike in Benin, girls and boys in the Nepal and Philippines-Mindanao studies tended to spend equal amounts of time in economic and domestic activities. In Nepal, the largest part of an adolescent's day was spent in crop and livestock production (16% of their days), and in the Philippines-Mindanao study, boys and girls worked about equal time in combinations of household chores, farm work and wage employment. Despite this apparently equal contribution, adolescent boys in Nepal tended to spend more time in activities that enhanced their self-development. For example, they spent 50 percent more time on recreation and education than girls did, and almost all the boys had more off-farm free time than did girls in two of the three study villages.

In addition, adolescents also contributed a significant amount of time earning income for their families. This was particularly true for adolescents in the lower socioeconomic groups. The degree to which girls earned income compared with boys varied. In Ecuador, 44 percent of boys and 19 percent of girls from families in lower income groups were engaged in wage-earning labor, compared with 3 percent of boys and 10 percent of girls in higher income families. Among 16-18-year-old girls in Benin, 75 percent performed income-generating activities, and spent 27 percent of their day in that work. This was in contrast to only 33 percent of boys who performed the same task, which accounted for only 3 percent of their day's activities.

There also tended to be gender differences in the tasks adolescents performed. Girls in the Benin, Ecu-

dor, Jamaica, Nepal, and Philippines-Mindanao studies were primarily responsible for household chores, including food preparation, child care, cleaning, and laundry, whereas boys' tasks tended to be outside of the home. Among girls in Benin, 8-10 hours a day were spent performing these chores stereotypical of girls but boys spent less than 3 hours doing these chores. In the Philippines-Mindanao study, younger girls (10-14 years old) spent twice as much time on household-related chores as did their brothers, and older (15-19 years old) girls spent three times that of their brothers. In Nepal, following agriculture and livestock production, the second most time-consuming activity for girls was household chores (91 minutes, as compared to 52 minutes for boys), but for boys it was education and training (140

minutes rather than 68 minutes for girls).

Furthermore, parents in the Philippines-Mindanao, Nepal, and Benin studies tended to consider the contributions of the girls different from those of the boys. Girls' contributions tended to be assessed relative to the amount of time needed to perform the task, whereas a boy's contribution was measured in terms of the amount of energy needed. For example, in the Philippines-Mindanao study, girls were expected to work longer hours than boys. Parents felt that because boys' labor was heavier than girls', the girls should compensate for this inequality by increasing the amount of time they spent on their tasks.

SELF-PERCEPTIONS

Many programs targeting adolescents include components aimed at building a strong positive self-image and self-perception (Peplinsky 1994). This is based on the belief that a positive self-image and self-perception are critically important for helping adolescents develop health-promoting behaviors. The ICRW studies in Ecuador, Cameroon, and Philippines-Cebu explored adolescents' self-perceptions and, in some cases, the link between perceptions and adolescent health and nutrition. In doing this, they sought to address an enormous gap between the program conviction about the benefit of building strong self-perceptions and a scarce research literature on this topic, especially in developing countries.

Ecuadorean adolescents' concept of body image was related to socioeconomic status, gender, and, to a certain degree, commercial images of desirable body sizes. Adolescents from the upper socioeconomic group tended to be taller than other adolescents and they wanted to be even taller; adolescents in the lower socioeconomic group tended to feel they were "skinny" and wanted to be fatter. More females than males felt they were too fat, particularly among the higher socioeconomic group, and they wanted to be thinner whereas the reverse was true for adolescent males. In the Cameroon study, most adolescents considered themselves to be of medium height (72%) and preferred to be this way (77%). Similarly with body size, most adolescents described themselves as medium size (71%) and an even higher proportion preferred to be this way (86%).

Males in both the Cameroon and Ecuador studies were happier with their sex than were the females. Among boys, 99 percent in both studies preferred to be boys, whereas only 71 percent of girls in Cameroon and 92 percent in Ecuador preferred to be girls. Reasons cited were that males had more freedom and independence, had better opportunities to work, and were a "stronger sex." Female satisfaction with their sex tended

to relate to their reproductive roles, and their image of women as being "unaffected, relaxed, understanding, and warm." Interestingly, 16 percent of Cameroonian adolescent girls who preferred to be girls said their reason was they wanted to be a household head—and these same girls seemed already to have many such responsibilities, although they did not have their own children.

