RESEARCH REPORT 108

Gender Equality and Investments in Adolescents in the Rural Philippines

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Dedication

This research report is dedicated to the memory of Dr. Michael Costello, director of the Research Institute for Mindanao Culture (RIMCU) at Xavier University. Mike supported this research in several ways, including encouraging us in pursuing this project. As a founder of St. Mary's School in Cagayan de Oro, he demonstrated in his life, with his actions, just how important quality education for adolescents was to him. As director of RIMCU, he oversaw our data collection activities in 1992. As an experienced and valued colleague, he helped in the data collection design and interpretation of the data, particularly the ethnographic information. Tragically, Mike was killed in a plane crash in Mindanao in January 1998. The Philippines has lost a dedicated educator and widely respected scholar. We grieve for the loss of our friend and for that of our coauthor and their four children.

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Foreword

For some time now researchers at IFPRI and elsewhere have been studying how resources are allocated within households in developing countries and why it matters from a policy perspective. Many social and cultural factors, as well as economic considerations, influence household decisions about the allocation of time, income, assets, and other resources. The recently published IFPRI book, *Intrahousehold Resource Allocation in Developing Countries: Models, Methods, and Policy,* edited by Lawrence Haddad, John Hoddinott, and Harold Alderman, provides an excellent review of the key relationships and empirical evidence. Many studies have looked at the way resources are distributed to men, women, and especially to small children, but one age group within the family has been largely ignored: the adolescents. Adolescence is a crucial period in that teenagers can make major contributions to their families' welfare through their labor and earnings, in and outside the household, but may sacrifice their own wishes and future well-being in the process if such contributions come at the expense of investments in their education.

The research methodology in this report, combining regression analysis with ethnography, provides a lesson in how complementarities between methodological approaches can be exploited. For example, from the regression analysis one might conclude that boys leave school earlier than girls to earn money. However, close questioning of household members makes it clear that the reason many boys leave school is more cultural than economic. Poor parents with limited resources for education tend to direct those resources to the children who have a strong wish to go to school, more often girls than boys in the Philippine setting studied here.

The research finds that parents are not unduly influenced by short-term needs and are ready to make substantial sacrifices in terms of current consumption in order to invest in their children's future. The research also concludes that boys and girls in this rural area of the Philippines are generally treated equally, providing a contrast with other Asian settings where discrimination by gender is common.

Per Pinstrup-Andersen
Director General

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Thanks are due to Kathleen Kurz and Charlotte Johnson-Welch of the International Center for Research on Women (ICRW) for their comments, which were of great assistance to us in improving an earlier draft of this report. ICRW, through the U.S. Agency for International Development (USAID), provided partial funding for this research. An earlier version of this study was published by ICRW as Report No. 7 under their Nutrition of Adolescent Girls Research Program, which motivated this research.

For helpful and detailed comments on various versions of this research report, without implicating them in any remaining errors, we also thank Michael Alba, Suresh Babu, Andrew Foster, Lawrence Haddad, Kelly Hallman, Reynaldo Martorell, Christine Pena, and Agnes Quisumbing.

We thank the USAID Office of Health and Nutrition for providing the financial means to undertake and analyze long-term resurveys of the Bukidnon population. There are few practical opportunities to collect this type of panel information, which is so necessary for addressing a number of questions related to household resource allocation decisions and nutrition outcomes.

Summary

This report examines the nutrition, health, educational attainment, and contributions to family welfare of adolescents living in a rural area of the Philippines. Adolescents, defined in this report as persons aged 10 to 19 years, make up 20 percent of the global population. According to 1990 United Nations data, a remarkable 85 percent of adolescents reside in developing countries.

Parents in low-income households cannot afford to provide the education, nourishment, and health-related inputs that they would prefer for their children. Moreover, parents in these poor households are compelled by their economic circumstances to rely heavily on adolescents to contribute significantly to current family welfare, through employment in the labor force, by working in farm fields cultivated by their families, and by undertaking household chores so that adults may spend more time as hired laborers and in self-employment. Not only are there limited resources for investing in the human capital of adolescents, but the opportunity cost of the time-demands that may be placed on adolescents for contributing to current family welfare further restricts the range of options for pursuing a better education and the time available for study at home.

In part because of the divergent opportunity costs for investments in boys and girls, parents may allocate food, provide health care, and invest in education, among other expenditures, differently by gender. A gender-differentiated analysis of investments in human capital has policy relevance for at least two reasons. First, females are responsible for reproduction, which, by itself, would suggest a need for directing relatively more resources to adolescent girls than boys. Second, there is a large body of evidence now from many parts of the world, in particular South Asia, that boys receive more resources than girls, an imbalance that is critical to redress for human rights reasons.

This analysis of the Philippine adolescent population indicates that adolescents make major contributions to current family welfare. Boys and girls work about equal amounts of time in a combination of household chores, farmwork, and wage employment. Girls, however, put in an extra 12 hours per week in school and study, compared with boys. Boys spend far more time than girls in agricultural labor, both on and off the family farm, which parents consider to be more strenuous (hour for hour) and more economically advantageous to family welfare than household chores.

Parents from poor households cannot afford to send as many children to school for as many years as parents from wealthier households. When forced by economic necessity to choose which of their children will attend school, parents will invest in the education of those children who express a strong desire to go to school and who do well in school.

Girls receive somewhat more education than boys. Demand for education by the adolescents themselves is apparently a key factor influencing the amount of education they receive. Socialization patterns in the Philippines emphasize the cultivation of such traits as "responsibility," "patience," and "sacrifice." When placed in a formal education system that is structured to expect and encourage these behaviors, and whose staff is predominantly female, boys reported that they were less likely to stay in school for as long as girls, other factors being equal.

An analysis of the intrahousehold distribution of food, using a new indicator of equality or fairness, suggests that preschoolers are favored. Even though other age and gender groups consume diets that are less preferred from a taste or cultural standpoint, they are compensated by larger shares of less-preferred foods. Consequently, nutrients were relatively evenly distributed among various age and gender groups. When asked directly, parents expressed repugnance at the suggestion that males should be entitled to better food than females or that family members who earn more should be entitled to better food.

Similarly, with respect to health expenditures, older household members (adolescents and adults) may be compensated with clothing, personal effects, and other nonfood and nonhealth expenditures for the favoritism shown preschoolers in food and health expenditures.

Policies that increase household incomes can do much to improve the welfare of adolescents, both girls and boys. Higher household incomes improve the welfare of adolescents in the areas of education, dietary quality, health care, and consumption of nonfood, nondurable goods. However, while income is an important determinant of educational attainment, the level of schooling attained is strongly influenced by the desire of the adolescents themselves to stay in school. This desire is positively conditioned by the level of parental education. Innovative and cost-effective means need to be found to persuade adolescents of poor, uneducated parents living in rural areas to remain in school longer.

Although the genders are relatively equal in the Philippine population surveyed here, targeted nutrition and health programs for adolescent girls may well be warranted because girls have greater nutritional needs, associated with reproduction. For example, iron requirements for females of reproductive age are nearly double those of males. Even though iron intakes improve with household income, very large increments in income would have to be realized before iron requirements could be met for females through increased consumption of nonstaple foods. This could reasonably be expected to occur only over several decades. Supplementation may be the best short-term solution to this problem, in that rich sources of iron in the diet are expensive, and nutrition education cannot solve the problem if women cannot afford to buy recommended iron-rich foods.

In countries where there is gender inequality, the detrimental effects of poverty are borne disproportionately by females. In those societies, programs such as credit and training, targeted to women, or subsidized education for girls are warranted to begin to redress these inequalities, which are rooted in sometimes centuries-old cultural and religious traditions. Moreover, where the incidence of poverty is higher among women, or where transfers of income targeted to women are highly productive, gender-specific

policies and poverty reduction are highly complementary. In the Philippines, such complementarities in addressing the problems of low-income women may not be important (except where nutrition and health requirements are greater for females, for example, in the treatment of iron deficiencies), at least as suggested by the evidence presented here on education, food intake, and health expenditures in one rural province.

The period of adolescence has received very little attention from economists. This study aims to provide some empirical evidence on basic relationships among gender, socioeconomic status, work patterns, education, food and nutrient intakes, health care, and nonfood, nondurable consumption items. In this case study, gender inequalities appear to condition household resource allocation decisions to a relatively small degree. This suggests that Philippine examples may be used in cross-country comparisons as a counterpoint to case studies where gender inequalities are a major determinant of household resource allocation decisions. Such contrasts may well provide fresh insights.

CHAPTER 1

Research Questions and Motivation for Policy Analysis

Adolescents, defined by the World Health Organization (WHO 1986) and in this report as persons aged 10 to 19 years of age, constitute 20 percent of the global population. A remarkable 85 percent of adolescents reside in developing countries (United Nations 1990), and their percentage relative to other age groups is rising (Blum 1991).

This report examines the nutrition, health, educational attainment, and contributions to family welfare of adolescents living in a rural area of the Philippines. The adolescent population in the Philippines made up one-quarter of the total population in 1970. Their absolute numbers grew rapidly, from 9.3 million in 1970 to 13.9 million in 1990, and are projected to increase to 18.3 million by 2010, when they will make up one-fifth of the total Philippine population (United Nations 1993).

Parents in low-income households cannot afford to provide the education, nourishment, and health-related inputs that they would prefer for their children. Such investments not only improve the quality of life for the children, but yield productivity increases both in school and eventually in the labor force that benefit society as a whole, with positive spillovers across generations.

Moreover, parents in these poor households are compelled by their economic circumstances to rely heavily on adolescents to contribute significantly to current family welfare—through employment in the labor force, by working in farm fields cultivated by their families, and by undertaking household chores so that adults may spend more time as hired laborers and in self-employment. Not only are there limited resources for investing in the human capital of adolescents, but the opportunity cost of the time demands that may be placed on adolescents for contributing to current family welfare further restricts the range of options for pursuing a better education and the time available for study at home.

While it seems obvious that much investment in human capital occurs during adolescence, adolescents have been relatively neglected in the economics literature concerned with household resource allocation. This is due, in part, to the relative scarcity of household survey data sets that contain individual-level information on adolescents. Data requirements are made more demanding by the fact that adolescents are not the

primary decisionmakers—their parents are—although adolescent preferences may have a significant influence on family investment decisions.

A gender-differentiated analysis of investments in human capital has policy relevance for at least two reasons.[1] First, females are responsible for reproduction, which, by itself, would suggest a need for directing relatively more resources to adolescent girls than boys. Good nutrition is particularly crucial for adolescent girls because they will soon be giving birth to children of their own. Many girls around the world (at least 25 percent) will have had their first child by age 19 years, and a great many more shortly thereafter (Senderowitz 1995). Because of rapid growth (boys and girls) and the start of menstruation (girls), adolescents are at risk for iron deficiency anemia (Brabin and Brabin 1992). Available evidence indicates anemia prevalence rates among adolescents of 27 percent in developing countries and 6 percent in developed countries (DeMaeyer and Adiels-Tegman 1985).[2]

Twenty-five percent of a person's attained height is achieved during adolescence, at the end of which adult height is attained. Muscle and fat both increase, with girls gaining relatively more fat, and boys gaining relatively more muscle. Low weight among females is of particular concern because it results in poor pregnancy outcomes, in particular low birth weight (Kramer 1987). Undernutrition, including micronutrient deficiencies, may also limit school achievement and work productivity, but this has not been investigated for adolescents (Kurz 1996). Such nutritional inadequacies, which were probably present well before adolescence, will have negative consequences for the health, nutritional well-being, and cognitive abilities of infants born to undernourished mothers.

Second, there is now a large body of evidence from many parts of the world, in particular South Asia, that boys receive more education and other resources than girls. Support for redress of such imbalances has traditionally been based on claims of improved social welfare. More recently, however, some authors (Ramalingaswani, Jonsson, and Rohde 1997, for example) have asserted that females have rights to adequate resources. In their view, education of girls is the most powerful of all interventions for eventually realizing gender equality:

> If girls are educated, then they are more likely to have wider opportunities, more likely to develop self-confidence and be less bound by tradition, more likely to exercise their own rights and their own judgements, more likely to use modern health and family planning services, more likely to share in decision-taking in the home and the community, more likely to send their own daughters to school, and more likely to have children who grow up healthy and well-nourished (Ramalingaswami, Jonsson, and Rohde 1997, 16).

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[1] The next two paragraphs, including citations, draw heavily from Kurz 1996.

[2] Of 523 studies on anemia reviewed by the World Health Organization, only 39 included adolescents (Kurz 1996). This is indicative of the relative lack of research and information on adolescents on a number of topics, compared with preschoolers and adults.

To formulate policies that are effective in raising investments in adolescent education, nutrition, and health, particularly for girls, it is necessary to understand the factors that constrain household spending for these resources as well as factors that lead to gender inequalities. To what extent do parents take advantage of the income-earning potential of adolescents, and as a consequence reduce investments in their education? Alternatively, to what extent do adolescents themselves participate in decisions about their education? Do they themselves want to go to school? Do parents treat girls and boys differently with respect to investments in education, employment, and responsibilities for household chores?

Gender differentiation may arise for practical or traditional reasons. For example, while adolescent girls and boys may both be engaged in agricultural work and in performing household chores, boys are more likely to be heavily involved in the former and girls in the latter. These differences in the types of jobs performed may be attributed to long-established social customs (cooking is primarily a female responsibility) or economic factors (tasks that require greater strength earn higher agricultural wages) or both.

Whatever the underlying causes, gender differentiation limits the real and perceived options that parents have for allocating family time and capital assets, so investments in the education of girls and boys have different opportunity costs. Policy intervention to improve educational outcomes depends on the needs and preferences of household members, as well as on the constraints faced by the household as a whole. If education is regarded as universally desirable, but constrained by family income, the appropriate policy intervention will be quite different from a situation where attitudes toward education depend upon the student's gender and where there is significant scope for reallocation of family expenditures toward education. Where gender-based discrimination occurs, it may be necessary to provide programs aimed at specific types of household members, for example, food-for-education programs that require daughters to attend school to obtain program benefits.

In part because of the divergent opportunity costs for investments in boys and girls, parents also may allocate foods and provide health care differentially by gender. If so, what is the extent of favoritism?

Where undernutrition occurs, nutrition education might well be an appropriate policy intervention if low-cost alternative diets that provide necessary nutrients are affordable and culturally desirable. If high-cost diets are required (for example, animal products that provide dense amounts of bioavailable minerals and vitamins), household income could well be a binding constraint, and in that case, nutrition education would not be an effective policy response.

Whereas this report evaluates the determinants of household expenditures for education, nutrition, and health as separate topics, there are strong complementarities among investments in these areas.[3] Nutrition and health are obviously synergistically linked. Poor health results in poor absorption of nutrients. Lack of nutrients, including a

[3] An extensive body of literature has evolved that may be broadly divided into contributions that focus on education and those that focus on health and nutrition. Useful surveys are provided by Behrman and Deolalikar (1988), Deaton (1997), Schultz (1988), and Strauss and Thomas (1995, 1998).

range of vitamins and minerals, is a major cause of poor health. Better nutrition leads to improved cognitive development, which enhances the return to investments in education. Unhealthy children are absent more often from school and, if marginally ill, are probably less attentive in school. Their siblings, more often their sisters, may have to stay home from school to care for them. Improved education will have intergenerational spillovers in that better-educated parents can be expected to provide better health and nutrition for their children.

The determination of the optimal mix of investments in education, nutrition, and health, then, is made complex by these strong complementarities. How should scarce public resources be allocated among, for example, formal education, nutrition education, provision of various types of improved health care, and food fortification and supplementation programs? This report does not make any attempt to evaluate returns and trade-offs to investments in these three areas. It does, however, provide new information on a crucial element in determining an optimal mix of public investments—a better understanding of the factors that determine the allocation decisions of poor households in the three areas of education, nutrition, and health.

The report is organized as follows. Chapter 2 discusses how the sample households were selected and what general types of information were sought from respondents. In order to take advantage of complementary analytical strengths of (1) quantitative questionnaires coupled with use of regression analysis and (2) ethnography, and to overcome weaknesses in each approach, both methodological approaches were used to collect and understand this information. The study is based on three sets of surveys undertaken during 1984/85 and 1992: a series of four household surveys, a follow-up quantitative survey round, and an ethnographic (cultural) study.

Chapter 3 addresses the issues of adolescent time allocation and investments in education as discussed above. The intrahousehold distribution of food is analyzed in Chapter 4. Expenditures on health and other nonfood items are looked at in Chapter 5. Chapter 6 draws conclusions and policy recommendations. It includes an evaluation of the insights gained by juxtaposing regression analysis and ethnography in each of individual chapters.

CHAPTER 2

Data and Methodology

This study is based on three sources of information. The first source is a series of four household surveys of 448 families conducted at four-month intervals in 1984/85, based on a quantitative questionnaire, as is common in economic studies of household resource allocation. These original survey data are complemented by one round of a quantitative questionnaire survey conducted in October and November of 1992 of households residing in the study area that had been previously surveyed, or that had been formed as the result of marriages of children from the previous study households. Third, an ethnographic study was conducted in 1992 consisting of in-depth, structured, but flexible interviews of a subset of 19 carefully selected households from the 1984/85 surveys.

The potential advantage of quantitative surveys of a relatively large number of households is that regression analysis may be applied to these data, which allows for estimation of the effects of specific variables (with other factors controlled) on outcomes of decisions made by members of households. The estimated coefficients may be interpreted as objective, replicable measurements of behavioral parameters for a population under study. Ethnographic studies may be criticized for being biased because of the subjective manner in which data are collected and interpreted and their small sample size. The latter can be a problem if the particular respondents chosen are not representative of the group. Small samples also do not permit measurement of the effects of causal factors on outcomes.

However, regression analysis may also produce unreliable conclusions. The researcher is often far removed from the cultural situation and data collection process, partly because it is inherent in the methodology that a team of enumerators and data managers be employed to collect the data. The researcher, therefore, may not understand how the data collection process could have generated biased information. Respondents may perceive a question in a different way than the researcher intends. Respondents may be fatigued or inclined to hide or falsify information. Important information that is relevant to a particular setting may be omitted from the questionnaire.[4]

[4] See Chung (1997) for a discussion of the ways in which qualitative methods can be used to inform the design of quantitative surveys.

Additional problems may be introduced into the data used in regression analysis if the enumerators are not well-trained and highly motivated. Errors also may be introduced in data processing. It is much more likely that an ethnographer will sense these problems and make appropriate adjustments in the interviews and analysis.

Important econometric challenges may arise because the models used may fail to reflect important details of actual behavior or because necessary assumptions fail to conform to reality. Finally, even assuming that regression estimations are unbiased, they must be interpreted. Various interpretations are often possible, depending on the specific cultural and economic setting, the knowledge of which is a strength of ethnography.

Recognizing the strengths and weaknesses of the two approaches and hoping to ameliorate the shortcomings of both, the investigators decided to employ both methodologies in addressing the set of questions outlined in the previous chapter. The extent to which the two methodologies complemented each other will be evident, it is hoped, from the discussion in the following chapters.

The Study Area

The southern part of Bukidnon Province, where the original 1984/85 household surveys were conducted, lies about midway between the two principal cities of Mindanao—Cagayan de Oro, on the northern coast, and Davao City, on the southern coast. By the mid-1970s, smallholder agriculture was almost exclusively devoted to corn and some upland rice farming, except for small areas of irrigated rice production. Corn exports flow north to Cagayan de Oro and thence to the heavy corn-eating areas of the central Visayas, or to Manila for livestock feed.