Variables of a psychosocial nature were also assessed. In the Cameroon study, the researchers assessed self-esteem and the degree to which people feel they can take

Creating a Method for Estimating Self-Esteem in Cameroon

The process of creating the self-esteem scale in the Cameroon study illustrates the need to develop a methodology and its exploratory nature. The investigators initially considered working with a commonly used self-esteem scale because it would allow results to be compared with those from previous studies. However, in preparing the U.S.-based survey, they realized that many of the questions were not relevant to adolescents' lives in Cameroon; instead, they developed a new culturally appropriate instrument over 3 months in the Northwest Province.

Ethnographic research techniques were used to collect qualitative information on adolescents' perceptions of their personal characteristics. Specifically, in key informant and focus group interviews, 20 adolescent girls were asked what they thought about their character, personality, and physical attributes; their plans for the future; their role in the household, community, and school; their food and clothing preferences; and their relationships with boys and others. The information was transcribed and analyzed, yielding a list of 103 words that adolescents used to describe themselves and their interactions with others. Then, to explore the underlying dimensions to this set of words, another 10 girls were asked to sort these words into consecutive piles and to discuss their sorting criteria. Analysis of the pile sorting revealed three underlying dimensions: good vs. bad, control vs. non-control, and social vs. individual. The strongest was the good-bad dimension.

The next phase was to translate this information into questions for the main survey in the Forest and Sahel zones. First to test whether adolescents' responses along the good-bad dimension scaled, a pilot survey of 10 self-esteem questions was completed among Northwest Province. Sixteen of the 103 words were eliminated because they were not consistently recognized by adolescents. As a pretest of the questions to be added to the main survey, another set of adolescent boys and girls was asked to rank the 87 remaining personal characteristics as good, neutral, or bad on a 3-point scale, and also rate whether these characteristics applied to themselves.

A factor analysis of 103 items and a principal component analysis of these pretest data supported that a 3-point scale of characteristics was sufficient to create a reliable scale of adolescent self-esteem. It was also determined that a 3-point scale could be used on the 40 good-bad and 30 neutral items. Questions were added to the study's main survey. Self-esteem scores were calculated for the survey analysis as follows: On the good-bad questions, informants were scored 1 for "good," 0 for "neutral," and 0 for "bad"; on the self-evaluation questions, informants were scored 2 for "a lot," 1 for "a little," and 0 for "not at all." A respondent's final self-esteem rank was the sum of the products of these two scores.

control of events in their lives (locus-of-control, Nowicki and Strickland 1973). In the Philippines-Cebu study, a prestige status scale, the Pasao Self-Concept Rating Scale (1979), and the Body Attractiveness and Satisfaction Scale (Lerner, Karabenick, and Stuart 1973) were applied. Reflecting the scarce literature on these topics from developing countries, much of the research effort was necessarily devoted to developing assessment methods. In two cases, instruments were developed for the first time—the self-esteem (see box) and prestige scales. In the other three — Nowicki and Strickland locus-of-control, Pasao Self-Concept Rating Scale, and the Body Attractiveness and Satisfaction Scale — existing scales were adapted to study samples.

Ultimately, however, these self-perception variables were not strongly related to nutritional outcomes in the Cameroon or Philippines-Cebu studies, or to behaviors

that were expected to influence nutritional outcomes. The primary reason for this appears to be the lack of variation among the study participants in the self-perception variables. Study participants had scores for these variables that fell into a narrow range, usually near the average score, regardless of variation among them in socioeconomic status, sex, age, or other factors. An explanation for the lack of variation could be that the research methods were not sensitive enough to detect true differences among adolescents. To explore this measurement issue, more qualitative investigation is recommended into how adolescents think about themselves, how much they think they can influence events in their lives, and how they view the influence of other people and events, especially within their family or household, or among their friends.