The Bukidnon Sugar Company (BUSCO), which began operations in 1977, was established in response to the high world sugar prices of a few years before. From the beginning, BUSCO was supplied primarily by sugarcane production from a few large haciendas (plantations) located near the mill. Sugarcane production was sufficiently profitable that there was a high demand for new contracts with the mill. The mill's capacity was expanded in 1981, and contracts were given to some smallholders.

The 1984/85 Surveys

The policy issue that motivated the original household surveys in 1984/85 was a concern that cash cropping might have adverse effects on human nutrition. The research strategy was to sample cash-crop–adopting (sugarcane households) and nonadopting households (corn households) and to compare household resource allocation and nutritional outcomes in the two situations. In the Philippine context, the situations of landowners, tenants, and landless laborers, both within and across crop groups, had to be compared and contrasted. In selecting a sample, selection bias was an additional consideration if only households near the mill were selected. In hopes of obtaining roughly comparable adopting and nonadopting groups, the survey area was extended beyond the vicinity of the mill to include households who did not have the opportunity to adopt

sugarcane cultivation (because the cost of transporting the sugarcane to the mill would be prohibitive) but who shared a common farming environment and cultural heritage with sugarcane-adopting households.

Early in 1984 a random sample of 2,039 households was drawn from the 18 villages in the area of interest; a brief preliminary survey was administered to each household to elicit information that was used to develop criteria for the stratified random sample that would be selected for the detailed study.

The presurvey of 2,039 randomly selected households indicated that larger farms (more than 15 hectares) accounted for less than 3 percent of all households, a figure that corresponded closely to information provided in the 1980 agricultural census. Only households with at least one child less than 60 months of age and farming less than 15 hectares were eligible for selection. Only households that characterized the primary occupation (including wage income) of the head of household as either corn or sugar production were eligible for selection, except for a small target group of households that indicated that, although neither sugar nor corn production was their primary source of income, they might receive some income from either. Later analysis of the detailed survey data indicated that the respondents' characterizations of their crop and tenure status were quite accurate.

Based on the criteria developed from the preliminary survey, a stratified random sample of 510 households was selected for detailed study. These households were not selected as a subset of the 2,039 households in the preliminary survey. Some attrition occurred during the study period; a total of 448 households participated in all four rounds of the detailed survey.

The four detailed surveys were undertaken in these households at four-month intervals, beginning in July 1984 and ending in August 1985. Outmigration was the primary reason for the reduction in the number of observations, which consisted, for the most part, of landless or nearly landless households. The topics covered in each of the four survey rounds are shown in Table 1. Other details of the data collection process are provided in Bouis and Haddad (1990).

The 1992 Survey

While the anthropometric information for the same respondents initially motivated a new round of surveys in 1992, additional information on adolescents and other household members was also collected in the areas of education, time allocation patterns, and use of hospital facilities.[5] Because of funding limitations, searches for previously surveyed households and for new "spin-off" households formed by children from originally surveyed households were limited to the 10 (contiguous) municipalities in which the 1984/85 respondents resided.

[5] An analysis of these anthropometric data is provided in Bouis et al. (1994).

Table 1 Topics covered by 1984/85 survey questionnaires in each of four rounds (unless otherwise specified)

Topic	Explanation
General household information[a]	Demographics, education, migration
Parcels of land	Ownership, tenure relations
Agricultural production record	Steps in production, input use, output
Sugar producer's questionnaire Corn producer's questionnaire Rice producer's questionnaire Other crop producer's questionnaire	Postharvest processing, disposition of output including revenues from sales, loans, past production history
Agricultural wage labor	By crop, by task
Other sources of income	Nonagricultural employment and transfers
Backyard production	Livestock, fruits, vegetables
Assets (rounds 1 and 4)	
Past income and assets (rounds 1 and 4)	
Food expenditures[a]	One-month recall
Nonfood expenditures	Four-month recall
Source of water/food preparation (round 1)	
Preschool feeding practices (round 2)[a]	
Reproductive history (round 1)	
Health services/nutritional knowledge	
Time allocation of wife	24-hour recall
Anthropometry and morbidity[a]	2-week recall
Individual food intake[a]	24-hour recall

Source: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85.

[a]Accomplished on first visit to households. Remaining topics covered during a second visit.

Of the 448 previously surveyed households, 352 were found to be still living in the study area and were resurveyed, and 98 spin-off families were surveyed, for a total of 450 households surveyed in 1992.[6] As indicated in Table 2, these 450 households included 2,065 of the 3,294 individuals surveyed in 1984/85. Of the 1,229 individuals "lost" between the 1984/85 and 1992 surveys, 664 were members of the 96 "lost" households and 565 were members of resurveyed households who had died or moved away in the intervening seven years. There were 772 persons surveyed in 1992 who were not surveyed in 1984. Three-quarters of these additional 772 persons were children born since the 1984/85 surveys, both to parents in the original survey households and to 98 of their children who had married and formed spin-off households after 1984/85.

Of the 772 adolescents (sons and daughters of the household head aged 10 to 19) identified in the 1984/85 surveys, 393 were missing from the 1992 surveys. As indicated in Table 2, 86 of the remaining 379 adolescents (as surveyed in 1984/85) had married:

6 These figures do not include six households that were surveyed both in 1984/85 and 1992 but not interviewed during all four survey rounds in 1984/85.

Table 2 Number of persons surveyed in 1984/85 and 1992, by age and relationship to household head

Households surveyed	Surveyed in 1984/85 (448 households)								Surveyed in 1992 but not in 1984/85		
	Dauthers and sons of household head										
	0 5 years	6 9 years	10 19 years	More than 20 years	Married	Parents	Other relatives and friends	Subtotal	Born after 1984/85	Born before 1984/85	Total
Surveyed in 1992											
Resurveyed from 1984/85 (352)											
Daughters and sons of household head											
0–5 years	0	0	0	0	0	0	0	0	318	0	318
6–9 years	215	0	0	0	0	0	0	215	81	0	296
10–19 years	374	345	141	0	0	0	0	860	0	3	863
More than 20 years	0	0	152	7	0	0	0	159	0	8	167
Married	0	0	12	3	0	0	0	15	0	1	16
Parents	0	0	0	0	0	687	0	687	0	0	687
Other relatives	0	0	0	0	0	0	29	29	28	79	136
Spin-off households (98)											
Daughters and sons now living away[a]	0	1	74	20	2	0	1	98	0	0	98
Their spouses	0	0	0	0	0	0	1	1	0	96	97
Their children	0	0	0	0	0	0	1	1	134	0	135
Other relatives and friends	0	0	0	0	0	0	0	0	3	21	24
Subtotal	589	346	379	30	2	687	32	2,065	564	208	2,837
Surveyed in 1984/85 but not in 1992											
Died or moved away from 352 households resurveyed in 1984/85	32	36	248	38	6	17	188	565	0	0	565
Resided in 96 households “lost” between 1984/85 and 1992	163	104	145	10	4	192	46	664	0	0	664
Total	784	486	772	78	12	896	266	3,294	564	208	4,066

Source: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85 and 1992.

[a]Two families moved in with parents-in-law; one family headed by single mother; one “other relative of wife” (not daughter or son).

72 had formed new households and 14 were living with their parents or parents-in-law. One hundred and fifty-two were older than 19 (no longer adolescents) and 141 were still adolescents. In total, 863 adolescents were identified in the 1992 surveys, almost all of whom had been surveyed in 1984/85.

The Ethnographic Study

The ethnographic aspect of the study represents an attempt to collect detailed, qualitative information on a subsample of 448 respondents who originally participated in the 1984/85 survey. This approach was designed to complement and update the 1984/85 data set: "complement" in that the information collected was conducive to qualitative analysis, whereas the original analysis was heavily quantitative, and "update" in that changes had probably occurred, not only in the lives of the original respondents, but also in the social and economic situation of the study area.

More specifically, the approach used was the informal structured iterative interview (Fujisaka 1986):

> Informal structured iterative interviewing is useful for exploratory research and the discovery of new research directions. The method can complement more structured research techniques, such as sample survey questionnaires. . . . Interviews are "informal but structured." "Informal" refers to the use of open-ended questions and no written questionnaire. "Structured" means that preselected specific guidelines are addressed . . . "Iterative" implies that researchers will return to talk to respondents until data sets are complete and satisfactory. Interview results are examined after the field session; new or previously missed questions, internal inconsistencies, and data gaps are identified. Interviewers return to ask necessary follow-up questions (Fujisaka 1986, 263–264).

Both parents and adolescents were interviewed, thereby making available three types of data: (1) objective indicators of nutrition, health, and human capital formation (for example, educational attainment, current enrollment status); (2) the subjective viewpoints of parents (such as beliefs and attitudes, aspirations, and normative standards); and (3) the subjective viewpoints of adolescents.

The initial meeting with each selected household was used to establish rapport and find out the family's history. The background of the household head and spouse, the "life story" and characteristics of each adolescent child, and the family's current economic situation were all investigated at this time. Subsequent visits were used to find out about nutrition, schooling, and health care patterns, especially among adolescents. Particular attention was also paid to gender differentiation (for example, time allocation and inheritance patterns) and economic problems of households. Three or four visits were required to obtain all of this information.

The interviews with adolescents were often difficult to complete. Many were painfully shy, and a few ran away from the study team when they heard that they were to be interviewed. Answers were generally slow in coming and sometimes seemed to be related only indirectly to the question being asked. Medina's (1991, 200–201)

observation that Filipino children are traditionally "encouraged to be dependent on the parents . . . to be respectful and obedient to authority . . . to be shy, not aggressive . . . (and) to be humble and submissive" seems an apt one for the sample of rural families in Southern Bukidnon.

Recent years have seen some economic development in the region. The provincial highway to the port city of Cagayan de Oro has been upgraded. Some large-scale irrigation projects have been opened, and rural electrification is widespread. Poverty, however, is still endemic, and both landlessness and economic inequality appear to be growing.

The households chosen for study were located in the municipalities of Quezon, Maramag, and Don Carlos. The choice of these three municipalities was made in order to minimize the travel time required, since they are close together. Quezon is largely a sugar area, while the other two are corn and rice areas.

Nineteen households from the original sample were chosen purposively, so that there was at least one adolescent child still living at home, and there was as much variation as possible in residence (isolated versus nonisolated), farm status (farm size and tenure), and education of the household head. A continuum was thus established, ranging from poorly educated landless households in isolated *barangays* (villages) to the well-educated owners of large, nonisolated farms (Table 3).[7] Note that assignment of households to their proper positions in this typology was based on their standing in the 1984/85 study. However, several of the respondents had experienced upward or downward mobility since that time.[8]

[7] Not a single case was found to represent Type 8 (highly educated, nonisolated tenant with a large farm). The number of case studies was thus reduced from 20 to 19.

[8] Economic improvement or decline was not uncommon, demonstrating that poverty (or relative economic security) is by no means a static concept. Indeed, cases of both upward and downward mobility were noted. Two tenant families experienced a decrease in the size of their farm holdings, apparently as part of a general trend away from letting out larger land parcels to only one tenant. Two female-headed households experienced downward mobility, one when the wife was abandoned by the husband, the other when the husband died after a long and expensive illness. Two households (one a former tenant, the other formerly landless) acquired land through inheritance, thus moving upward in the local status hierarchy. A small landowner was able to purchase additional land, while other landless families improved their economic standing when the spouse acquired a better-paying or more stable job outside of agriculture. This latter outcome occurs more frequently among the better educated, nonisolated households.

Table 3 Ethnographic sample, based on the household s status in 1984/85

Size of farm/ tenure status	Isolated households		Nonisolated households	
	Low education (0 6 years)	High education (7+ years)	Low education (0 7 years)	High education (7+ years)
Large farm (5 hectares or more)				
Owner	(1) (San Jose, Quezon)	(2) (Calao-Calao, Don Carlos)	(3) (New Nongnongan, Don Carlos)	(4) (Poblacion, Don Carlos)
Tenant	(5) (Kiara, Don Carlos)	(6) (Lumintao, Quezon)	(7) (Poblacion, Don Carlos)	(8)[a]
Small farm (less than 5 hectares)				
Owner	(9) (San Roque, Maramag)	(10) (New Nongnongan, Don Carlos)	(11) (Bocboc, Don Carlos),	(12) (Poblacion, Don Carlos)
Tenant	(13) (Kiara, Don Carlos)	(14) (Bocboc, Don Carlos)	(15) (San Jose, Quezon)	(16) (Calao-Calao, Don Carlos)
Landless	(17) (Merangeran, Quezon)	(18) (Kisanday, Maramag)	(19) (Poblacion, Quezon)	(20) (Bocboc, Don Carlos)

Source: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85.

Note: Names in parentheses indicate the village and municipality where the selected family resided.

[a]No household matched these criteria.

CHAPTER 3

Adolescent Contributions to Family Income and Investments in Their Education

There is an obvious tension between the contributions that adolescents can make to family income and investments in their education. It is not difficult to understand why adolescents in poor households might be asked to work long hours in the labor force, on the farm, or in the house, thereby sacrificing future earning power because of the lost opportunity for education. Alternatively, other family members may be called upon to make sacrifices so that adolescents may further their education. How is this potentially contentious decision resolved? What key factors influence work patterns of adolescents and investments in their education?

In most rural societies, adolescent girls are more heavily involved in household chores than boys, and adolescent boys are more heavily involved in farmwork than girls. Does this gender-differentiation in work patterns result in gender differences in educational attainment?

In this chapter, results from the ethnographic interviews help develop a context for interpreting the statistical results. Time allocation data for adolescents shed some light on the questions; a more detailed econometric analysis is used to estimate the responsiveness of investments in education to various determinants.

Adolescents Time Allocation

Results of the Ethnographic Study

There is a strong division of labor along gender lines with respect to household chores and other work. Male tasks are generally performed outside the home. These tasks, such as fetching water, gathering or chopping firewood, farmwork, or animal husbandry, often require muscular strength. By contrast, girls are expected to clean the house, do the laundry, cook, wash the dishes, and babysit.

Parents believe that girls should spend more time on household chores than boys spend on farmwork. This is considered "fair," because the work done by boys is viewed

as harder or more physically taxing. Most of the adolescent girls interviewed agreed with this rationale.

Most parents believe that their adolescent children should be allowed to work outside the home for pay. A clear majority indicated that they had already allowed this in the past. However, they do not believe that children should be taken away from school in order to take advantage of such opportunities. Parents claim that they do not subscribe to the "old-fashioned" notion that all of a child's earnings from labor market activities should be contributed to the family budget. The general belief in this case seems to be that at least part of these earnings should be reserved for the personal needs of the child.

Results of the 1992 Household Surveys

All respondents 10 years of age and older were asked to recall time spent on seven types of activities during the preceding week. These were household chores, school attendance, work in their family's farm fields, tending the family vegetable garden, work in a family-owned business, agricultural employment off of their own farm, and nonagricultural employment.[9] Average hours spent per week in these categories of activities are presented in Table 4 for older and younger adolescents, by gender and by tercile of value of household assets.[10] For purposes of comparison, the same information is provided for mothers and fathers and for older sisters and brothers still living at home.

For younger adolescents (10–14 years), daughters are already spending one-third as much time as their mothers on household chores, and nearly twice as much time (six hours or more) on household chores as sons in the same age category. These boys spend five hours more than girls working on their household farms and tending the vegetable gardens. The total time of seven hours spent on fieldwork is about one-fourth as much time as their fathers spend on this activity. Time spent in school is by far the most important activity. Girls spend about 10 percent more time in school than boys. At this age, the household's wealth, as measured by the value of its assets, appears to have only a small effect on the time allocation patterns of boys. There is some tendency for boys from low-asset-value households to spend less time in school and more time on household chores and in agricultural employment than boys from high-asset-value households. For older adolescents (ages 15–19), gender differentiation in activities becomes much more pronounced, and household wealth becomes an important factor in determining time allocation. Daughters spend one-half as much time as their mothers in household chores and three times as much as sons. These boys spend three times as much time as girls working on the family farm or in some form of paid employment—about three-quarters as many hours as their fathers.

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[9] Household surveys were undertaken in November and December of 1992, which are not months of highest demand for agricultural labor, nor is it a notably slack period. The height of the sugar harvest occurs during April and May (a 12-month crop cycle). The main corn crop is harvested in June and July (a 4-month crop cycle). A secondary corn crop is harvested during November and December.

[10] For the 1992 surveys, funding was insufficient to allow collection of information on total expenditures or joint and individual incomes by source (these were collected in the 1984/85 surveys). Information on value of assets was collected in both the 1984/85 (first and fourth rounds) and 1992 surveys.

Table 4 Hours spent per week, by type of activity, type of household member, and asset tercile

Type of household member and age/ asset tercile	Household chores	Attend school	Own farm	Tend vegetable garden	Own business	Non-agricultural employment	Agricultural employment	Total hours
				(hours/week)				
Daughters (10–14)	13.2	35.7	0.8	1.1	1.0	0.1	0.6	52.5
1	12.0	34.1	0.6	0.8	0.1	0.3	1.0	49.0
2	13.6	38.2	0.9	1.1	1.8	0.0	0.7	56.3
3	14.0	35.0	0.9	1.4	1.0	0.0	0.0	52.4
Sons (10–14)	7.4	31.4	3.5	3.5	0.5	0.1	2.0	48.3
1	11.6	26.7	2.8	3.2	0.1	0.1	3.7	48.1
2	5.6	33.9	2.5	3.2	0.9	0.0	1.7	47.8
3	5.5	33.1	5.1	4.1	0.3	0.2	0.9	49.1
Daughters (15–19)	19.3	29.9	2.3	1.0	4.0	1.1	0.4	58.1
1	26.8	25.9	2.1	1.0	0.2	0.0	0.9	56.8
2	18.5	30.8	1.4	0.5	5.9	2.5	0.6	60.3
3	16.4	31.1	3.2	1.4	4.3	0.6	0.0	56.9
Sons (15–19)	6.2	17.4	10.0	3.9	0.6	2.9	6.1	47.2
1	6.1	9.7	7.2	3.9	0.6	3.5	9.5	40.4
2	8.8	16.2	8.2	4.1	0.8	3.1	7.4	48.5
3	4.3	23.8	13.4	3.9	0.5	2.3	2.7	50.9
Daughters (over 19 years)	28.9	3.6	7.2	4.0	3.0	8.2	0.5	55.4
Sons (over 19 years)	8.6	3.7	16.1	3.9	2.7	5.2	4.7	44.9
Mothers	40.2	0.2	5.2	3.4	7.1	1.4	2.7	60.2
1	43.6	0.0	3.3	2.6	3.7	0.5	4.6	58.4
2	39.4	0.1	5.7	3.1	9.1	0.5	3.3	61.2
3	37.3	0.4	6.7	4.5	8.6	3.5	0.0	61.0
Fathers	7.6	0.0	17.6	7.9	4.4	6.0	7.4	51.0
1	9.2	0.0	13.0	6.5	1.4	6.0	12.3	48.5
2	8.1	0.0	16.6	9.0	6.0	5.2	8.2	53.3
3	5.5	0.0	23.6	8.1	5.8	6.8	1.3	57.1

Source: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85.

Note: One is the lowest asset tercile.

Older adolescent boys dramatically reduce the time they spend in school, compared with their younger brothers. Schooling is strongly influenced by household wealth—the higher the income, the longer boys stay in school. By contrast, girls reduce time spent in school only marginally as they get older. Household wealth has some influence on time spent in school, but the effect appears to be not nearly as strong for girls as it is for their brothers. Older adolescent girls spend much more time in school than boys, particularly at lower levels of household wealth. Whether this is an effect solely linked to wealth or whether it is due to other variables that are correlated with wealth, is addressed subsequently.

In sum, younger adolescents make significant contributions to family welfare by helping with household chores and farmwork, but they spend more time in school than

working. There are no striking differences in the time allocation patterns between boys and girls at this age, nor does the value of their household's assets make a difference.

Older adolescents make major contributions to household income. Boys and girls work about equal amounts of time in a combination of household chores, farmwork, and wage employment. Girls, on average, put in an extra 12 hours per week in schoolwork, compared with boys. Boys spend far more time than girls in agricultural labor, both on and off the family farm, which parents consider to be more strenuous (hour for hour) and more economically advantageous to family welfare than household chores.

Adolescents Education

Expenditures for education obviously are a primary strategy for parents to invest in their children's future. Parents are motivated in part by a desire for their children to have the multifaceted benefits that education can provide, in terms of the opportunity for personal growth and for improved employment opportunities. They may also be motivated, in part, by the hope that better educated, and thus more prosperous, children will be better able to provide future support for their parents. The time allocation information suggests that girls spend more time in school than boys. Why is this?

Are parents following an economic strategy of portfolio diversification—boys can more easily find agricultural employment, while girls can more easily find nonfarm employment?[11] Alternatively, is it the custom for boys to inherit land, while girls are compensated by more education (Quisumbing 1995)? To what extent is the decision to stay in school determined by the adolescent, the mother, or the father?

An econometric model is used to isolate the effects of gender, family income, parents' educations, and remoteness on educational attainment. Ethnographic interviews are then used to discern the underlying motivations driving the patterns that are revealed.

Results of 1992 Household Surveys

Data were collected in the 1992 household surveys on years of schooling completed for all children.[12] This information, disaggregated by gender, age group, and value of household assets, is summarized in Table 5. The patterns displayed are consistent with those just discussed for time spent in school. Girls receive more education than boys. Differences in the years of education received by girls versus boys increase with age and decline with household wealth. That is, the likelihood that boys will drop out of school increases more than the likelihood that girls will drop out of school as the boys and girls get older. For any given age, however, the differentials in years of education decline with increasing household wealth.

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[11] In the latter half of the 1980s, during the Aquino administration, the government initiated free provision of secondary schooling, so the opportunity cost of education is primarily forgone earnings alternatives rather than direct costs.

[12] Years of schooling completed was also collected in the 1984/85 survey, but this information is not used in the analysis in this chapter.

Table 5 Years of education, by gender and asset tercile

Age/asset tercile	Years of education			Sample size	
	Girls	Boys	Girls minus boys	Girls	Boys
10–14 years					
All	4.4	3.9	0.4	248	295
1	3.9	3.2	0.7	77	89
2	4.4	3.8	0.6	78	102
3	4.8	4.7	0.1	93	104
15–19 years					
All	8.4	7.0	1.4	141	191
1	7.6	5.8	1.8	30	53
2	8.1	6.8	1.3	49	57
3	9.0	7.9	1.1	62	81
Over 19 years					
All	10.4	8.3	2.1	61	123
1	7.3	5.8	2.5	7	19
2	9.8	7.9	1.9	15	36
3	11.3	9.2	2.1	39	68

Source: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85.

An Econometric Model

The dependent variable is *years of education completed* by each child. Since this dependent variable only takes on nonnegative integer values, the standard regression model is inappropriate. One way to approach this estimation problem is to consider educational attainment as the outcome of a sequence of decisions: each year, the family decides whether the child will attend school for one more year. This decision depends on many factors, including the child's age, the family's income, the parents' attitudes and educational achievements, the distance to the school, the gender of the child, and the child's previous educational attainment. The constellation of regressors influences the probability that a randomly selected child will continue in school or stop.

The conditional probability (P) of stopping at educational attainment level g given that the child attains *at least* level g is written as

$$P(A_i = g \mid A_i \geq g; X_i). \tag{1}$$

Here, A is the attainment variable, g is the grade level attained, i indexes children, and X_i represents the vector of regressors for the i^{th} child. A dummy dependent variable is defined:

$$Y_i = 1 \text{ if } A_i = g; \; Y_i = 0 \text{ if } A_i > g. \tag{2}$$

The model

$$P(y = 1) = f(X\beta + \varepsilon), \tag{3}$$

is then estimated as a logit model. Additional analytical details are provided in the Appendix.

The model could be estimated for each grade level g = 1, ..., 12; and a model for never attending school (g = 0) could be estimated as well. The data set contains too few observations for g = 10, 11, and 12, so our estimates focus only on g = 1, ..., 9. In this model, children only contribute observations for grade levels that they are old enough to be eligible to attend. For example, consider the regression for grade level g = 3. A child old enough to have only attended second grade would be excluded from this regression. On the other hand, a child old enough to have attended grade five would be included. If that child completed third grade and then stopped, she would be assigned Y_i = 1; if she had completed fourth or fifth grade, then she would be assigned Y_i = 0.

Table 6 displays logit results obtained by pooling the nine equations (allowing for distinct intercepts). However, for subsequent results, the restrictions imposed by the pooling are relaxed and the nine equations are estimated individually. Since the equation models the probability of stopping school, a positive coefficient indicates that an increase in the corresponding regressor increases the probability of stopping school; a negative coefficient indicates that an increase in the value of the associated regressor leads to a reduction in the stopping probability. A gender dummy (zero for female, one for male) was included and was allowed to interact with all other variables in the specification in order to quantify any gender differentiation and to provide tests for its statistical significance.

Table 6 Estimated logit model for stopping school at a given education level

	Girls			Boys			Differential		
Variable	Coefficient	*t*-ratio	*P*-value[a]	Coefficient	*t*-ratio	*P*-value[a]	Coefficient	*t*-ratio	*P*-value[a]
FATED	−0.051	−1.78	0.0745	−0.112	−4.78	0.0000	−0.060	−1.63	0.1035
MOMED	−0.087	−2.94	0.0033	−0.102	−3.69	0.0002	−0.014	−0.35	0.7249
REMOTE	−0.003	−1.04	0.2996	0.0048	1.95	0.0509	0.0075	2.10	0.0361
Ln(*AGE*)	−16.30	−18.31	0.0000	−10.72	−19.26	0.0000	5.58	5.32	0.0000
INCOME	−0.007	−1.86	0.0636	−0.015	−5.25	0.0000	−0.008	−1.82	0.0691
*G*1	−4.39	−10.94	0.0000	−2.11	−7.35	0.0000	2.28	4.61	0.0000
*G*2	−3.57	−9.41	0.0000	−1.13	−4.12	0.0000	2.44	5.22	0.0000
*G*3	−2.49	−7.28	0.0000	−0.39	−1.43	0.1521	2.11	4.83	0.0000
*G*4	−1.81	−5.36	0.0000	0.07	0.24	0.8063	1.88	4.32	0.0000
*G*5	−1.32	−3.91	0.0001	0.54	1.89	0.0593	1.86	4.20	0.0000
*G*6	−0.05	−0.89	0.3728	0.25	4.98	0.0000	0.30	4.00	0.0001
*G*7	0.17	0.47	0.6355	1.21	3.55	0.0004	1.04	2.14	0.0323
*G*8	0.82	2.24	0.0249	2.51	6.73	0.0000	1.68	3.21	0.0013
*G*9	1.60	3.80	0.0001	2.73	5.80	0.0000	1.13	1.79	0.0737

[a]Probability = $P(|t| > |t^*|)$ where t^* is the reported value of the *t*-ratio.

The coefficients in Table 6 are not to be interpreted as the numerical values of the effects of the regressors on the probabilities of stopping school, though the signs and statistical significance are informative; see the Appendix for details concerning the interpretation. Not surprisingly, the strongest effect is associated with age. Preliminary analysis indicated that age should enter the model logarithmically. Additionally, so that the intercept (and intercept differential for gender) for each attainment level would have a clean interpretation, *Ln* (*AGE*) is expressed as the deviation from the attainment-specific mean of *Ln* (*AGE*). The probability that a child in the data set stopped school at any given level of attainment declines with age; for both girls and boys the effect of age is strongly significant. This indicates that the older a child is, the less likely it is that the child stopped school at a given grade level; this effect is significantly stronger for girls than for boys. The age variable is not perfectly correlated with the grade dummies because children start school at different ages, they may drop out of school temporarily, or they may be held back for a year or more. No effort has been made to identify and model these events.

Increasing father's education (*FATED*) has a statistically significant negative effect on the probability of stopping school for girls and boys; the coefficient for boys is more than twice that of girls and the difference between the two (captured in the differential) is statistically significant. Similarly, mother's education (*MOMED*) has a statistically significant negative effect on the probability of stopping for both girls and boys, but the differential effect is not statistically significant. For girls, the coefficient on mother's education is more than 50 percent larger than the coefficient on fathers' education. For boys, the coefficient on father's education is about 10 percent larger than the coefficient on mother's education.

The effect of remoteness (measured as travel time to the doctor) is negative (and statistically weak) for girls and significantly positive for boys. This may reflect the fact that in more rural areas, alternative activities for girls are rather limited, but agricultural alternatives for boys are more prevalent.

The final variable to consider is family income (proxied by per capita expenditures recorded in the 1984/85 survey).[13] Preliminary analysis indicated that this variable is endogenous (that is, simultaneously determined with the dependent variable *EDUC*). To overcome this endogeneity, instrumental variables are used. The instruments are measures of family assets taken during the 1984/85 and 1992 survey rounds. The coefficient for girls is the expected sign and is statistically significant; the coefficient for boys is about double that for girls and is also statistically significant, as is the differential effect. Thus, higher income strongly encourages boys' educational attainment.

The intercepts (indicated by *G*1, ..., *G*9 in the table) display a strong increasing trend, indicating that children at the average age of each attainment level have higher probabilities of stopping at higher attainment levels (this interpretation is due to the fact that *Ln* (*AGE*) is expressed as the deviation from the mean age of each attainment level). Not only are stopping probabilities higher, but the differential effect for boys is

[13] An attempt was made to use family assets as a measure of resource availability, but the results were unsatisfactory.

statistically significant, indicating that boys are more likely to stop school than girls at every attainment level, all else being equal.

The conditional stopping probabilities can be manipulated to give the probabilities of achieving various grade levels, conditional only on the values of the regressors contained in X. These, in turn, can be used to calculate the mathematical expectations of educational attainment for various values of the regressors.

In Table 7, the expected educational attainments of children of various ages are shown for three levels of parents' educations (assuming that both parents have 4, 6, or 10 years of schooling) and for three levels of family income (the 20th percentile, the

Table 7 Expected educational attainment for various combinations of parents education and family income

Parents years of education	Age	Family income[a]					
		20th Percentile (25.85)	Median (37.57)	90th Percentile (86.40)	20th Percentile (25.85)	Median (37.57)	90th Percentile (86.40)
		Girls			Boys		
		(years of schooling)					
4 years	7	0.35	0.49	0.91	0.29	0.27	0.23
	8	0.66	0.81	1.14	0.62	0.63	0.67
	9	1.14	1.29	1.57	1.07	1.15	1.69
	10	2.01	2.13	2.29	1.60	1.82	2.66
	11	3.01	3.10	3.26	2.16	2.52	3.58
	12	3.90	4.00	4.30	2.78	3.23	4.42
	13	4.89	5.01	5.39	3.46	3.94	5.10
	14	5.88	5.99	6.39	4.20	4.62	5.70
	15	6.78	6.90	7.38	4.98	5.40	6.34
6 years	7	0.47	0.61	0.95	0.41	0.40	0.34
	8	0.84	0.98	1.27	0.82	0.84	0.94
	9	1.45	1.56	1.78	1.33	1.46	2.10
	10	2.39	2.46	2.54	1.88	2.16	3.01
	11	3.30	3.37	3.51	2.46	2.87	3.96
	12	4.14	4.24	4.52	3.13	3.61	4.78
	13	5.11	5.21	5.56	3.88	4.36	5.43
	14	6.06	6.16	6.54	4.67	5.11	6.03
	15	6.95	7.06	7.55	5.48	5.85	6.69
10 years	7	0.70	0.81	0.97	0.68	0.67	0.61
	8	1.28	1.38	1.60	1.25	1.30	1.47
	9	2.04	2.09	2.15	1.81	2.03	2.63
	10	2.94	2.97	2.96	2.41	2.77	3.50
	11	3.73	3.78	3.93	3.09	3.54	4.49
	12	4.55	4.62	4.88	3.92	4.39	5.33
	13	5.46	5.55	5.86	4.78	5.19	5.99
	14	6.36	6.45	6.81	5.60	5.92	6.64
	15	7.27	7.38	7.85	6.43	6.70	7.35

[a] Family income is in pesos per capita per week.

median, and the 90th percentile income levels in the sample). Three striking patterns are evident in the table. First, girls may always be expected to attain higher levels of education than similarly situated boys. Second, parents' education has a strong positive effect on children's educational attainments; this effect is stronger for boys than for girls. Third, income has a strong positive effect on boys' educational attainments; for girls the effect of income is weaker.

Table 8 shows expected educational attainment for various combinations of father's and mother's education, with family income set at the median. To interpret this table, begin, for example, at the cell representing expected educational attainment for a seven-year-old girl whose parents each have four years of education: the entry is 0.49 years. If mother's education is increased to 10 years, holding all else constant, the expected educational attainment rises to 0.64 years. If, on the other hand, father's education is

Table 8 Expected educational attainment for various combinations of father s and mother s education

Father s education	Age	Mother s education					
		4 years	6 years	10 years	4 years	6 years	10 years
		Girls			Boys		
		(years of schooling)					
4 years	7	0.49	0.54	0.64	0.27	0.38	0.61
	8	0.81	0.87	0.99	0.63	0.80	1.14
	9	1.29	1.37	1.55	1.15	1.37	1.77
	10	2.13	2.25	2.48	1.82	2.04	2.39
	11	3.10	3.24	3.53	2.52	2.72	3.05
	12	4.00	4.17	4.54	3.23	3.43	3.83
	13	5.01	5.18	5.46	3.94	4.18	4.64
	14	5.99	6.13	6.36	4.67	4.92	5.38
	15	6.90	7.02	7.25	5.40	5.65	6.10
6 years	7	0.56	0.61	0.70	0.29	0.40	0.63
	8	0.92	0.98	1.12	0.67	0.84	1.19
	9	1.48	1.56	1.74	1.23	1.46	1.86
	10	2.36	2.46	2.67	1.94	2.16	2.51
	11	3.24	3.37	3.64	2.67	2.87	3.21
	12	4.07	4.24	4.56	3.40	3.61	4.03
	13	5.05	5.21	5.49	4.12	4.36	4.83
	14	6.03	6.16	6.40	4.85	5.11	5.56
	15	6.94	7.06	7.29	5.60	5.85	6.30
10 years	7	0.70	0.74	0.81	0.32	0.43	0.67
	8	1.17	1.24	1.38	0.75	0.94	1.30
	9	1.87	1.95	2.09	1.39	1.63	2.03
	10	2.71	2.80	2.97	2.20	2.43	2.77
	11	3.44	3.54	3.78	2.99	3.19	3.54
	12	4.16	4.32	4.62	3.72	3.95	4.39
	13	5.11	5.27	5.55	4.45	4.71	5.19
	14	6.08	6.21	6.45	5.19	5.46	5.92
	15	7.02	7.15	7.38	5.99	6.25	6.70

increased to 10 years, instead of mother's, expected educational attainment rises to 0.70 years. The father's education exerts a stronger influence. The relative strengths of father's and mother's educations across boys and girls in this table may not coincide with the relative sizes of their coefficients in Table 6 because the entries in Table 8 are non-linear functions of the coefficients, variables, and stopping probabilities.

For younger girls, the effect of increasing father's education is stronger than the effect of increasing mother's education, but for girls 11 years and older, the effect of increasing mother's education dominates. For boys, the effect of increasing mother's education always dominates the effect of increasing father's education. The effects of both parents' education are stronger for boys than for girls. The latter effect might be anticipated because there is "more room for improvement" among the boys (this may also be true for the income effect).

Results of the Ethnographic Study

Information collected from the ethnographic interviews generally supports the specific finding from the household surveys that girls were making greater progress in school than boys. Sixty percent of parents agreed with this. The others thought that education was about equal between boys and girls. Only one respondent thought that boys were getting more schooling.

There are at least two plausible theories for why this is the case. One theory is economic and argues that there are more work opportunities for boys in the rural setting than for girls. The opportunities may tempt boys away from their studies as soon as they are able to experience the freedom brought about by the cash income they can earn from working as agricultural workers. Boys also may perceive a lower, long-run payoff from schooling, since they believe that they will eventually become farmers anyway.

A second theory would point to gender-linked, culturally formed personality differences between boys and girls, which is the explanation favored by most of the respondents. Girls, unlike boys, are described by parents as possessing certain traits that can help them do well in school. They are "more studious," "patient," and "willing to sacrifice." They are also described as "interested in their studies."

A less favorable set of characteristics is associated with boys. Boys are criticized for being less responsible and are seen as being prone to "vices" (for example, drinking). Boys are overly fond of "roaming around" and "playing with their *barkada*" (peer group). They must be constantly "reminded" and "scolded" to do their schoolwork. The problem, therefore, is not one of competing opportunities for gainful employment. Indeed, only one respondent (a father) gave this sort of explanation, whereas all others seemed to be saying that boys do not work enough in general, whether in the classroom or on the farm.

In cases where a child had dropped out of school, parents were asked why this had happened. In no case was it claimed that this occurred because the child had to get a job or work on the farm. Instead, common responses were that he or she was "sick," "ashamed," "a slow learner," or "had lost interest in schooling." Associated with this latter category were comments such as "played hooky from school," "influenced by his

barkada," "did not like school," "did not like the teacher," and "played too much." In general, children stopped going to school either without informing their parents about their decision, or over the loudly voiced objections of the parents. In no case was it asserted that a conscious decision had been made (by either the parents or the child) to barter continuing on in school for the prospect of short-run wage earning opportunities.

Respondents in the study (the parents particularly) held strong positive attitudes toward schooling. When asked if there are any bad things associated with education, only two of the parents could think of a negative attribute. By contrast, most mentioned two or three "good things" that can result from going to school. These revolved largely around future economic benefits for the child, although there was also a strong emphasis on the way in which the school helps the young person to become more fully developed socially and morally. Few male respondents, whether fathers or sons, felt that farming was an attractive career—one to be consciously planned for. There was a clear preference for white-collar employment, for boys as well as girls, which requires at least a high school education.

The economic functionality of schooling seems to apply more to the child's ability to support himself than to any sort of increased "wealth flow" from child to parents. Schooling seems to be a major component of the younger generation's "establishment fund," that is, the moral responsibility on the part of the parents to insure that their children will get a "good start in life."