DISCUSSION

Most of the descriptive findings on adolescents gathered in the eleven studies contribute new knowledge. Only two of the topics, reproductive health and education, have been addressed extensively, though usually in isolation from the other topics considered here. The following discussion highlights the main findings and their interpretation. These and other points form the basis for the recommendations.

GENDER DIFFERENCES IN BIOLOGICAL AND SOCIAL INDICATORS

A pattern that emerges across the studies is that some of the nutritional variables indicated vulnerability among the boys, whereas some of the social variables indicated vulnerability among the girls. Undernutrition (BMI-for-age) was the variable with the greatest deficit among boys compared with girls. At least twice as many boys as girls were undernourished. To our knowledge, the ICRW studies are the first to have investigated gender differences in undernutrition among adolescents, and to have identified boys' vulnerability measured by this indicator. (It should be noted that the prevalence of undernutrition was high among both boys and girls only in the studies in India, Nepal, and Benin, and more so in early than late adolescence. Whether the overall prevalence was high or low, however, the rate among boys was higher.) Further investigation is needed, especially in populations where undernutrition continues throughout adolescence, to establish whether this vulnerability continues into adulthood or is transient. Undernutrition is known to limit the work productivity of men and women, so if it continues into adulthood, improving nutritional status would certainly be recommended. However, if the growth rate of boys is simply slower than that of girls during adolescence, owing to anemia and a higher requirement for iron, or for other reasons, boys may finish growing within their early 20s without long-term negative consequences.

Three findings involving social indicators, on the other hand, pointed to the higher vulnerability of girls in the social realm. First, in the Mexico longitudinal study, cognitive development of girls slowed unexpectedly around age 15, whereas the boys' development continued to increase. This was probably due to a "social ceiling" imposed on girls that limited their social and intellectual stimulation. Second, in the Benin study, formal education was more limited for girls than boys. Parents felt that education was irrelevant, that girls needed to be trained at home to perform household, child care, agricultural, and other income-generating tasks. Third, in the Ecuador study, more girls than boys in wealthier families had left school and were working outside the home. This suggests that parents in more affluent families place greater emphasis on education for boys. These findings suggest that the social and intellectual development of boys is promoted by adults, but no special value is placed on education of girls. In essence, less is invested in girls and women, and less is expected of them. Subsequently, women have fewer income-generating opportunities than men, and have less say in the political and economic development of their communities and countries.

The difference between the nutritional and social vulnerabilities identified here has implications for the use of social indicators. Among adolescents, nutritional status was not a good indicator of gender differences in social development. Therefore, at least for this age group, nutritional measures alone should not be used as indicators of well-being.

CATCH-UP GROWTH

The longitudinal studies on catch-up growth without an intervention during adolescence were mixed about how much height could be made up following undernutrition in early childhood. The Guatemala metabolic study in which adolescents received a food supplement

showed only modest gains in growth hormone levels. This may, in turn, suggest that only small gains in height may be possible with intervention, though it is not certain how to separate changes in stature from changes in growth hormone levels.

Furthermore, a food intervention during adolescence that is aimed at increasing final stature will also cause an increase in weight, including fat stores. Whether this is advantageous depends on existing weight and fat stores. If underweight among adolescents is prevalent, then a food intervention could contribute to reducing the prevalences of both underweight and stunting. However, if underweight is not prevalent, despite a high prevalence of stunting, any benefits of greater stature must be balanced against the potential for promoting overweight. The Benin data (Figures 1-4) underline this caution, indicating that adolescents gain more weight relative to the BMI reference data than height relative to the height reference data. This occurs without an intervention, and may suggest that a food intervention would favor a weight gain.

In addition, it is not known whether improved food intake during early adolescence would hasten menarche. Among well-nourished adolescents, early maturers grow in height faster before menarche but for a shorter period of time, while late maturers grow slower before menarche but for a longer period of time, and the total height achieved during adolescence may be similar for both. It is not known how intervening with extra food during adolescence would influence this balance. If the intervention is premenarcheal to take advantage of the faster growth, it might hasten menarche and shorten the length of time during which the faster growth occurs (Martorell, Khan, and Schroeder 1994). Ultimately, it could be that no additional height would be gained. In conclusion, before interventions can be recommended, further investigation is needed into how much height and weight could be gained by increasing food intake.