All respondents affirmed that it was worthwhile for girls to go to school, even if "she (later) gets married." This seems to be true for at least four reasons (as summarized in Table 9): (1) many respondents seem to view gender-based equality as a value that is basic to their role as parents; (2) girls, like boys, can find employment—the economic payoff from educating girls is every bit as tangible for girls as it is for boys; (3) an educated girl will later become a better wife and mother; (4) as was the case for children in general, education adds to the prospects for personal growth and increased social status. As one mother said, summarizing strongly held feelings in response to questions about possible gender discrimination, "[Girls] are the same. God made them as such."

To what extent does there seem to be a trade-off between schooling and work on the family farm? For the entire sample of 53 adolescents, only 7 cases were found (6 males, 1 female) where the adolescents were staying at home and regularly taking on some sort of farmwork. Even in these cases, most of this work was not being done on a full-time basis. For those boys and girls who are still in school, farmwork is rarely done on actual school days, except when work is urgently required on their own farm and other persons cannot be found. The more typical pattern is that adolescent boys work for a few hours on Saturdays, and then again, on an intermittent basis, during the summer vacation. A little more than half of all adolescents staying at home were not working on the farm at all or were doing so for fewer than eight hours per month.[14]

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[14] In this regard, it is pertinent to note in Table 4 (the household survey time allocation information) that older adolescent sons in households with high asset values spend just about as much total time in farmwork and wage employment as do older adolescent sons in households with low asset values. Still, the boys from the wealthier households are able to spend 14 hours more per week in school, which is presumably "leisure" time for the boys from the poorer households.

Table 9 Reasons given for why it is worthwhile for a girl to go to school

Gender-based egalitarianism
- "Same for girls as for boys" (2 times)
- "Regardless of sex"
- "If the child is interested—girl or boy"

Economic rewards
- "To help her find a job" (2 times)
- "It will be easier for her to find a job"
- "Girls work when they have an education"
- "To find a white-collar job" (2 times)
- "The higher the education, the lighter the work: Grade 6 graduates become housemaids, but high school graduates can work as a salesgirl"
- "To uplift their standard of living"

Improved family life/functioning
- "(To bring a) bright future for her husband and children"
- "To assist her husband" (3 times)
- "She will need it if her husband is poorly educated or jobless" (3 times)
- "To help her be a better housewife"
- "To teach her children"

Personal growth/social status
- "She will be respected by the community"
- "A good education is something to be proud of"
- "It makes the parents proud to have their child in school"
- "So she won't be shy/confined to the house; a girl with no schooling will have nothing to do except get married"
- "A girl without learning is pitiful"
- "She will have something to give her husband"
- "So that her husband cannot put her down"

Source: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85.

A large majority (nearly 90 percent) of the parents strongly felt that children should not be taken out of school in order to earn money, even if there were abundant work opportunities in the area for adolescent males. Finally, even in cases where adolescent children are allowed to work for wages (for example, during summer vacation), the general perception seems to be that they should be allowed to keep some or all of these earnings for themselves. Again, therefore, the financial incentive (from the parent's point of view) for choosing work over schooling is not strong.

CHAPTER 4

The Intrahousehold Distribution of Food and Nutrient Intakes

This chapter examines the evidence on food and nutrient intakes of adolescents based on the 24-hour recall recorded in the 1984/85 surveys.[15] A key objective is to investigate the extent to which there may be inequality in the distribution of food among family members, particularly with respect to gender or age or both. Statistical analysis of the food recall data and the ethnographic information yield mutually consistent results.

Nutrient Intakes and Recommended Daily Allowances: Evidence from the 1984/85 Bukidnon Surveys

To understand how adolescents fare in the intrahousehold distribution of food, it is necessary, first, to provide some background information on household-level patterns of food consumption. Per capita food expenditures, price paid per kilogram of each food, and per capita consumption by expenditure quintile for 18 food groups are presented in Table 10. Note that at the margin, as income and food expenditures increase, consumers buy meats, dairy products, fish, fruits, cakes, and cooking ingredients (primarily cooking oil and sugar). Expenditures for the primary food staples, corn and rice, and for vegetables increase with income, but the percentage increases are far smaller than for the other food groups.

Table 11 shows calorie intakes disaggregated by food group. The 24-hour recall information indicates that total calorie consumption from corn and rice is nearly constant across expenditure quintiles; as income increases, marginal increases in calorie intakes come from nonstaple sources.[16] At low levels of income, hunger satiation dominates food consumption choices so that diets consist primarily of staples and vegetables

[15] This section was developed in collaboration with Christine Peña (see, also, Bouis and Peña 1997).

[16] Bouis and Haddad (1992) argue that the 24-hour recall dietary information provides a more accurate reflection of actual food intakes than the food expenditure information (calorie availability).

Table 10 Food expenditures, food prices, and kilograms consumed per capita, by expenditure quintile and food

Food	Expenditure quintile 1	2	3	4	5	All
Food expenditures (pesos/capita/week)						
Rice	2.31	3.86	4.62	4.63	10.47	5.17
Corn	9.91	10.26	9.71	9.17	4.68	8.75
Wheat and bread	0.20	0.23	0.15	0.52	0.97	0.41
Cakes and baked goods	0.22	0.50	0.30	0.82	1.73	0.71
Roots and tubers	0.84	0.81	0.93	0.85	0.96	0.88
Lentils, beans, and seeds	0.17	0.34	0.38	0.59	1.07	0.51
Pork	0.46	0.63	1.36	1.34	4.26	1.61
Beef	0.18	0.03	0.15	0.39	1.14	0.38
Chicken	1.21	0.85	1.35	1.78	2.45	1.53
Eggs	0.13	0.12	0.17	0.33	0.73	0.30
Fresh fish	1.38	2.69	2.28	4.65	6.08	3.42
Dried fish	3.73	4.76	5.13	6.79	6.75	5.43
Milk	0.04	0.06	0.11	0.14	1.18	0.31
Other meat	0.58	0.41	0.82	0.81	1.43	0.81
Green leafy vegetables	1.65	1.73	2.30	2.00	1.99	1.93
Other vegetables	1.08	1.29	1.34	1.78	1.95	1.49
Fruits	2.03	4.72	7.27	10.21	13.39	7.52
Cooking ingredients	0.38	0.44	0.86	1.25	2.32	1.05
Total	26.51	33.73	39.23	48.04	63.53	42.21
Food prices (pesos/kilogram)						
Rice	5.78	6.02	5.86	5.70	5.73	5.81
Corn	4.16	4.34	4.26	4.16	4.03	4.20
Wheat and bread	23.43	13.93	14.07	15.52	16.75	16.16
Cakes and baked goods	11.61	9.58	10.52	14.91	15.16	13.05
Roots and tubers	2.46	3.02	2.26	2.69	3.48	2.78
Lentils, beans, and seeds	8.47	11.53	10.06	10.40	11.53	10.63
Pork	20.13	23.86	26.60	22.61	27.85	24.86
Beef	26.31	20.34	25.73	33.70	31.88	30.50
Chicken	31.05	26.37	28.28	30.14	23.62	27.74
Eggs	32.69	31.88	32.08	33.10	32.34	32.50
Fresh fish	14.17	15.36	16.32	17.93	18.18	16.56
Dried fish	18.36	19.50	20.41	21.89	23.89	20.82
Milk	28.61	34.36	38.23	38.15	39.84	38.09
Other meat	31.66	28.96	45.33	27.72	40.27	35.01
Green leafy vegetables	9.81	10.30	11.71	11.00	10.33	10.64
Other vegetables	4.79	4.02	4.83	4.51	4.40	4.50
Fruits	12.77	16.34	21.52	24.77	22.32	19.84
Cooking ingredients	15.51	17.46	17.87	19.61	19.04	17.97
Total	6.00	6.70	7.53	8.43	10.17	7.76
Kilograms (per capita/week)						
Rice	0.40	0.65	0.80	0.82	1.87	0.91
Corn	2.34	2.36	2.25	2.19	1.13	2.05
Wheat and bread	0.01	0.01	0.01	0.03	0.06	0.02
Cakes and baked products	0.02	0.06	0.04	0.05	0.11	0.06
Roots and tubers	0.42	0.31	0.51	0.39	0.43	0.41
Lentils, beans, and seeds	0.02	0.04	0.05	0.06	0.09	0.05

(continued)

Table 10 Continued

Food	Expenditure quintile					All
	1	2	3	4	5	
Pork	0.02	0.03	0.06	0.06	0.16	0.06
Beef	0.01	0.00	0.01	0.01	0.04	0.01
Chicken	0.04	0.03	0.05	0.07	0.11	0.06
Eggs	0.00	0.00	0.01	0.01	0.02	0.01
Fresh fish	0.12	0.18	0.15	0.29	0.32	0.21
Dried fish	0.19	0.24	0.25	0.31	0.29	0.26
Milk	0.00	0.00	0.00	0.00	0.03	0.01
Other meat	0.02	0.02	0.02	0.04	0.05	0.03
Green leafy vegetables	0.18	0.18	0.22	0.22	0.22	0.20
Other vegetables	0.25	0.36	0.29	0.42	0.44	0.35
Fruits	0.37	0.54	0.53	0.61	0.74	0.56
Cooking ingredients	0.03	0.03	0.05	0.07	0.14	0.06
Total	4.43	5.04	5.29	5.64	6.23	5.33

Source: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85.

Notes: Food prices are taken from the food expenditure survey; food quantities are taken from the 24-hour recall of food intakes; food expenditures are computed from these quantity and price data.

(vegetables being a relatively inexpensive source of variety). As income increases, marginal utilities from additional energy and variety in the diet fall to the point where considerations of individual taste drive consumption decisions, in particular the desire for more meat and fruits in the diet.

What implications do these food consumption patterns have for intakes of other nutrients as income increases? Table 12 presents the simple sample averages of household adequacy ratios—the ratios of household intakes to recommended daily allowance for each nutrient—for nine nutrients by expenditure quintile.[17]

As a check against the methodology used in computing nutrient intakes, the overall average nutrient ratios for the sample population were compared with ratios derived from a nationwide nutrition survey undertaken in 1982 (FNRI 1984). With the exception of niacin, both the Bukidnon sample average and the nationwide average adequacy ratios are reasonably similar. The discrepancy with niacin is explained by the fact that rice is an important source of niacin, which is not present in corn. The Bukidnon sample population eats a corn-based staple diet, while the most widely consumed staple food in the Philippines is rice. In Table 12, intakes of iron, calcium, niacin, riboflavin, and

17 Nutrient adequacy ratios in this chapter are calculated without regard for individual body weights and activity patterns, using daily intakes recommended by the Food and Nutrition Research Institute (FNRI). Some activity information is available such that more precise calculations for calorie adequacy ratios are possible for adults and some adolescents, but not for all children. The primary objective in presenting information on nutrient adequacy ratios in the text is to compare across income groups within single age-gender groups. Because activity patterns decline with income, particularly for men, the increase in energy adequacy ratios as incomes rise is somewhat understated.

Table 11 Family calorie intakes per adult equivalent and calories purchased per peso of food expenditure, by expenditure quintile and food

Food	Expenditure quintile					Quintile 5 minus quintile 1
	1	2	3	4	5	
Calorie intake[a]						
Rice	254	395	515	501	1,148	894
Corn	1,569	1,541	1,446	1,384	693	–876
Wheat and bread	7	12	6	22	33	26
Cakes and baked goods	7	23	16	29	61	54
Roots and tubers	88	63	103	75	89	1
Lentils, beans, and seeds	9	20	23	26	47	38
Pork	10	12	21	23	61	51
Beef	2	0	2	4	10	8
Chicken	7	6	8	14	26	19
Eggs	1	1	1	3	6	5
Fresh fish	14	23	22	34	43	29
Dried fish	51	64	62	78	75	24
Milk	1	1	2	3	18	17
Other meat	5	3	5	9	10	5
Green leafy vegetables	15	15	18	18	16	1
Other vegetables	15	21	18	24	23	8
Fruits	77	108	107	136	133	56
Cooking ingredients	20	27	43	73	130	110
Rice and corn	1,823	1,936	1,961	1,885	1,841	18
All others	329	399	458	569	780	451
Total	2,152	2,335	2,419	2,454	2,621	469
Calories purchased per peso[b]						
Rice	579	557	579	547	594	571
Corn	866	814	833	828	834	835
Wheat and bread	185	297	282	247	229	248
Cakes and baked goods	341	389	417	336	280	353
Roots and tubers	628	661	697	591	576	630
Lentils, beans, and seeds	365	370	359	282	284	332
Pork	158	112	108	114	89	116
Beef	59	68	86	63	51	55
Chicken	45	47	39	44	55	46
Eggs	47	48	49	47	47	48
Fresh fish	58	55	52	44	41	50
Dried fish	75	75	68	65	62	69
Milk	134	91	109	87	93	103
Other meat	86	56	50	76	42	62
Green leafy vegetables	58	55	48	54	48	53
Other vegetables	101	101	82	89	76	90
Fruits	297	268	225	206	144	228
Cooking ingredients	261	361	333	364	347	333
Total	457	406	376	311	256	361

Source: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85.

[a]Calories computed from 24-hour recall survey.

[b]Calorie information from 24-hour survey and price information from food expenditure survey.

Table 12 Ratio of household nutrients consumed to recommended daily allowance, by expenditure quintile

Nutrient	Expenditure quintile					Sample average	National average
	1	2	3	4	5		
Calories	0.83	0.88	0.90	0.93	0.99	0.91	0.89
Protein	1.04	1.13	1.14	1.25	1.35	1.18	1.00
Iron	0.74	0.81	0.85	0.93	1.10	0.89	0.92
Vitamin A	1.06	0.97	1.14	1.28	1.39	1.17	n.a.
Vitamin C	0.95	0.92	1.02	1.08	1.01	1.00	0.91
Calcium	0.59	0.71	0.77	0.81	0.90	0.76	0.80
Niacin	0.63	0.79	0.88	0.96	1.33	0.92	1.20
Riboflavin	0.45	0.47	0.51	0.57	0.64	0.53	0.56
Thiamine	0.51	0.60	0.64	0.63	0.88	0.65	0.72

Sources: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85. The national average figures are taken from FNRI 1984.
Note: n.a. indicates "not available."

thiamine, all appear to be strongly and positively correlated with income.[18] Income elasticities appear to be somewhat lower for calories and proteins, and lowest for vitamin A and vitamin C, the only two nutrients for which a pattern of monotonically increasing adequacy ratios across expenditure quintiles is not in evidence.[19] On average, individuals in the lowest expenditure quintile consume the recommended allowances of protein and vitamin A; diets are generally deficient in other nutrients. By contrast, the diets of the highest expenditure group appear to be seriously deficient only in riboflavin. There is considerable variation around these averages; the next few tables address the question of whether any of this variation is systematically related to age or gender.

Table 13 disaggregates the household adequacy figures in Table 12 by age group and gender. Parents generally meet their calorie requirements (subject to the qualification that activity patterns may be more strenuous than those assumed in deriving the recommended allowances), while children's calorie intakes are well below requirements, even in the highest expenditure quintile. For all types of household members, there is a consistent, though small, increase in calorie adequacy ratios as household incomes increase.

There is also a consistent increase in iron intake for all types of household members across expenditure quintiles. These increases are much larger than for calories. A striking distinguishing feature for iron, however, is that adequacy ratios for adolescent girls are much lower than for males. This reflects the considerably higher (about 80 percent

18 Income (as measured by total expenditures) increases from approximately US$57 per capita per year to $239 from lowest to highest expenditure quintile, a percentage increase of 320 percent.

19 Household-level income elasticities for calories, iron, vitamin A, and vitamin C for these data are estimated in Bouis 1991. These estimates are 0.16 for calories, 0.44 for iron, and not significantly different from zero for vitamins A and C, magnitudes that correspond closely to the patterns shown in Table 12.

Table 13 Ratio of nutrients consumed to recommended daily allowance, by type of household member and expenditure quintile

Nutrient/ expenditure quintile	Ages 0 5		Ages 6 9		Ages 10 14		Ages 15 19			
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Mothers	Fathers
Calories										
1	0.77	0.72	0.75	0.74	0.72	0.74	0.80	0.87	1.00	0.97
2	0.82	0.76	0.78	0.75	0.73	0.74	0.82	0.93	1.07	1.03
3	0.86	0.69	0.82	0.87	0.76	0.77	0.76	0.88	1.12	1.05
4	0.81	0.82	0.85	0.79	0.73	0.79	0.83	0.94	1.11	1.07
5	0.86	0.87	0.95	0.89	0.90	0.87	0.77	1.06	1.18	1.12
All	0.82	0.77	0.83	0.81	0.77	0.78	0.80	0.94	1.10	1.05
Protein										
1	1.11	1.07	1.10	1.09	0.97	0.90	0.88	0.86	1.00	1.11
2	1.25	1.23	1.16	1.14	1.04	0.91	0.90	0.99	1.09	1.20
3	1.26	1.05	1.25	1.28	1.09	0.92	0.90	0.89	1.13	1.22
4	1.26	1.29	1.39	1.41	1.16	0.94	1.10	1.18	1.21	1.32
5	1.44	1.44	1.49	1.49	1.27	1.16	0.93	1.15	1.30	1.42
All	1.26	1.22	1.28	1.28	1.11	0.97	0.94	1.01	1.15	1.25
Iron										
1	0.69	0.67	0.84	0.90	0.69	0.42	0.64	0.45	0.53	1.10
2	0.79	0.79	0.95	0.87	0.66	0.45	0.79	0.46	0.57	1.22
3	0.87	0.71	0.92	1.12	0.77	0.48	0.78	0.56	0.62	1.30
4	0.84	0.90	1.08	1.03	0.71	0.50	0.90	0.54	0.66	1.44
5	1.04	1.14	1.37	1.33	1.02	0.59	0.83	0.65	0.76	1.65
All	0.85	0.84	1.03	1.05	0.77	0.49	0.79	0.53	0.63	1.34
Vitamin A										
1	0.84	1.10	1.27	0.90	0.72	0.97	1.31	1.29	1.26	1.08
2	0.85	1.09	0.96	0.81	0.73	0.81	1.00	1.06	1.03	1.15
3	1.24	0.96	0.91	1.06	1.06	0.88	0.88	1.26	1.26	1.36
4	1.40	1.32	1.55	1.05	1.06	0.93	1.39	0.79	1.26	1.46
5	1.35	1.79	1.30	1.42	0.96	1.40	1.14	0.82	1.44	1.52
All	1.14	1.25	1.20	1.05	0.91	1.00	1.14	1.04	1.25	1.31
Vitamin C										
1	0.99	0.81	0.88	1.04	0.96	0.91	0.54	1.17	0.93	1.10
2	0.90	0.93	0.90	0.82	0.76	0.80	1.03	0.41	0.96	1.07
3	1.22	0.84	0.74	1.24	0.83	0.69	0.65	0.76	1.14	1.26
4	0.97	1.22	1.18	0.64	0.83	1.16	1.12	0.90	1.07	1.31
5	0.90	0.97	1.18	0.73	1.09	0.75	0.60	0.86	1.10	1.18
All	1.00	0.95	0.98	0.89	0.89	0.86	0.79	0.82	1.04	1.18
Calcium										
1	0.46	0.40	0.54	0.60	0.51	0.48	0.55	0.59	0.67	0.91
2	0.50	0.49	0.69	0.60	0.54	0.58	0.71	0.58	0.80	1.07
3	0.54	0.54	0.59	0.81	0.56	0.53	0.70	0.62	0.93	1.18
4	0.51	0.59	0.70	0.63	0.60	0.59	0.82	0.71	0.96	1.22
5	0.69	0.75	0.84	0.77	0.73	0.61	0.57	0.79	1.04	1.31
All	0.54	0.55	0.67	0.68	0.59	0.56	0.67	0.66	0.88	1.14

(continued)

Table 13 Continued

Nutrient/ expenditure quintile	Ages 0 5		Ages 6 9		Ages 10 14		Ages 15 19			
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Mothers	Fathers
Niacin										
1	0.60	0.56	0.58	0.64	0.50	0.60	0.44	0.70	0.74	0.74
2	0.71	0.75	0.79	0.64	0.67	0.70	0.78	0.68	0.92	0.91
3	0.79	0.75	0.90	0.84	0.79	0.75	0.64	0.87	1.02	1.01
4	0.88	0.82	1.00	0.93	0.71	0.78	0.89	0.95	1.11	1.08
5	1.15	1.20	1.36	1.25	1.10	1.18	0.99	1.18	1.55	1.56
All	0.83	0.82	0.93	0.86	0.75	0.80	0.75	0.88	1.07	1.06
Riboflavin										
1	0.37	0.39	0.42	0.40	0.44	0.41	0.37	0.40	0.54	0.58
2	0.42	0.38	0.41	0.38	0.39	0.40	0.38	0.53	0.57	0.59
3	0.43	0.39	0.46	0.54	0.42	0.44	0.50	0.53	0.63	0.60
4	0.50	0.43	0.54	0.54	0.39	0.55	0.56	0.52	0.62	0.74
5	0.66	0.69	0.65	0.51	0.54	0.56	0.51	0.58	0.70	0.69
All	0.48	0.46	0.50	0.47	0.44	0.47	0.46	0.51	0.61	0.64
Thiamine										
1	0.42	0.44	0.46	0.48	0.47	0.46	0.44	0.57	0.60	0.62
2	0.48	0.49	0.60	0.43	0.52	0.57	0.55	0.65	0.70	0.75
3	0.52	0.52	0.62	0.64	0.55	0.56	0.54	0.68	0.78	0.73
4	0.60	0.52	0.61	0.59	0.38	0.55	0.53	0.50	0.73	0.79
5	0.80	0.77	0.94	0.78	0.81	0.81	0.66	0.80	1.03	0.94
All	0.56	0.55	0.65	0.58	0.55	0.59	0.54	0.64	0.77	0.77

Source: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85.

higher) iron requirements for females than for males; it does not indicate that women eat far less iron-rich food than men.[20]

Compared with calories and iron, vitamin A and vitamin C are distributed evenly among household members, although parents consume more vitamin A than their children do. Preschoolers' vitamin A intakes appear to be strongly correlated with income, while there is no clear association (positive or negative) between vitamin A intakes of children from the ages of 6 to 19 and household income.[21] For vitamin C, with the possible exception of mothers, there is no clear association between intakes and increases in income for any specific type of household member. Calcium, niacin,

20 The daily allowances of iron recommended by the FNRI and used in the calculations in this report may overstate iron requirements by 10–20 percent, with the exception of pregnant women whose requirements may be severely understated (Judith McGuire, personal communication; for more details, see Bouis 1991).

21 This suggests that parents make sure that preschoolers "eat their vegetables," but older children are harder to convince.

riboflavin, and thiamine intakes are strongly related to income for nearly all types of household members.

Measuring Inequality in the Distribution of Food within the Family

Detecting inequality in the intrahousehold distribution of food poses a difficult definitional problem. If all individuals required identical amounts of nutrients regardless of age, gender, physiology, and activity pattern, and if all individuals had identical taste preferences and knowledge of their nutritional requirements, then favoritism in the allocation of a particular food or nutrient could reasonably be defined as

$$[x_i/\Sigma x_j]/[1/n] > 1, \tag{4}$$

where n is the number of household members, x_i is consumption of the i^{th} household member of food or nutrient x, and Σx_j is total household consumption of x. In this example, $1/n$ may be interpreted as the index of an individual's "fair share" of household consumption.

Precisely because none of these conditions hold, it is difficult to define an acceptable index of inequality that is empirically tractable. Most attempts to do so have used calorie intakes in the numerator and have corrected the denominator for differences in calorie requirements due to age, gender, weight, pregnancy and lactation, and activity patterns by replacing $1/n$ by $n_i/\Sigma n_j$, where n_i is defined as an "adult equivalent."

This approach generally is considered to be an unsatisfactory solution because (1) recommended calorie intakes with respect to these various criteria are still the subject of considerable debate, (2) some critical information (for example, activity patterns) is difficult to measure, and (3) even if all relevant criteria are accurately taken into account, calorie adequacy provides a measure of whether an individual is in energy balance, which is not necessarily a measure of relative welfare.[22] Nevertheless, use of calorie intakes has an advantage in that individuals know, to some extent, when their requirements are not being met (they experience hunger), and avoiding hunger is widely presumed to take high priority with most individuals (Bouis 1996).[23]

It is reasonable to assume that necessities are more equitably distributed within households than are luxuries. Therefore, an additional complaint against use of calorie

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22 In theory, if the calorie adequacy ratio is correctly measured and is chronically below 1.0, an adult's energy balance is in deficit and he or she will lose weight, with the opposite result if the calorie adequacy ratio is chronically above 1.0. Thus, all else being equal, an "overweight" adult may be eating more than an "underweight" adult, but would have a calorie adequacy ratio lower than that of the underweight adult if the overweight adult was currently losing weight and the underweight adult was currently gaining weight. If both had stable weights, then both adults would have calorie adequacy ratios of 1.0. For children, in theory, calorie adequacy ratios measure energy intakes required to maintain "normal" growth, given the child's observed weight.

23 The similarity of preference for hunger satiation across cultures may be contrasted with preference for any specific food or food group, which may be highly prized in some societies and disliked in others. The awareness of shortfalls in consumption of calories (hunger) may be contrasted with, say, deficiencies in vitamin A or iron intakes.

intake (a necessity) is that it is a rather insensitive measure of inequality, as compared with a measure based on nonstaple foods with higher income elasticities. However, this particular property of relative equity makes calorie intake a good candidate for use as an index to replace $1/n$ in the expression above.

The data in Tables 10 and 11 on food expenditures and calorie intakes can be used to calculate the formula proposed for measuring inequality in intrahousehold food distribution. Suppose that, instead of representing average consumption levels for each of five expenditure quintiles, the data in these two tables represent individual food consumption patterns for a five-member household in which food consumption is highly skewed. That is, this hypothetical household spends 42 pesos per capita per week for food, on average, with 64 pesos being spent on the most highly favored member and only 27 pesos being spent on the least favored member.

Assume that this distribution of total expenditures is established by household member 5, who is the recognized decisionmaker. Given this distribution, each member of the household is allowed to allocate her own total food expenditure as she wishes among various foods. Whatever food allocation decisions are made by members of the household once the distribution is established might be considered Pareto optimal in the sense that whatever allocation is chosen maximizes his or her own utility without affecting the utility of other household members.

Interpreting the data in Tables 10 and 11 as outlined above shows that household member 5 has chosen a diet that is higher in meats, dairy products, fish, fruit, and cooking ingredients than household member 1, whose diet is relatively staple-intensive. Member 1 chose not to spend her 27 pesos on various foods in the same proportions as household member 5, simply because satisfying hunger took precedence over taste for more preferred foods. These allocation outcomes can be modeled as a lexicographic utility function (Encarnacion 1990) in which satiation of hunger is given top priority, or as a marginal utility curve for hunger satiation that is quite steep (relative to marginal utility curves for other goods and characteristics) up to a certain level of satiation, and then abruptly levels off. It is the cruel decisionmaker (parent), indeed, who will not allow individual household members to satisfy hunger first (to the extent possible within a given individual's budget constraint) before satisfying other wants.

Linking the assumption of Pareto optimality with the primal desire for hunger satiation leads to a conclusion that one of the most equitably distributed "commodities" within households will be hunger satiation. Consequently, hunger satiation (which will be highly correlated with staple food consumption, calorie intakes, and body weights) should be highly insensitive to inequality in intrahousehold distribution of resources. Foods, nutrients, or even nonfoods with high income elasticities should provide much more sensitive measures of such inequality.

The proposed measure of inequality in the intrahousehold distribution of food uses a presumption of equity in hunger satiation across household members as the basis for calculating an index of an individual's "fair share" in the consumption of specific foods. This measure is:

$$R_i = \frac{X_j \Big/ \sum_{j=1}^{n} X_j}{C_i \Big/ \sum_{j=1}^{n} C_j}, \tag{5}$$

where

X_i = consumption by individual i of food/nutrient X, where X is measured in kilograms, units of a nutrient, or total expenditures;
C_i = calorie intake of individual i;
ΣC_j = total household calorie intake; and
ΣX_j = total household consumption of X.

The denominator, the proportion of total household calories that an individual consumes, takes account of differences among individuals (within a specific household) in metabolic rates, heights, activity patterns, and physiological status (pregnant, breast-feeding). This is necessary because persons who require more calories than other family members in order to satiate hunger receive a higher proportion of household calories.[24]

The numerator is the individual proportion out of total household consumption (measured in kilograms, units of a nutrient, or expenditures) of any specific food or nutrient. For favored persons in a family, the food share over energy share (FS/ES) ratios will be greater than 1.0 for "preferred" foods (foods with relatively high income elasticities) and perhaps less than 1.0 for "low-status" foods (foods with relatively low income elasticities).[25]

Evidence of Inequality in Food Distribution from the 1984/85 Surveys

Mean individual food intakes averaged across four rounds, based on 24-hour recalls by mothers, were used in the analysis here to minimize day-to-day variations in individual food consumption. Table 14 reports the number of consuming households for each of 18 food groups and the percentage of individuals, by age and gender, who consumed each of the 18 foods in those households.

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[24] However, there are some economies of scale in calories needed for maintaining body weights. All else being equal, an adult weighing 10 percent more than the average requires fewer than 10 percent more calories to maintain that weight; returns to scale for young children are more nearly constant (FAO/WHO/UN 1985) (see Bouis 1994 for a discussion). Thus, some downward revision of adult calorie proportions may be advisable relative to child proportions.

[25] Note that this definition associates "preferred" and "low-status" foods with high and low income elasticities, and not with (unobservable) individual preferences. In the analyses of sample mean FS/ES ratios, the authors assume that the effects of variations in individual preferences are averaged out; in the regression analyses, it is assumed that the effects of individual preferences are absorbed into the disturbance term. If individual preferences are systematically related to other variables (age and gender classifications, for example), then the separate effects are difficult to disentangle. For example, children may not like to eat vegetables, and their FS/ES ratios for vegetables will be lower as a result; this "inequality" does not necessarily imply "discrimination."

Table 14 Number of consuming households and percent of individuals in those households consuming foods, by age and gender group

Food	Number of consuming households out of 448	Age-gender group									
		0 5 years		6 9 years		10 14 years		15 19 years		Over 19 years	
		Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
		(percent)									
Corn	406	1.00	1.00	1.00	0.99	0.99	0.98	0.99	0.97	0.99	1.00
Rice	340	0.87	0.92	0.91	0.93	0.91	0.87	0.93	0.86	0.93	0.92
Roots and tubers	288	0.81	0.81	0.84	0.89	0.88	0.91	0.84	0.92	0.88	0.95
Wheat and bread	130	0.65	0.72	0.65	0.73	0.58	0.57	0.26	0.48	0.65	0.77
Beef	52	0.54	0.52	0.59	0.68	0.59	0.72	0.73	0.53	0.79	0.76
Chicken	146	0.83	0.86	0.88	0.78	0.78	0.75	0.70	0.77	0.88	0.87
Pork	158	0.63	0.74	0.73	0.73	0.65	0.74	0.73	0.70	0.82	0.80
Other meat	101	0.33	0.44	0.46	0.43	0.53	0.45	0.67	0.31	0.77	0.58
Eggs	101	0.74	0.66	0.63	0.67	0.62	0.71	0.56	0.57	0.61	0.74
Milk	82	0.77	0.79	0.49	0.69	0.45	0.39	0.25	0.35	0.30	0.43
Dried fish	441	0.98	0.99	1.00	0.98	0.99	0.99	0.99	0.99	1.00	0.99
Fresh fish	342	0.94	0.92	0.93	0.93	0.92	0.93	0.91	0.91	0.94	0.97
Fruits	401	0.94	0.92	0.96	0.95	0.89	0.95	0.86	0.94	0.94	0.96
Green leafy vegetables	437	0.83	0.87	0.91	0.92	0.96	0.97	0.95	0.97	0.98	1.00
Lentils, beans, and seeds	173	0.76	0.67	0.80	0.79	0.85	0.78	0.81	0.81	0.87	0.90
Other vegetables	434	0.88	0.85	0.93	0.91	0.98	0.93	0.99	0.99	0.98	1.00
Cakes and baked goods	162	0.71	0.76	0.64	0.73	0.52	0.68	0.59	0.53	0.55	0.63
Cooking ingredients	358	0.99	0.98	0.98	0.97	0.97	0.94	0.90	0.95	0.96	0.98

Source: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85.

The FS/ES ratio for each of 18 food groups was calculated for every individual in the sample. The sample means of these FS/ES ratios are reported in Table 15 by age and gender group. The standard errors of the means are in parentheses. Sample means that are more than two standard errors from 1.0 are taken as indicative of inequality in intrahousehold food distribution.

Using this rule of thumb, preschoolers and school-aged children generally receive more than their fair share of eggs, milk, fish, fruits, cakes, and cooking ingredients (higher-income-elasticity foods) and less than their fair share of vegetables and lentils (lower-income-elasticity foods), suggesting that this age group is favored in the intrahousehold distribution of food. No systematic gender differences are evident for these two age groups. Preschoolers do somewhat better than school-aged children, in terms of having higher ratios for milk, fruits, cakes, and cooking ingredients and having fewer ratios two standard deviations below 1.0 for meats and food staples.

Where FS/ES ratios tend to be high for preschoolers and school-aged children, these ratios are low for adult males, and where they are low for preschoolers and school-aged children, they are high for adult males. Likewise, adult females consume relatively few fish, cakes, and cooking ingredients and relatively large quantities of vegetables and lentils. Food distribution between adult males and adult females differs in that more meats (higher-income-elasticity foods) and rice go to males, while females consume more roots and wheat.

The fact that adults, preschool children, and school-aged children consume more than equal shares of some foods and less than equal shares of other foods suggests some sort of compensation mechanism. However, where adolescents have mean ratios that deviate significantly from 1.0, the means are nearly all below 1.0 (the one exception is dried fish for two age-gender groups). Several ratios are below 1.0 for animal products (the exception is eggs, which, however, have high standard deviations) and fruits and vegetables. Again, no systematic differences by gender are evident.

How can the factors that determine equity or inequality in the intrahousehold distribution of food be determined? FS/ES ratios, of course, are defined only for households with positive consumption of a particular food. Given that a household does consume a particular type of food, greater equity (say as household income increases) may result from reducing the number of nonconsuming members or by giving higher marginal shares to individuals whose FS/ES ratios fall below 1.0 or both. The first possibility is examined by estimating a logit regression equation in which the dichotomous dependent variable is set to zero for individuals who do not consume a particular type of food and set to one for individuals who do consume it. The sample is, of course, restricted to households that do consume each type of food.

Table 16 summarizes the results of 18 logit regressions, one for each food. Each equation uses the following regressors: total expenditures per capita (a proxy for household income), the average of the number of years of education of the father and mother, a score for the nutritional knowledge of the mother, municipal population density (thought to be positively related to easier availability of foods for purchase in markets; a high percentage of food consumption comes from own-produced food for the households studied

Table 15 Food share/energy share ratios, by food and by age and gender group

Food	Ages 0 5		Ages 6 9		Ages 10 14		Ages 15 19			
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Mothers	Fathers
Corn	0.98	0.93	0.97	0.97	0.99	0.98	1.02	1.01	1.01	1.02
	(0.04)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.01)	(0.01)
Rice	1.02	1.05	0.86	0.99	0.92	0.81	1.11	0.85	1.03	1.14
	(0.08)	(0.09)	(0.03)	(0.13)	(0.04)	(0.03)	(0.10)	(0.05)	(0.04)	(0.04)
Roots and tubers	1.00	1.09	0.98	1.03	0.97	1.04	0.97	1.07	1.12	0.86
	(0.06)	(0.07)	(0.05)	(0.05)	(0.05)	(0.05)	(0.08)	(0.06)	(0.04)	(0.03)
Wheat and bread	1.30	1.37	0.91	1.08	0.81	0.75	0.60	0.62	1.26	0.83
	(0.27)	(0.19)	(0.11)	(0.14)	(0.16)	(0.17)	(0.26)	(0.13)	(0.12)	(0.08)
Beef	0.82	0.72	0.74	0.64	0.63	0.79	1.11	0.55	1.14	1.33
	(0.15)	(0.16)	(0.13)	(0.14)	(0.13)	(0.14)	(0.32)	(0.15)	(0.19)	(0.18)
Chicken	1.20	1.29	1.00	0.95	1.01	0.73	0.76	0.76	1.04	1.13
	(0.14)	(0.13)	(0.06)	(0.08)	(0.14)	(0.06)	(0.13)	(0.09)	(0.08)	(0.09)
Pork	0.88	1.06	0.84	0.86	0.67	0.90	1.03	1.17	1.00	1.22
	(0.13)	(0.13)	(0.07)	(0.10)	(0.08)	(0.14)	(0.21)	(0.40)	(0.07)	(0.10)
Other meat	0.35	0.62	0.51	0.53	1.15	0.84	1.32	0.33	0.84	1.61
	(0.07)	(0.11)	(0.08)	(0.12)	(0.23)	(0.27)	(0.34)	(0.09)	(0.10)	(0.14)
Eggs	1.40	1.30	1.02	1.07	0.84	1.43	1.65	1.15	1.03	0.72
	(0.15)	(0.29)	(0.16)	(0.17)	(0.14)	(0.27)	(0.57)	(0.31)	(0.17)	(0.12)
Milk	4.00	4.52	0.96	1.74	0.60	0.47	0.38	0.31	0.86	0.28
	(0.60)	(0.76)	(0.30)	(0.33)	(0.14)	(0.12)	(0.19)	(0.10)	(0.23)	(0.07)
Dried fish	1.15	1.11	1.13	1.12	1.07	1.02	0.96	1.08	0.94	0.94
	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)	(0.03)	(0.01)	(0.02)

continued)

Table 15 Continued

Food	Ages 0 5		Ages 6 9		Ages 10 14		Ages 15 19			
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Mothers	Fathers
Fresh fish	1.12	1.32	1.10	1.04	0.93	0.99	1.05	0.90	0.94	0.99
	(0.04)	(0.05)	(0.04)	(0.04)	(0.05)	(0.04)	(0.15)	(0.10)	(0.02)	(0.04)
Fruits	1.42	1.29	1.10	1.13	0.88	1.03	0.81	1.03	1.05	0.87
	(0.10)	(0.08)	(0.04)	(0.05)	(0.04)	(0.04)	(0.06)	(0.10)	(0.04)	(0.03)
Green leafy vegetables	0.64	0.70	0.78	0.74	0.88	0.98	0.88	1.04	1.27	1.12
	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.06)	(0.02)	(0.02)
Lentils, beans, and seeds	1.22	0.72	0.83	0.80	0.91	0.86	0.84	1.13	1.13	1.12
	(0.32)	(0.08)	(0.06)	(0.06)	(0.08)	(0.08)	(0.10)	(0.22)	(0.06)	(0.06)
Other vegetables	0.71	0.74	0.77	0.81	0.88	0.86	0.96	1.04	1.22	1.13
	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.05)	(0.04)	(0.02)	(0.02)
Cakes and baked goods	1.69	2.04	1.17	1.35	0.76	1.14	1.28	0.88	0.77	0.75
	(0.22)	(0.34)	(0.19)	(0.16)	(0.16)	(0.16)	(0.30)	(0.21)	(0.07)	(0.09)
Cooking ingredients	1.44	1.34	1.20	1.17	1.06	1.04	0.79	0.96	0.95	0.85
	(0.08)	(0.07)	(0.05)	(0.10)	(0.06)	(0.05)	(0.06)	(0.07)	(0.02)	(0.02)

Source: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85.
Note: The numbers in parentheses are standard deviations.