Where undernutrition is prevalent throughout adolescence, additional food is undoubtedly required, but this was not the case in the ICRW studies; undernutrition was not highly prevalent at the end of adolescence, even in the India, Nepal, and Benin studies.

ANEMIA, MORBIDITY AND REPRODUCTIVE HEALTH

Anemia was the greatest nutritional problem the adolescents in the studies experienced. It was prevalent in five of the six studies in which it was assessed. The Guatemala metabolic study showed that adolescents' iron status improved substantially after iron supplements were given. The prevalence of other micronutrient deficiencies among adolescents also should be investigated. Anemia among pregnant women is a well-known problem, and one that is addressed widely in prenatal services. Anemia in adolescents is not well known, though results from the ICRW/USAID studies closely match those cited in the review by DeMaeyer and Adiels-Tegman (1985). Anemia in adolescents is often not addressed in programs either. Improving iron status in a sustainable fashion is an investment in the future productive and reproductive roles of adolescents. It is also expected to promote growth during the adolescent years.

The prevalence of illness from infectious disease, especially diarrheal disease, respiratory infection, and fever, was much higher than expected. The morbidity data were self-reported, and therefore not as reliable as clinical records, but were numerous enough to suggest further research with clinical confirmation, and routine inquiries by adolescent health practitioners regarding infectious disease morbidity. Finally, the Nepal data suggested that gender preferences should be considered in the design of health services targeted to adolescents.

Most of the findings on reproductive health are

consistent with earlier research by others: adolescents were knowledgeable about how to prevent unwanted pregnancy and how HIV infection is transmitted, but wanted more information about how their bodies worked; communication with parents on sexual matters is limited; sexual activity can begin at an early age; and the average age of marriage is increasing, and is not often triggered by menarche. In addition, it was found that Cameroonian adolescents preferred relatively large families. This suggests that family planning efforts in some parts of Africa will continue to be challenging well into the future.

VIOLENCE

The study in Kingston, Jamaica highlighted the dramatic effects of violence on the lives of adolescents. Violence with acute effects was evident in the rape of girls less than 12 years old by known attackers. Violence with effects of a more chronic nature was found in the form of adolescent girls physically fighting each other at school, and this was highly predictive of poor school achievement. Crime, violence, and accidents contribute to morbidity, mortality, and the loss of years of productive life; they also place a severe burden on health services. Domestic and community violence also reduce the effectiveness of health and development programs if the staff are not aware of how it can cripple participation and outcomes. In regions where violence is a problem, additional research is needed to evaluate its impact on adolescence.

POVERTY AND ADOLESCENT EDUCATION AND WELL-BEING

A strong theme underlying the findings on school attendance was that poor families often needed to take their adolescent children out of school so they could earn income for the household, or so they could take on household responsibilities while the adult members

worked for pay. When this occurred, girls were pulled out more often, or from an earlier year in school, than boys. In many of the studies, parents wanted their children to stay in school and regretted the need to pull them out to provide household labor. That the children performed many domestic tasks and sometimes earned income in addition to attending school attests to the value parents placed on their children's education. Poverty, though, seemed to be a stronger reality driving parental decisions than their education preferences. In the Benin and Nepal studies, where the communities were probably the poorest compared with the other nine studies, education was valued the least because the parents did not see it as relevant to the lives of their children. In other words, the need for household labor or income from the adolescents was so great that sending their children to school was simply too much of a luxury, and this was more true for girls than for boys.

Poverty was also related to numerous other aspects of adolescent well-being. This was illustrated most clearly in the study in Ecuador. Ecuadorian adolescents from the poorest households had the worst nutritional status and were the most likely not to have enough food; were least likely to attend school and most likely to work outside the home compared with adolescents from the wealthiest households. The poorest households were also the least likely to have both parents present, suggesting less stability and perhaps less personal attention for the adolescents and other children. Although the data from the ICRW/USAID research program are not sufficient to allow us to fully understand all the implications of household poverty for adolescent development and well-being, they do indicate that poverty alleviation programs and policies would benefit from consideration of adolescents and their economic and social roles.