Table 16 Results of logit regressions, by food, using individual consumption in positively consuming households as observations

Food	Total expenditures per capita	Average of mother s and father s education	Nutritional knowledge of mother	Municipal population density	Age-and-gender group									
					0 5 years	6 9 years		10 14 years		15 19 years		Over 19 years	
					Male	Female	Male	Female	Male	Female	Male	Female	Male
Corn													
Rice	+	+		+									
Roots and tubers								+				+	
Wheat and bread	+												
Beef		+										+	+
Chicken													
Pork	+	+											
Other meat													+
Eggs	+	+											
Milk	+		+										
Dried fish													
Fresh fish	+												
Fruits		+										+	
Green leafy vegetables								+	+	+	+	+	+
Lentils, beans, and seeds	+								+			+	+
Other vegetables						+	+	+	+	+	+	+	+
Cakes and baked goods	+												
Cooking ingredients	+	+											

Notes: Plus and minus signs indicate the signs on coefficients that are statistically significant at the 5 percent level; blank spaces indicate nonsignificant coefficients. Age and gender groups were represented by dummy variables. Preschool girls were taken as the base case, so the corresponding dummy variables were excluded from the regression.

here), and age-gender dummy variables corresponding to the groups shown in Table 13 (preschool females, the base case, are excluded).

The signs for coefficients that were statistically significant from zero at the 5 percent level of confidence for a two-tailed test are reported in Table 16. The results indicate that several foods are consumed by a higher proportion of household members as household income increases. The one exception is corn. Rice is substituted for corn as income increases (see also Table 10).

More highly educated households apparently substitute rice for corn and fruits for green leafy vegetables. A larger share of household members in more highly educated households eat beef, pork, eggs, fruits, and cooking ingredients and a smaller share consume dried fish, chicken, and green leafy vegetables.

The coefficients for the dummy variables that identify male or female adults are positive for roots and tubers, beef, other meat, green leafy vegetables, fruits, other vegetables, and lentils, and negative for milk and cakes; these results are consistent with the FS/ES ratios shown in Table 15. Coefficients for the dummies that identify children aged 6–9 years are significant only for milk (negative) and other vegetables (positive). A larger share of adolescents consume vegetables, lentils, and roots and tubers (relative to preschool girls) and a smaller share of adolescents consume milk, cakes, and cooking ingredients. In no case was the coefficient for preschool boys significantly different from that of preschool girls.[26]

Whether inequality in food distribution translates into inequality in nutrient distribution is addressed by calculating FS/ES nutrient ratios for each individual and averaging them within each age and gender group. These averages are presented in Table 17. A comparison of Table 15 with Table 17 suggests that the distribution of nutrients is more equal than the distribution of foods. This is explained by the interaction of two patterns: (1) each age-gender group has a high FS/ES ratio for at least one food group and (2) nutrients are relatively well distributed across food groups. For example, parental shares of dairy products and cooking ingredients are relatively low, but parental shares are high for green leafy vegetables, which are rich in several micronutrients.

Protein, iron, niacin, riboflavin, and thiamine are remarkably evenly distributed, although this is coincidental, as it is unlikely that, other than calories, respondents were aware of the nutrient content of the foods being consumed. The high ratios for calcium for preschoolers are a consequence of their high dairy shares. The higher ratios for vitamins A and C for adults (particularly for mothers) are a consequence of their high green leafy vegetable and fruit shares.

It is important to note that equity in FS/ES nutrient shares does not in any way take into account nutrient requirements. For example, iron requirements for adolescent girls and

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26 Investigation of the second mechanism by which FS/ES ratios change in response to various factors (that is, increases or decreases in amounts, given positive consumption) might begin with Tobit estimation of regression equations that have FS/ES ratios as the dependent variable. However, a number of econometric issues arise, including endogeneity of some regressors, and the fact that food-shares are interdependent within a household and across food groups. A more sophisticated econometric analysis will be undertaken in future work.

Table 17 Food share/energy share ratios, by nutrient and by age and gender group

	Ages 0 5		Ages 6 9		Ages 10 14		Ages 15 19			
Nutrient	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Boys**	**Girls**	**Mothers**	**Fathers**
Protein	1.01	1.03	1.02	1.01	1.00	1.00	0.99	0.99	0.99	1.00
	(0.09)	(0.09)	(0.06)	(0.07)	(0.05)	(0.07)	(0.07)	(0.07)	(0.06)	(0.07)
Iron	0.98	1.03	0.99	0.99	0.98	1.00	0.97	0.98	1.03	1.01
	(0.16)	(0.16)	(0.12)	(0.12)	(0.10)	(0.13)	(0.12)	(0.13)	(0.14)	(0.14)
Vitamin A	0.89	0.95	0.96	0.92	0.97	0.97	0.92	0.95	1.10	1.04
	(0.40)	(0.39)	(0.32)	(0.33)	(0.27)	(0.39)	(0.36)	(0.29)	(0.38)	(0.33)
Vitamin C	0.88	0.93	0.93	0.94	0.99	1.04	0.90	1.02	1.11	1.00
	(0.43)	(0.47)	(0.36)	(0.39)	(0.41)	(0.41)	(0.33)	(0.33)	(0.32)	(0.35)
Calcium	1.04	1.10	1.01	1.01	0.99	1.01	0.94	1.00	1.01	0.97
	(0.24)	(0.28)	(0.14)	(0.16)	(0.11)	(0.16)	(0.16)	(0.13)	(0.14)	(0.15)
Niacin	1.03	1.07	1.04	1.02	1.00	0.99	0.98	0.97	0.99	0.99
	(0.17)	(0.17)	(0.09)	(0.10)	(0.10)	(0.12)	(0.21)	(0.12)	(0.10)	(0.14)
Riboflavin	0.99	1.00	0.97	0.95	0.98	0.99	1.01	0.95	1.00	1.02
	(0.27)	(0.30)	(0.20)	(0.19)	(0.22)	(0.28)	(0.31)	(0.24)	(0.23)	(0.22)
Thiamine	0.98	0.98	0.98	0.95	0.99	0.99	1.01	0.97	1.01	1.01
	(0.24)	(0.24)	(0.18)	(0.17)	(0.21)	(0.25)	(0.26)	(0.22)	(0.19)	(0.22)

Note: Standard deviations are in parentheses.

adult women are approximately twice as high as for their male counterparts. As discussed earlier, for this population, iron adequacy is twice as high for fathers as for mothers.

Findings from the Ethnographic Study

During meals, members of the study households help themselves to whatever is laid on the floor or on the table (if they own one). In this context, it is easy to understand why nearly all parents interviewed claimed that they were not favoring their sons over their daughters when it comes to the distribution of food to the children. Moreover, children are encouraged to eat on time because this is "important for their health." It is commonly believed that irregular meal schedules can cause illness. Adults interviewed do not think that employed members of the family are necessarily entitled to extra food. This is viewed as being "unfair" to other members because "everyone is doing his or her own share in the household."

A strong majority (75 percent) of parents claimed that there had never been a time when their family lacked for food. These findings do not mean that there is no hunger in Bukidnon. In fact, this study found that the bottom income quartile of the sample experienced food shortages. Other surveys conducted in the area (Madigan 1988) have also shown serious nutritional problems among what might be called the "lower-lower"

class. For the typical household, though, the more relevant problem is likely to be shortages of nutrient-rich foods such as meat, fresh fish, milk products, and vitamin supplements. Food shortages may be rare, but diets are heavily dependent on carbohydrates— corn grits, rice, sweet potatoes—with only some vegetables and a little fish paste or dried fish.

Three respondents who had never experienced a food shortage were asked the hypothetical question of how they would cope with such a situation. One suggested that everyone in the family would be made to eat a little less; the other two asserted that she and her husband would "go hungry. . . (so that) the children could eat." Here, too, there is little or no evidence that Filipino males enjoy privileged access to food, but children may enjoy such access.

CHAPTER 5

The Intrahousehold Distribution of Health Care and Other Nonfood Expenditures

The preceding chapter found no evidence of gender-based inequality in the intrahousehold distribution of food. Does this hold true for health expenditures as well? To what extent do adolescents receive medical attention outside the home for their illnesses, and what factors determine the quality of professional help selected? Is there age-based or gender-based favoritism in the intrafamily distribution of expenditures on clothing and other items not directly related to food or health? The findings from the ethnographic study are discussed first, followed by regression analysis of the household survey data.

Findings from the Ethnographic Study

The question of adequate health care, or perhaps of the absence of such, is a real and immediate one in southern Bukidnon. One province-level comparison of infant mortality rates in the Philippines ranked Bukidnon 56th out of 67 provinces on this measure (Table 16 in Flieger, Abenoja, and Lim 1981). In the respondent households in the ethnographic study, 5 of the 19 families had experienced the death of at least one child, and in three cases, three or more children had died.

Health-related questions were posed to the adolescents themselves, as well as to their mothers. Mothers were asked which of their children was the healthiest, and why they thought that child was better-off than his or her siblings. Of those answering, eight named one of their sons as healthiest, while seven chose a daughter. Thus there seems to be little correlation between gender and this particular health measure, subjective though it may be.

Many of the reasons given for assessing one child to be healthier than others are near tautologies. Healthy children are "not frequently ill," "strong," and "active." Of more interest, perhaps, is the perceived connection been health and weight gain. In Table 18, 60 percent of the mothers noted with satisfaction that their healthiest child could best be characterized as being either "not thin" or (even more frequently) "fat." Nearly

Table 18 Reasons why a mother perceives a child as healthy

Response	Number[a]	Percent
Child is rarely sick or does not easily get sick	8	53.3
Child is "active"	7	46.7
Child is big or strong or hardworking	7	46.7
Child is "fat" or not thin	9	60.0
Child has a good appetite	7	46.7
Child eats a lot of vegetables	3	20.0
Child was given good prenatal or postnatal nutrition	2	13.3

Source: International Food Policy Research Institute and the Research Institute for Mindanao Culture surveys, 1984/85.

[a]Fifteen respondents answered the question; multiple responses were coded.

half also said that a healthy child is one who has a good appetite. The nutritional factor was additionally stressed by those who saw a connection between good health and, first, eating a lot of vegetables and, second, enjoying better nutrition just before or after birth.

Similar questions were also asked of the sample of 29 adolescents (15 girls, 14 boys). Not surprisingly, health concepts held by the children were similar to those mentioned by their mothers. Healthy individuals are "fat" or possessed a big, strong body. They have good appetites, are hard-working, and "active." In two cases (both girls), the respondents attributed their good health to the fact that they ate a lot of vegetables.

Mothers were asked to describe what they felt were the major causes of illness. The responses that were given most frequently to this question are somewhat scientific in nature and typically emphasized the contraction of communicable diseases. These include germs or viruses as disease-causing agents, dirty surroundings, insects such as flies and mosquitoes, and weather factors. Nutritional factors were noted less frequently. "Lack of vitamins," "insufficient food," and "food not digested well" were mentioned by only one or two respondents. Also, little emphasis was placed on behavioral factors such as overfatigue, stress, or cigarette smoking.

A few respondents voiced their belief that illness could be brought on by supernatural causes. According to one mother, sickness is simply "the will of the Lord." Another said that God will sometimes punish sinners by making them ill. And two respondents stated that sickness is the work of "evil spirits" or "fairies."

As a means of following up on such superstitious explanations, respondents were asked specifically if they believed that sickness could be brought on by *buyag*. (According to this folk belief, certain animistic beings can cause someone—generally a person who is too self-confident or sure of himself—to become ill.) Thirteen mothers answered this question, with six saying "yes," and six claiming not to believe in *buyag*, while one said "maybe."

The first line of defense against an illness is the family health care system. Assuming the presence of gender-linked stereotypes, one might expect that adolescent girls will be called upon more frequently than boys to help out when someone in the family

falls sick. Moderately strong evidence in support of this view was found in the adolescent interviews. Virtually all respondents claimed that they would usually help out when a family member got sick. Most frequently, this was not to directly nurse the patient back to health, but only to take over some of the mother's household chores while she performed that particular function.

A follow-up question asked if the child had ever missed one or more days of school during an illness episode of this sort. Two-thirds of the adolescent girls said that they had, compared with only one-third of the boys. This indicates that the health care tasks assigned to adolescent girls are generally heavier than those given to boys.

When an illness or injury is severe, health care may be sought outside the home. When mothers were asked about past incidents of severe illness in which one of their children had to be confined to a hospital, 14 such cases were identified, 10 male and 4 female.

The adolescents were asked about their most recent episode of illness. The most frequently mentioned responses were measles (8 cases), fever (7 cases), cough (5 cases), and toothache and headache (2 cases each). Modern medical practitioners were consulted in only 7 of the 29 cases. These included 5 doctors, 1 dentist, and 1 midwife at the Barangay Health Center. No strong pattern of gender-based inequality was apparent from the analysis of use of care providers. In 4 instances, the consultation with a modern practitioner was made for a boy; in 3, it was for a girl.

Reproductive health is a special concern for females. Both mothers and daughters were asked about the types of education that had been provided on such topics as menstruation, sex, and contraception. Girls were asked if they had experienced any special problems or symptoms with regard to their reproductive system.

Discussions between parents and their children on sex matters rarely occurred. For girls, only about one-third could say that their mother had talked to them about menstruation. In most cases, these discussions centered around certain folk beliefs, such as the ways by which one can control menstrual-related pimples. In only one case did a mother talk to her daughter about sex, and this was merely to give the rather ambiguous instruction that she should be careful about going out with boys since "something bad might happen to her." For the sons, too, all respondents reported that neither their mother nor their father had talked to them about sex.

Other sources of information about sex included the school (mentioned by two girls and five boys) and friends (mentioned by three girls and one boy). Classroom lectures about reproduction and related matters appear to be rather technical and hard to follow, since no less than five of the respondents who said that these subjects had been presented in school went on to add that they had since "forgotten" what was taught.

Another gender-linked health issue is cigarette smoking. Casual observation, as well as data from the present study, suggests that smoking is much more common among adolescent boys than girls. Almost half of the boys contacted by the study team admitted to smoking on at least an occasional basis. None of the girls had as yet acquired this habit. Every respondent (boys and girls alike) mentioned that smoking is bad for their health. Most of the smokers, in fact, claimed that they were trying to reduce their cigarette smoking.

Utilization of Health Care Providers

Analysis of the household survey data includes investigation of the factors that determine (1) the type of health care providers consulted when adolescents fall ill, and (2) the intrafamily distribution of expenditures for health and other nonfood items such as clothing. This section examines the factors in general that determine the type of health care providers consulted and specifically whether adolescent girls are provided less access to health care providers than other family members.

The approach taken here follows a model developed by Gertler and van der Gaag (1988) to analyze demand for health care. Four types of health care alternatives available to individuals are considered: (1) self-care; (2) care from the Barangay Health Center or traditional healers; (3) care from a nurse, usually stationed in a rural health clinic; and (4) care from a physician.

The basic model assumes that the household chooses the provider that gives the highest level of utility (satisfaction). Utility (V) from a provider j is presented here as

$$V_j = \beta'_{oj} + \beta_{1j}X + \alpha_1(Y - P_j - wT_j) + \alpha_2(Y - P_j - wT_j)^2, \quad (6)$$

where

X = a column vector of socioeconomic variables,

Y = total household expenditure,

P_j = the fee for provider j,

w = the opportunity cost of time,

T_j = the travel time to provider j, and

the household subscript is suppressed.

Two alternative estimating equations can be specified for equation (2), depending on the assumptions made with regard to the perceived effectiveness of alternative health care providers. First, under the assumption that all four health care providers are considered equally effective, the model estimated is the multinomial logit model. Alternatively, if the parents can rank the effectiveness of alternatives, the model estimated is an ordered-probit model. The results of both models are reported here.

Only those individuals who reported illnesses within two weeks prior to the survey date were included as observations. The explanatory variables included (1) the number of days ill (duration of illness as a proxy for the perceived severity of an illness), (2) age, (3) gender, (4) zero-one dummy variables to distinguish children from adolescents, (5) zero-one dummy variables for the 0–6 age group and the 13–18 age group, and (6) the time cost of seeking care. The time cost of seeking care

was estimated two different ways: (1) from a wage function and (2) from a computed average wage, based on total household income.[27]

Multinomial logit estimates using both measures of the time-cost of seeking care are presented in Table 19.[28] Some care is required in interpreting the coefficients of the multinomial logit model: each coefficient records the impact of a marginal change in the regressor on the log odds-ratio of the choice at hand relative to the reference choice (self-care). For details, the reader may consult Greene (1997, 914–916). The duration of illness proxy is statistically significant in determining the log odds-ratio of each provider relative to self-care. The older the person who is sick, the greater the odds of seeing a nurse. Being a child enhances the odds of consulting a nurse, and being an adolescent improves the odds of being brought to a Barangay health worker or a traditional healer. Being in a particular age group does not affect one's odds of consulting a physician.

In agreement with the ethnographic findings, gender did not affect the odds of seeing any of the alternative providers. The presence of other children and adolescents in the family seems to reduce the odds of a sick member being brought to a nurse and to a physician, respectively.

The results of the ordered-probit model are presented in Table 20.[29] The MU(1) and MU(2) terms are estimated threshold parameters that distinguish among the choices. As for the multinomial logit model, the estimated coefficients do not directly yield the marginal effects of changes in regressors on choice probabilities.[30] The statistically signifi-

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[27] Three potential estimation problems arise. First, including only individuals who have reported illness introduces the possibility of sample selection bias because characteristics that influence individuals' propensity to report illness (or to become ill in the first place) may affect their choice of health care providers. Dow (1996) found no evidence that this bias was present for a similar model estimated with data from the Côte d'Ivoire.

Second, while the literature typically treats severity (or duration) as exogenous (see Alderman and Gertler 1997; Li 1996; and Gertler, et al. 1995), it is likely to be endogenous. The standard solution to this problem would be an instrumental variables technique to estimate jointly severity and provider choice. Akin et al. (1998), using a large data set of ill and not-ill individuals, jointly estimated illness and provider choice equations; their instruments for the presence of illness included housing type, type of water supply, the presence of toilets, refrigerators, air conditioners, and so forth (variables that affect the probability of becoming ill, but not the choice of curative health care). The endogeneity correction increased somewhat the magnitudes of the estimated elasticities with respect to price and distance and resulted in a lower probability of choosing self care, accompanied by a somewhat higher probability of choosing each alternative to self care. These effects were not large.

Finally, a better proxy for severity might have been days lost from work or school. However, data for that variable were unavailable.

Instrumental variables of the type proposed by Akin et al. vary only by household, and observations are only available for a relatively small number of households. Moreover, accounting for endogeneity seems unlikely to change the results very much. Based on these two considerations, the more complex estimation exercise was not undertaken. The econometric results of primary interest (age and gender differentials) are consistent with the results of the ethnographic study.

[28] The results indicate that it does not matter whether the fitted or average wage was used in the estimation. That consumption and the square of consumption net of health care expenditures are shown to be statistically significant in the choice of all providers implies that the model used conforms to the basic assumption of a quadratic random utility function.

[29] That MU(1) and MU(2) are shown to be statistically significant indicates that the estimated model satisfies the assumption regarding ordering. The MUs are the threshold utility levels that the decisionmaker uses in ranking lower to higher quality providers. These also indicate that the estimated ranking is consistent with what is hypothesized (doctor, nurse, health worker, self-care—from highest to lowest).

[30] For a technical explanation of why this is so, see Greene 1997, 927–928.

Table 19 Multinomial logit estimates on health care utilization

Independent variable	Fitted wage		Average wage	
	Coefficient	t-ratio	Coefficient	t-ratio
Provider 2 (traditional healer)				
Portion of total expenditures not allocated for health care	−0.002451**	−2.800	−0.002452**	−2.800
Portion of total expenditures not allocated for health care squared	0.000001**	2.219	0.000001**	2.221
Days sick in past two weeks	0.067135**	3.152	0.067129**	3.152
Age	−0.005080	−0.522	−0.005077	−0.521
Gender	−0.267940	−1.611	−0.267830	−1.611
1 if individual belongs to 0–6 age group, 0 otherwise	0.134900	0.504	0.135000	0.505
1 if individual belongs to 13–18 age group, 0 otherwise	0.698750*	1.847	0.698980*	1.848
Number of adolescents in household	−0.215010**	−2.756	−0.215020**	−2.755
Number of children in household	−0.048336	−0.880	−0.048281	−0.879
Intercept	−0.93476	−2.286	−0.934900	−2.286
Provider 3 (nurse)				
Portion of total expenditures not allocated for health care	−0.001469**	−2.316	−0.001473**	−2.322
Portion of total expenditures not allocated for health care squared	0.000001*	1.744	0.000001*	1.749
Days sick in past two weeks	0.066276**	3.944	0.066273**	3.944
Age	0.013219*	1.896	0.013219*	1.896
Gender	−0.074390	−0.569	−0.074310	−0.569
1 if individual belongs to 0–6 age group, 0 otherwise	0.596860**	2.734	0.596800**	2.734
1 if individual belongs to 13–18 age group, 0 otherwise	0.476430	1.564	0.476530	1.564
Number of adolescents in household	−0.066762	−1.205	−0.066584	−1.202
Number of children in household	−0.099827**	−2.268	−0.099757**	−2.266
Intercept	−1.067800	−3.287	−1.067200	−3.285
Provider 4 (physician)				
Portion of total expenditures not allocated for health care	0.003421**	5.755	0.003403**	5.722
Portion of total expenditures not allocated for health care squared	−0.000001**	−3.587	−0.000001**	−3.567
Days sick in past two weeks	0.146400**	8.758	0.146360**	8.758
Age	0.005728	0.824	0.005718	0.823
Gender	−0.037163	−0.271	−0.037164	−0.271
1 if individual belongs to 0–6 age group, 0 otherwise	0.207160	0.967	0.206740	0.966
1 if individual belongs to 13–18 age group, 0 otherwise	0.131200	0.425	0.130870	0.424
Number of adolescents in household	−0.209860**	−3.601	−0.208750**	−3.584
Number of children in household	−0.065802	−1.451	−0.065665	−1.448
Intercept	−2.695700	−7.979	−2.691200	−7.968
Sample size	1,754.000		1,754.000	
Chi-squared	221.523		220.784	
Log-likelihood	−1,990.125		−1,990.494	

Sources: Fitted wage is derived from estimates in Haddad and Bouis 1991; average wage is derived from household per capita income.

Notes: Provider 1, self-care, is excluded here because it is the reference choice.

*Significant at 10 percent. **Significant at 5 percent.

Table 20 Ordered probit estimates on health care utilization

Independent variable	Fitted wage		Average wage	
	Coefficient	t-ratio	Coefficient	t-ratio
Portion of total expenditures not allocated for health care	−0.000333	−0.884	−0.000331	−0.877
Portion of total expenditures not allocated for health care squared	0.045149**	2.402	0.044849**	2.384
Days sick in past two weeks	0.062648**	8.979	0.062644**	8.979
Age	0.003645	1.293	0.003644	1.293
Gender	−0.027382	−0.487	−0.027387	−0.487
1 if individual belongs to 0–6 age group, 0 otherwise	0.166330*	1.947	0.166210**	1.945
1 if individual belongs to 13–18 age group, 0 otherwise	0.133720	1.053	0.133630	1.053
Number of adolescents in household	−0.094468**	–3.997	−0.094049**	–3.978
Number of children in household	−0.038567**	–2.028	−0.038513**	–2.025
MU(1)	0.275950**	14.193	0.275920**	14.193
MU(2)	0.888720**	25.282	0.888540**	25.285
Intercept	−0.976870	−4.221	−0.973070	−4.203
Sample size	1,754.000		1,754.000	
Chi-squared	119.355		118.909	
Log-likelihood	–2,041.209		–2,041.432	

Notes: The fitted wage is derived from estimates in Haddad and Bouis 1991; the average wage is derived from household per capita income.
*Significant at 10 percent.
**Significant at 5 percent.

cant coefficient for the duration of illness variable indicates that a prolonged illness drives the individual to seek care from a higher-quality provider. The results also indicate that if the sick person is a child, the probability of seeking care from a higher-level provider is greater than otherwise. However, the presence of other children and adolescents in the household dampens the chances of consulting a higher-level provider. Again, the gender of the sick family member was not a statistically significant variable in determining provider choice.

Both male and female adolescents are less likely to be taken to formal health care providers than children. The relative hierarchy of this pattern is the same as that for intrahousehold distribution of food. Because of data limitations, the analysis is unable to determine if, for example, boys are brought to more expensive doctors for consultation than girls.

Intrafamily Distribution of Expenditures for Health Care and Other Nonfood Items

In examining the intrafamily distribution of expenditures for health care and other nonfood items, the methodology used follows an approach developed by Deaton (1987).

Reduced-form demand functions for certain goods X (indexed by i) are derived from a constrained utility maximization problem:

$$X_i = X_i(P, W, C, Y), \tag{7}$$

where

P = a vector of prices,
W = a vector of wages earned by household members,
C = a vector of personal characteristics of individual household members, and
Y = the total unearned income of the household.

From equation (3), the Engel curve for the reference household is constructed as

$$E_i = P_i X_i = \Phi_j(X_o, A, B, D), \tag{8}$$

where

$E_i = P_i X_i$ = the total household expenditure on X_i,
X_o = the total household expenditure on all goods and services,
A = a vector that characterizes the demographic composition of the household, including N_k
N_k = the number of household members belonging to the kth age-gender group.
B = a vector of other household characteristics, and
D = a term representing unobservable factors such as tastes and preferences.

$\partial E_i/\partial N_k$ gives the change in total expenditures on good X_i due to the addition of a household member belonging to demographic group k. $\partial E_i/\partial N_k$ may be positive or negative, depending on X_i and k, and on whether the marginal propensity to consume X_i, $\partial E_i/\partial X_o$ is greater than 0. The ratio of these two terms is what Deaton (1987) refers to as the outlay equivalent of group k on X_i. Expressing this ratio in per capita terms, the result is

$$\Pi_{ik} = [(\partial E_i/\partial N_k) / (\partial E_i/\partial X_o)] \, (N/X_o). \tag{9}$$

Deaton (1997, 235) describes the outlay-equivalent ratio as a way "to calibrate the effects of an additional child [or adolescent, etc.] in terms of the effects of changes in the size of the budget." Deaton provides the following example: "[t]he outlay-equivalent ratio for a male child on tobacco, say, is the fraction by which [per capita expenditures] would have to be reduced to induce the same reduction in tobacco expenditure as would an additional male child."

To arrive at estimates of equation (9), equation (8) was estimated by ordinary least squares, following this general specification:

$$(P_i X_i) / X_o = \alpha_i + \beta_i ln(X_o / N) + \tau_i ln(N) + \Sigma\delta_{ik}(N_k / N) + \Phi_i Z + u, \tag{10}$$

where

$\alpha_i, \beta_i, \tau_i, \delta_{ik}, \Phi_i$ = the regression coefficients;
Z = a vector of individual and household characteristics that includes zero-one dummy variables for survey rounds, education levels of mother and father, farm area, mother's nutritional knowledge, and the ages of mother and father;
X_o / N = total household expenditure per capita;
N = household size; and
N_k / N = the proportion of the kth demographic group to household size.

Two categories of nonfood items were considered: items that are associated with health care spending, and items that are clearly consumed by specific demographic groups. Health care expenditure items, which were analyzed to determine the effect on health expenditures of having a member of group *k* fall ill, included (1) doctor services, (2) drugs and medicines, (3) dentist services, and (4) traditional medicines. The second set of expenditure items included (1) alcohol and tobacco, (2) male clothing and shoes, (3) female clothing and shoes, (4) children's clothing and shoes, (5) personal effects, (6) recreation, and (7) family events.

The "Π ratios" defined in equation (5) were estimated for health expenditure items; results are shown in Table 21, and those for the nonhealth expenditure items are presented in Table 22. The final two columns in Table 21 (all health fees and all drug fees) suggest that children less than two years of age are generally favored with respect to health care spending. Inequality in the 2–12 and 13–18 age groups is indicated with males favored over females. Both the ethnographic and survey evidence suggest that adolescent boys spend more time away from home and in agricultural labor. They may be more prone to serious accidents than adolescent girls, which may explain why health expenditures are higher for adolescent boys than girls.

In Table 22, per capita expenditures on alcoholic beverages are shown to decline with the addition of adult females, adolescent females, and children to the household. By contrast, the addition of an adult male increases total per capita consumption of both alcohol and tobacco. That the addition of a male adult increases household spending on alcohol and tobacco suggests the entitlement that adult males have over such items.

However, the presence of adult male members increases household expenditures on several other items as well, including those that are consumed by females, such as women's clothing and shoes. While household income effects are controlled in the model, this pattern perhaps reflects a significant influence of women's preferences over the allocation of whatever extra income the additional male household members bring into the household.[31]

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[31] While the results tend to show that adult members and adolescents are generally favored in expenditures, this may not necessarily mean that the elderly, young children, and preschoolers are discriminated against. The consumption of children and infants, in particular, may not be significant enough to affect spending on the items considered here.

Table 21 Share of weekly household expenditures going to health goods (outlay equivalence ratios)

Demographic group	Private doctor s fees	Government doctor s fees	All doctor s fees	Private drugs	Dental fees	Traditional drugs	Traditional health fees	Traditional drug and health fees	All health fees	All drug fees
Sick males more than 56 years	–8.34	–2.79	–8.30	–8.35*	–8.85	–7.34	–6.95	–7.68	–8.45*	–8.70*
Sick females more than 56 yrs	4.01	–11.71	3.66	5.44**	–4.97	–3.08	1.26	0.95	4.05**	5.24
Sick males 19–55 years	–1.59	–5.31	–1.70	1.71*	2.68	–4.69	4.55**	4.08	–0.46	1.82*
Sick females 19–55 years	0.67	–8.34	0.45	–1.02	–4.06	1.96	–0.84	–0.64	–0.12	–1.19
Sick males 13–18 years	1.75*	–5.46	1.58**	2.83*	–1.47	1.27	–0.76	–0.64	1.86*	2.77*
Sick females 13–18 years	–2.88**	–1.78	–2.89*	–0.35	36.53*	15.90*	0.13	1.72	–1.53	1.11
Sick males 2–12 years	–1.27	–0.40	–1.27	–0.33	–0.64	7.93*	3.74*	4.54	–0.84	–0.36
Sick females 2–12 years	–1.50	–1.22	–1.52**	–1.02*	–1.34	–1.13	0.14	0.03*	–1.37*	–1.08*
Sick males 0–1 year	1.15**	–0.64	1.11**	0.20	17.06*	0.33	–2.45	–2.42	0.90**	0.88
Sick females 0–1 year	1.60*	–5.27	1.44*	0.14	–1.03	7.01	3.65	4.35	1.09*	0.10

*Significant at 10 percent.
**Significant at 5 percent.

Table 22 Share of weekly household expenditures going to adults and children s goods (outlay equivalence ratios)

	More than 56 years		19 55 years		13 18 years		2 12 years		0 1 year	
Expenditure item	**Males**	**Females**	**Males**	**Females**	**Males**	**Females**	**Males**	**Females**	**Males**	**Females**
Alcohol	1.36	−0.85*	0.61	–1.06*	0.05	−0.38*	−0.13*	−0.11*	0.17	0.35
Tobacco	−0.47	−0.59	0.92**	−0.67	−0.26	0.02	−0.22	−0.04	0.91**	−0.12
Alcohol and tobacco	0.48	−0.87**	0.59**	–1.03*	−0.21	−0.35	−0.30	−0.21	0.33	0.03
Male clothing	1.64*	–1.43	0.25*	−0.73	−0.26*	−0.74	−0.08*	−0.18**	−0.47	−0.73
Male shoes	–1.22	–1.65	0.28	−0.68	2.20**	−0.58	0.42	−0.47	−0.80	0.39
Male clothing and shoes	1.42	–1.87	0.38**	−0.88	0.86*	−0.88	0.04	−0.28	−0.63	−0.59
Female clothing	1.74*	−0.88	0.22*	−0.70*	−0.65	0.31*	0.07*	−0.19*	–1.16	−0.79
Female shoes	0.46	–2.48*	−0.58	4.60*	0.38	2.14*	−0.17	0.16	−0.53	0.38
Female clothing and shoes	1.76*	–1.23	0.12*	1.32*	−0.60	0.59*	0.03*	−0.18*	–1.24**	−0.74
Adult clothing and shoes	1.38*	–1.53	0.22	0.30*	0.05*	−0.10**	0.02*	−0.24	−0.98	−0.69
Children’s clothing	–1.45	−0.90	−0.52	−0.67	0.43*	0.62	0.45	0.31*	0.23	−0.39
Children’s shoes	–1.76	−0.05	−0.53	–1.55*	0.98	2.12*	1.06	0.68	0.23	0.47
Children’s clothing and shoes	–1.78	−0.95	−0.64	−0.96	0.55*	0.93*	0.58*	0.38*	0.23	−0.35
Personal effects	0.81	−0.46	–1.01**	1.53*	−0.05	0.42	−0.46	−0.81*	−0.84	0.05
Recreation	−0.03	4.55*	0.38*	–1.57	0.75*	0.46*	−0.56*	−0.27*	–3.59	–3.10
Family events	0.10	−0.76**	−0.48*	1.48	0.31	0.28	0.20	−0.05*	0.58	0.68
Miscellaneous	–2.43	1.49	–1.47	1.05	−0.50	1.56	−0.84	1.02	0.77	−0.75
Other	0.03	−0.41	−0.53*	1.17*	0.19	0.29	0.01	−0.12**	0.20	0.32

*Significant at 10 percent.
**Significant at 5 percent.

Additional female adolescents add to expenditures on adult female clothing and shoes and additional adolescent males add to expenditures on adult male clothing and shoes. Both additional females and males add to expenditures on childrens' clothing and shoes and recreational expenditures. Thus, no gender-related discrimination is indicated.

CHAPTER 6

Conclusions

Linguistic analysis of Filipino kin terminology has shown a striking lack of gender differentiation (Stoodley 1957), a pattern that is generally incompatible with strongly discriminatory patterns against females. For example, the Tagalog language has a general term for child (*anak*), but no specific word for either "daughter" or "son." Fertility surveys, too, almost invariably show that Filipinos are just as likely to desire a daughter as a son. Indeed, a few studies (for example, Wong and Ng 1985) have shown a slight preference for a girl among Philippine parents.

Consistent with this lack of discrimination against females, the Filipino family system is bilateral and bilocal (that is, the family is well integrated into the families of both parents), and is considerably more egalitarian than the systems in most of the neighboring East Asian countries (Medina 1991). These structural underpinnings strengthen the status of women because they ensure that a newly married female will not be left alone and powerless in her husband's village or extended family system.

Research Findings

There is much evidence from surveys of the Bukidnon households to support the view that females and males enjoy equal status in the intrafamily distribution of resources. The analysis indicates a more or less egalitarian sharing of food, equal access to health care, a perceived sharing of household chores (even though specific tasks are gender-differentiated), and somewhat more education for girls than for boys.

Education

According to the results of this research, girls study more, stay in school longer, and attain higher levels of education than boys do. On average, girls put in an extra 12 hours per week in school and study, compared with boys. Educational attainment of both sexes is positively related to family income and to the educational levels of both parents, and the gender gap in educational attainment diminishes as family income increases. While adolescents make major contributions to family welfare, there is little evidence from the ethnographic study to support the view that parents from poor households are motivated to withdraw their sons from school to benefit from their income-earning potential.

Demand for education by the adolescents themselves is apparently a key factor influencing the amount of education that they receive. Socialization patterns in the Philippines emphasize that girls more than boys acquire such traits as "responsibility," "patience," and "sacrifice." When placed within a formal education system that is structured such that these behaviors are expected and encouraged, and whose staff is predominantly female, girls find school more congenial than boys do. This may explain why girls appear to be favored with respect to educational investments: when forced to choose by economic necessity, parents will invest in the education of specific children who express a strong desire to go to school and who do well in school. In the cultural setting studied here, it is much more likely that girls, rather than boys, will want to stay in school.

In examining household resource allocation decisions economists have often assumed a "unitary" preference function for the household, assuming either that a parent makes decisions for the entire family or that there is no conflict in the values and desires of individual family members. Empirical evidence is accumulating that contradicts this assumption (see, for example, Haddad, Hoddinott, and Alderman 1997). The fact that adolescents appear to exercise considerable autonomy where education is concerned suggests that modeling parent-child interactions within the household has more empirical relevance than models that take the household as the unit of observation.

Food Shares

A new measure of inequality in intrahousehold distribution of food was introduced in this research. The food share/energy share (FS/ES) ratio is based on the assumption that hunger satiation (energy consumption) is relatively evenly distributed among household members. A related assumption is that inequality will be manifested more strongly in terms of how nonstaple foods (in particular, those that have high income elasticities) are distributed.

Application of this measure of inequality to the food intake information from the 1984/85 surveys produces no evidence of gender inequality. The results indicate that preschoolers are favored in the intrahousehold distribution of food, a conclusion different from that reached by comparing only energy adequacy levels, both uncorrected (Bouis and Haddad 1990) and corrected for individual weights and activity patterns (Haddad, Kanbur, and Bouis 1992). Even though, compared with preschoolers, other age and gender groups consume diets that are less preferred (in terms of taste, not nutrients), they are compensated by greater proportions of less-preferred foods, so that nutrients are relatively evenly distributed among various age and gender groups. However, more preferred nonstaple foods such as meat, dairy products, and fruits are eaten more frequently and shared among a greater number of family members as income increases.