SELF-PERCEPTIONS

Self-perceptions were not significantly related to nutrition and health outcomes in the Cameroon and Philippines-Cebu studies, but there was not enough variation among the variables to expect such relationships. These two studies contributed new methodologies for investigating self-esteem and prestige, which can be adapted for use in other developing countries.

Self-perceptions should be considered within a broader framework for understanding how adolescents develop their health-promoting behaviors, and ultimately preserve or improve their health and nutritional status. The components of this framework are information about health, self-perceptions, life skills to enable the development of constructive behaviors, and actual health-promoting behavior and decision-making in the reproductive area (Carnegie Council on Adolescent Development 1993; Millstein, Peterson, and Nightingale 1993).

Also important are the influences that others exert on the adolescent, including peers, families, the media, schools, and health care providers. Implicit and explicit messages from these sources are often contradictory, and this will slow the adolescent's ability to develop strong, positive health-promoting behaviors. Many variables within this framework are difficult to measure, including self-perceptions, behavior and behavior change, and skill levels. As in the Cameroon and Philippines-Cebu studies, research is needed to improve the ability to assess such variables. With better measurement, greater strides can be made in evaluating program strategies aimed at helping adolescents develop health-promoting behaviors, and in suggesting improvements that increase their effectiveness.

RECOMMENDATIONS

The following recommendations are based on the findings from the eleven research projects. They also reflect discussion at the ICRW conference held in May 1994.

Provide integrated health services that are accessible and acceptable to adolescent boys and girls.

Integrated health services are needed to meet the myriad needs of adolescents. These should focus on promoting healthy behaviors and providing treatment services, and could include reproductive health services, use of family planning methods and other interventions to postpone pregnancies, education on sexuality and fertility, and training adolescents in self-care techniques. The health needs and health care preferences of girls and boys can be different, and both should be addressed. Boys are often left out of adolescent reproductive health initiatives, and efforts should be made to include them. The detection and treatment of anemia should be included. The services should be provided in sites that are accessible and acceptable to adolescents, including neighborhood youth clubs, schools, and through the media. Sites that should probably not be emphasized are public clinics or family planning clinics, because adolescents often feel there is a stigma attached to them, and prefer not to use them. Adolescents should be involved in the development and implementation of these services, so that they are acceptable to the users and meet their needs. This involvement also would engage adolescents in the decision-making process and in acting as change agents, thereby contributing to their adoption of recommended behaviors, use of services, and potentially, to enhancing their self-esteem. The cost-effectiveness of providing different modalities of integrated services for adolescents should be assessed.

In addition, staff should be aware of the signs of domestic and community violence, and be able to counsel or refer adolescents in such circumstances. When programs are designed to reduce violence and its effects on adolescents, they need to be targeted to youths at risk, especially those out of school, those in urban areas, and males. Programs should be based on family life education, healthy lifestyles, and conflict resolution. Topics should include building self-esteem, interpersonal relationships at home and at school, coping with stress, problem solving, parenting skills and family dynamics, and prevention of substance abuse. Community interventions should be developed that include teacher training, parent-teacher interaction, and training health care providers.

Improve iron status of adolescents within existing programs.

Because anemia was the greatest nutritional problem adolescents in the ICRW studies experienced, it is strongly recommended that adolescents be included in programs that address anemia and other micronutrient deficiencies. This includes programs that promote the production and consumption of iron-rich foods and foods enhancing iron absorption, and that prevent or treat infections causing iron loss, such as hookworm and schistosomiasis. A focus on anemia in programs that address adolescent health is also strongly recommended. Adolescents can be reached through schools in countries where a high proportion attend school. Otherwise, community-based health workers could seek out nonschool-going adolescents in addition to other target groups, and other options can be considered where health workers are not community based. It is not known whether boys would benefit as much as girls from interventions to reduce the prevalence of anemia. Although boys and girls had a similarly

high prevalence of anemia during adolescence, iron status improves among adult men once they have finished growing.

Implement policies and programs that seek to increase the productivity and income of the poor.

An indirect but powerful way to promote the well-being of adolescents in poor households is to promote income-earning and time-saving opportunities for the parents, especially the mothers. When the parents are more productive and earn more, there is less need to have their children earn income, and the adolescents' time is freed to attend school. In addition, there are many other benefits of increased productivity and household income. For instance, with additional time and resources, adolescents and other household members may be able to use health services more often, with benefits to their growth and development. Specific strategies will depend on the circumstances. In rural areas where infrastructure is limited, investments could be made to save labor, such as increasing access to fuel resources and potable water. Initially, investments to improve the access of poor families to health services could promote better health, and hence higher productivity. Where households are income poor, strategies would include those that increase the income-earning opportunities and the productivity of the parents, especially the mothers.

Promote girls' access to and participation in educational opportunities.

Strategies to promote girls' education should focus on increasing enrollment, participation, and completion rates. Many important lessons have been learned in this field and have yielded the following recommendations: build schools closer to communities so that more girls will be allowed to attend; provide financial incentives as one way to overcome the issue of cost, where appropriate; introduce ap-

propriate technology to reduce the need for girls' labor; modify school hours so that girls can attend school and still have time for their domestic responsibilities; and change community attitudes about the value of girls' education (ABEL 1993). In cases where the objectives to increase girls' education are being met, care should be taken that attendance and achievement by boys are also sustained, as suggested by the Philippines-Mindanao study.

Further investigate certain adolescent topics.

The numerous unexplained findings suggest that certain topics need further investigation. Broadly speaking, there is still much to be understood about adolescents' lives. We need to know more about how they perceive themselves and their social, cultural, and economic environment so they will respond more positively than they have in the past to approaches designed to reach them. Within a focus on the whole person, it is critical to understand the links and synergisms among various aspects of adolescents' lives. The influence of domestic and community violence is but one example that deserves attention. The Jamaica study showed that fear of community violence could impede school attendance and that physical fights between students were associated with poor school achievement. The effects of violence on education should be investigated in other settings, and its influence on other aspects of adolescents' lives should be explored.

More information is also needed to better grasp the dynamics of household poverty and to find specific interventions to alleviate its consequences among adolescents. When searching to understand the key factors influencing adolescent health, nutritional status, and behaviors, it is important to be able to distinguish among the influences of house-

hold income poverty, adolescents' sociocultural environment, and access to health services by adolescents or their caretakers, and the synergisms among these influences.

Finally, more research is needed on the nutrition and health status of boys, and how boys can be included in health programs. More boys than girls were undernourished, and in some studies, more boys were stunted and anemic, but the reasons are

not known, and the consequences into adulthood have not been explored. The sparse literature on adolescent nutrition focuses almost exclusively on girls, perhaps as a precursor to the almost exclusive adult focus on pregnant and lactating women. Boys have not been a large focus in adolescent reproductive health programs, and more research is needed about how to reach them.

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The Nutrition of Adolescent Girls Research Program

This document is a synthesis of findings from ICRW's Nutrition of Adolescent Girls Research Program established in 1990 through a cooperative agreement with the Office of Nutrition, USAID. The program provided needed information on the many factors that affect and are affected by nutritional status. The program included 11 research projects: five in Latin America and the Caribbean, four in Asia, and two in Africa. Research reports from the projects and background papers are available through ICRW.

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The International Center for Research on Women (ICRW) is a private, nonprofit organization dedicated to promoting social and economic development with women's full participation. Established in 1976, ICRW examines women's economic, health, and social conditions in developing countries from an integrated perspective that considers their dual productive and reproductive functions, is grounded in the generation of high-quality, empirical information, and draws attention to women's participation in and critical contribution to development and the environment. Working with policymakers, practitioners, and researchers throughout Latin America and the Caribbean, Asia, and Africa, ICRW helps influence policy and action through its research, technical support and analysis, and communications programs. Grants, contracts, and contributions from international and national development agencies, foundations, corporations, and individuals support ICRW's work.