The findings of the ethnographic study closely corroborate these conclusions. Family members help themselves from a common dish, a system of food distribution that is less likely to produce discrimination than, for example, a custom of letting males eat first, or having a parent serve individual portions to each family member.

Parents expressed repugnance at the suggestion that males should be entitled to better food than females or that family members who earn more should be entitled to better food. The youngest children in these families were showered with affection and special attention.

Health Care Expenditures

In addition to being favored in the intrafamily distribution of food, preschoolers are favored in the provision of health care. There does not appear to be gender discrimination at any age in the selection of health care providers when family members fall ill. There is some indication that male adolescents receive more than their share of health care expenditures, but this may be because teenage boys are more prone to serious accidents than girls. Older household members (adolescents and adults) may receive a larger share of income for clothing, personal effects, and other nonfood and nonhealth expenditures, which compensates somewhat for the favoritism shown preschoolers in the areas of food and health expenditures.

Policy Conclusions

It is crucial not to lose sight of the fact that incomes among the households sampled are very low. As a consequence, life for adolescents consists of much hard work, their diets are inadequate, they receive poor medical care, and their schooling is cut short because their families lack the resources to pay for more advanced education. Diets are especially poor in nutrients provided by nonstaple foods, and despite the apparent absence of gender inequality, such deficiencies can affect girls more severely than boys.

In countries where there is gender inequality, the detrimental effects of poverty are borne disproportionately by females. In those societies, policies such as credit and training programs targeted at women or subsidized education for girls are warranted to begin to redress these inequalities. Moreover, where the incidence of poverty is higher among women, or where transfers targeted at women are highly productive, gender-specific policies and poverty reduction are highly complementary. In the Philippines, the evidence from one rural province suggests that such policies may not be important in addressing the problems of low incomes, except where nutrition and health requirements are greater for females. In these cases targeted nutrition and health programs for adolescent girls may well be warranted because of their greater nutritional needs associated with reproduction, for example, in treating iron deficiencies. Iron requirements for females of reproductive age are nearly double those of males. Although iron adequacy for adolescent girls increases significantly with income because of greater consumption of nonstaple foods, iron intakes are still inadequate even at higher income levels. Supplementation may be the best short-term solution to this problem in that rich sources of iron in the diet are expensive, and nutrition education cannot solve the problem if women cannot afford to buy the iron-rich foods recommended.

In addition to the time spent at school and in studying, adolescents put in many hours performing routine chores, working on the farm, and participating in the labor force. However, research findings reduce concern that rising wages available to adolescents (especially young adolescents) will tip the school-work tradeoff strongly toward work in this setting. Parents strongly wish to secure education for their children, but those lacking means appear willing to allow boys to opt out. This income effect is particularly important for adolescent boys. Policies that increase incomes may enable parents to more strongly encourage their children to remain in school. Policies designed to focus boys' attention on the benefits of education may also be desirable.

Complementarities between Regression and Ethnographic Methodologies

The strategy of exploiting potential complementarities between the ethnographic and regression methodologies (as discussed in Chapter 1) has worked well in this study. Two examples can be cited. First, with respect to the determinants of adolescent education, early on in the project exploratory regression analysis of the gap in education levels between girls and boys demonstrated a strong income effect for boys and a weaker income effect for girls. The initial hypothesis, formulated before the ethnography was undertaken, was that labor force conditions (for example, opportunities for agricultural wage employment for males) were a primary determinant of this pattern of investment in education. But based on the findings derived from the ethnographic interviews the underlying reason for the difference in education between adolescent boys and girls is quite different from the hypothesis: boys choose to leave school because they find it less congenial.

Second, with respect to the intrahousehold distribution of food, use of the FS/ES ratio to measure equality or "fair shares" rests on the validity of an untested assumption that energy will be the most equitably distributed commodity or nutrient. It is reassuring, then, that the findings of the ethnographic study corroborate so closely the conclusions reached using the calculated FS/ES ratios that there is no gender discrimination and that preschoolers are favored. That the findings are so similar bestows a higher degree of credibility on the conclusions than either methodology implemented in isolation could.

Further Research

Because the period of adolescence has received so little attention from economists, empirical evidence with respect to family resource allocation during this crucial time is scarce. Data should be accumulated on basic relationships between gender and socioeconomic status and work patterns, education, food and nutrient intakes, health care, and nonfood, nondurable consumption items for adolescents in a number of countries and situations. As robust relationships are identified, program and policy recommendations could be designed that reflect the commonalities and differences across case studies. The case study presented here suggests that the Philippine example could provide a contrast with situations in other countries where gender inequalities are severe. This

study provides further evidence that household decisionmaking involves bargaining among individual family members with divergent preferences, as adolescents' desire to continue or stop their education influences family investments in education.

This research has looked at several issues, each individually quite complex, in a broad way. What are some questions left unanswered?

- Many families have made substantial sacrifices to invest in the education of their children at the secondary level. What has been the impact of this education on the offsprings' choices of occupations as adults? How has it affected their earning power and their propensity to migrate to urban centers? How relevant is the content of public school education to those who choose to remain in Bukidnon and to live on farms? How effective is secondary education on nutrition and birth control (for boys as well as girls) in influencing behavior later during marriage?
- What are the major health problems of adolescent girls and boys? Are these problems brought about primarily by poor-quality diets, or generally poor community health and sanitation conditions, or detrimental behaviors such as smoking? How can public and private health care and nutrition education programs best be designed to solve these health problems? If these health care needs go unmet, what are the consequences for adolescents later when they become adults, get married, and raise families?
- Higher-income children and adolescents clearly consume better-quality diets than lower-income children and adolescents. What are the functional consequences of having consumed a higher-quality diet during childhood, for example, in terms of anthropometric measures and cognitive abilities of the following generation of preschoolers?

Convincing answers to many of these questions can only be obtained by undertaking extensive baseline surveys of several aspects of the experiences of adolescents as they mature and then following up later with surveys of their experiences as adults. The research design may also need to involve program interventions during adolescence. Such research is expensive. Even if funding can be found, a long-term commitment to understanding the significance of the adolescent period in the overall process of reaching physical and behavioral maturity is required on the part of investigators. The panel data analyzed here, which compare well with other available data sets in the breadth of information available, still fall far short of these requirements.

In conclusion, the ethnographic interviews uncovered a willingness on the part of parents in poor families to make substantial sacrifices to invest in the futures of their children through education. While adolescents contributed significantly to family welfare by undertaking household chores and working in farm fields, parents indicated that studies took precedence over this work, particularly if these chores could be relegated to weekends and school vacations. Adolescents were expected to keep most of the wages which they earned in the labor force for themselves. The econometric evidence presented in various chapters is largely consistent with these ethnographic findings.

Parents in the rural Philippine context studied here give high priority to investment in the futures of their adolescent children. Conversely, household resource allocation

decisions do not appear to be strongly influenced by short-term benefits to be gained from employment of adolescents. It behooves the government and other development agencies, then, to identify and implement programs and policies that tap into and provide a high payoff to the willingness of parents to sacrifice current consumption for their children's future. Success in identifying and implementing such policies and programs will depend, in part, on a much deeper understanding of the adolescent period with respect to household resource allocation and recognition of the unique tension between the parental desire to invest in and prepare adolescents for adulthood and their need to rely on their contributions to family welfare.

APPENDIX

Sequential Logit Model

Let the following definitions pertain:

Y_i = dichotomous dependent variable; $i = 1,..., N$;

X_i' = row vector of K regressors; $i = 1,..., N$;

A_{gi} = educational attainment of level g by individual i; and

A^* = highest educational attainment possible.

Now consider conditional probability that an individual stopped at educational attainment level g, given that the individual attained at least level g and given the explanatory variable vector, X_i'; for each value of g, the conditional probabilities are

$$
\begin{aligned}
q_0 &= P(A_{gi} = 0 \mid X_i');\\
q_1 &= P(A_{gi} = 1 \mid A_{gi} \geq 1 , X_i');\\
q_2 &= P(A_{gi} = 2 \mid A_{gi} \geq 2 , X_i');\\
&\vdots\\
q_{*-1} &= P(A_{gi} = A^* - 1 \mid A_{gi} \geq A^* - 1 , X_i');\\
q_* &= P(A_{gi} = A^* \mid X_i').
\end{aligned}
$$

The probabilities of attaining particular educational levels, conditioned only on the explanatory variables, can be calculated as

$$P_0(X_i') = P(A_{gi} = 0 \mid X_i') = q_0;$$

$$
\begin{aligned}
P_1(X_i') = P(A_{gi} = 1 \mid X_i') &= P(A_{gi} = 1 \mid A_{gi} \geq 1 , X_i')P(A_{gi} \geq 1 \mid X_i')\\
&= q_1(1 - q_0);
\end{aligned}
$$

$$
\begin{aligned}
P_2(\mathrm{X_i}') = P(A_{gi} = 2 \mid X_i') &= P(A_{gi} = 2 \mid A_{gi} \geq 2 , X_i')P(A_{gi} \geq 2 \mid X_i')\\
&= q_2 \times [\, 1 - P_0(X_i') - P_1(X_i') \,]\\
&= q_2(1 - q_1)(1 - q_0);
\end{aligned}
$$

$$
\begin{aligned}
P_3(X_i') = P(A_{gi} = 3 \mid X_i') &= P(A_{gi} = 3 \mid A_{gi} \geq 3\ , X_i)P(A_{gi} \geq 3 \mid X_i') \\
&= q_3 \times [\ 1 - P_0(X_i') - P_1(X_i') - P_2(X_i')\ ] \\
&= q_3(1 - q_2)(1 - q_1)(1 - q_0); \\
&\vdots \\
P^*(X_i') &= (1 - q_{*-1})(1 - q_{*-2}) \ldots (1 - q_0).
\end{aligned}
$$

With this set of probabilities, the expected educational attainment, conditioned on X, looks like

$$E[A_{gi} \mid X_i'] = \sum_{g=0}^{*} A_{gi} \times P_g(X_i')$$

The partial derivatives of this expectation with respect to the kth regressor are

$$\frac{\partial E[A_{gi} \mid X_i']}{\partial X_{ki}} = \sum_{g=0}^{*} A_{gi} \times \frac{\partial P_g(X_i')}{\partial X_{ki}}.$$

The probabilities can be expressed as follows. Define a dichotomous dependent variable, Y, that takes on the value 1 if

$$(A_i = A_{gi} \mid A_i \geq A_{gi}),$$

zero otherwise. Then, using the *logistic probability function*,

$$\text{Prob}\ [Y_i = 1] = q_g = \exp(X_i'\,\beta) / [1 + \exp(X_i'\,\beta)] = \Lambda(X_i'\,\beta).$$

The marginal effects of this function are easily expressed:

$$\partial q_g / \partial(X_i'\beta) = \Lambda(X_i'\beta)[1 - \Lambda(X_i'\beta)],$$

whence

$$
\begin{aligned}
\partial q_g / \partial X_{ik} &= \beta_k \{\exp(X_i'\beta) / [1 + \exp(X_i'\beta)]^2\} \\
&= \beta_k\, \Lambda(X_i'\beta)\, [1 - \Lambda(X_i'\beta)].
\end{aligned}
$$

The marginal effects on the P_g probabilities are extensions of these results. Logistic regression models are discussed in many standard econometric texts, including Greene 1997.

References

Akin, J., D. Guilkey, P. Hutchinson, and M. McIntosh. 1995. The demand for health care in Sri Lanka: Estimation of the economic model with correction for endogenous illness. University of North Carolina at Chapel Hill, Chapel Hill, N.C., U.S.A.

Alderman, H., and P. Gertler. 1997. Family resources and gender differences in human capital investments: The demand for children's medical care in Pakistan. In *Intrahousehold resource allocation in developing countries: Models, methods, and policy*, ed. L. Haddad, J. Hoddinott, and H. Alderman. Baltimore, Md., U.S.A.: Johns Hopkins University Press for the International Food Policy Research Institute.

Behrman, J., and A. Deolalikar. 1988. Health and nutrition. In *Handbook of development economics*, ed. H. Chenery and T. N. Srinivasan. Vol. 1. Amsterdam and New York: Elsevier.

Blum, R. W. 1991. Global trends in adolescent health. *Journal of the American Medical Association* 265 (20): 2711–2719.

Bouis, H. E. 1991. The determinants of household-level demand for micronutrients: An analysis for Philippine farm households. International Food Policy Research Institute, Washington, D.C. Photocopy.

———. 1994. The effect of income on demand for food in poor countries: Are our data bases giving us reliable estimates? *Journal of Development Economics* 44 (1): 199–226.

———. 1996. A food demand system based on demand for characteristics: If there is curvature in the Slutsky Matrix, what do the curves look like and why? *Journal of Development Economics* 51: 239–266.

Bouis, H. E., and L. J. Haddad. 1990. *Agricultural commercialization, nutrition, and the rural poor: A study of Philippine farm households*. Boulder, Colo., U.S.A.: Lynne Rienner.

———. 1992. Are estimates of calorie-income elasticities too high? A recalibration of the plausible range. *Journal of Development Economics* 39 (2): 333–364.

Bouis, H. E., and C. L. Peña. 1997. Inequality in the intrafamily distribution of food: The dilemma of defining an individual's "fair share." In *Intrahousehold resource allocation in developing countries: Models, methods, and policy*, ed. L. Haddad, J. Hoddinott, and H. Alderman. Washington, D.C.: Johns Hopkins University Press for the International Food Policy Research Institute.

Bouis, H. E., M. Palabrica-Costello, O. Solon, and A. B. Limbo. 1994. *Understanding gender-differentiated constraints to Philippine farm household investments in adolescents: Implications for their nutritional status*. Research Report Series No. 7. Washington, D.C.: Nutrition of Adolescent Girls Research Program, International Center for Research on Women.

Brabin, L., and B. J. Brabin. 1992. The cost of successful adolescent growth and development in girls in relation to iron and vitamin A status. *American Journal of Clinical Nutrition* 55 (5): 955–958.

Chung, K. 1997. Using qualitative methods to improve the collection and analysis of data from LSMS household surveys. In *Designing household survey questionnaires for developing countries: Lessons from ten years of LSMS experience*, ed. M. Grosh and P. Glewwe. Washington, D.C.: World Bank.

Deaton, A. 1987. *The allocation of goods within the household: Adults, children, and gender*. Living Standards Measurement Study Working Paper 39. Washington, D.C.: World Bank.

———. 1997. *The analysis of household surveys: A microeconometric approach to development policy*. Baltimore, Md., U.S.A.: Johns Hopkins University Press for the World Bank.

DeMaeyer, E., and M. Adiels-Tegman. 1985. The prevalence of anemia in the world. *World Health Statistics Quarterly* 38: 302–316.

Dow, W. 1996. *Unconditional demand for health care in Côte d Ivoire: Does selection on health status matter?* Living Standards Measurement Study No. 127. Washington, D.C.: World Bank.

Encarnacion, J. 1990. Consumer choice of qualities. *Economica* 57 (1): 63–72.

FAO/WHO/UNU (Food and Agriculture Organization of the United Nations/World Health Organization/United Nations University). 1985. *Energy and protein requirements*. Technical Report Series 724. Geneva: WHO.

Flieger, W., M. K. Abenoja, and A. C. Lim. 1981. *On the road to longevity: 1970 national, regional, and provincial mortality estimates for the Philippines*. Cebu City: San Carlos Publications.

FNRI (Food and Nutrition Research Institute). 1984. Second nationwide nutrition survey Philippines 1982. Manila: National Science and Technology Authority.

Fujisaka, S. 1986. Informal structured iterative interview: A method and a short training course. *Philippine Quarterly of Culture and Society* 14: 263–275.

Gertler, P., and J. van der Gaag. 1988. *The willingness-to-pay for medical care: Evidence from two developing countries.* Washington, D.C.: World Bank.

Gertler, P., and J. Molyneaux. 1996. Pricing public health services: Results from a social experiment in Indonesia. Rand Corporation, Santa Monica, Calif. Photocopy.

Greene, W. H. 1997. Econometric analysis. 3rd ed. Englewood Cliffs, N.J., U.S.A.: Prentice Hall.

Haddad, L., and H. Bouis. 1991. The impact of nutritional status on agricultural productivity: Wage evidence from the Philippines. *Oxford Bulletin of Economics and Statistics* 53 (1): 45–68.

Haddad, L. J., R. Kanbur, and H. E. Bouis. 1991. Do better-off households exhibit lower intrahousehold inequality? Energy intake and energy expenditure data from the Philippines. Paper presented at the Institut National de la Recherche Agronomique Conference on Household Economy and Modeling the Family Farm in Agriculture, Montpellier, France, December 4–6, 1991.

Haddad, L., J. Hoddinott, and H. Alderman, eds. 1997. *Intrahousehold resource allocation in developing countries: Models, methods, and policy*. Baltimore, Md., U.S.A.: Johns Hopkins University Press for the International Food Policy Research Institute.

Ii, M. 1996. The demand for medical care: Evidence from urban areas of Bolivia. Living Standards Measurement Study Working Paper No. 123. Washington, D.C.: World Bank.

Kramer, M. S. 1987. Determinants of low birth weight: Methodological assessment and meta-analysis. *Bulletin of the World Health Organization* 65 (5): 663–737.

Kurz, K. M. 1996. Adolescent nutritional status in developing countries. *Proceedings of the Nutrition Society* 55 (1B): 321–337.

Madigan, F. C. 1988. Inter-agency working group on poverty determination: Regional poverty indicators: 1985. In *Medium-term Philippines development plan 1987 1992*, cited in Population Center Foundation, Selective Dissemination of Information, II, 2 (1988).

Medina, B. T. G. 1991. *The Filipino family: A text with selected readings*. Diliman, Quezon City: University of the Philippines Press.

Quisumbing, A. 1995. The extended family and intrahousehold allocation: Inheritance and investments in children in the rural Philippines. Food Consumption and Nutrition Division Discussion Paper 3. International Food Policy Research Institute, Washington, D.C.

Ramalingaswani, V., U. Jonsson, and J. Rohde. 1997. *The Asian enigma in the progress of nations 1996*. New York: United Nations Childrens' Fund.

Schultz, T. P. 1988. Education investments and returns. In *Handbook of development economics*, ed. H. Chenery and T. N. Srinivasan. Vol. 1. Amsterdam and New York: Elsevier.

Senderowitz, J. 1995. *Adolescent health: Reassessing the passage to adulthood.* World Bank Discussion Paper 272. Washington, D.C.: World Bank.

Stoodley, B. 1957. Some aspects of Tagalog family structure. *American Anthropologist* 59 (2): 236–249.

Strauss, J., and D. Thomas. 1995. Human resources: Empirical modeling of household and family decisions. In *Handbook of development economics*, ed. J. R. Behrman and T. N. Srinivasan. Vol. 3. Amsterdam: North-Holland.

———. 1998. Health, nutrition, and economic development. *Journal of Economic Literature* 36 (June): 766–817.

United Nations. 1990. *1988 demographic yearbook*. New York.

———. 1993. *The sex and age distribution of the world population*. The 1992 revision. New York.

WHO (World Health Organization). 1986. *Young people s health: A challenge for society.* Technical Report Series No. 731. Geneva.

Wong, A. K., and Ng Shui Meng. 1985. *Ethnicity and fertility in Southeast Asia: A comparative analysis*. Research Notes and Discussions Paper 50. Singapore: Institute of Southeast Asian Studies.

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