HOUSEHOLD INCOME ALLOCATION: EFFECTS OF GENDER ON DEMAND AND EXPENDITURE PATTERNS IN SOUTHAFRICA

by

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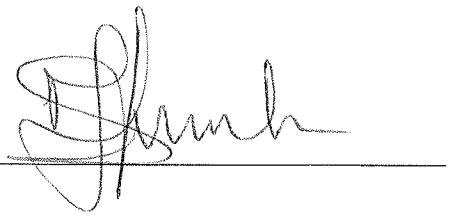
SIGNED: 

APPROVAL BY THESIS DIRECTOR

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DEDICATION

Dedicated with gratitude
To

My mother, Anjelina Auma Sumba
For her prayerful support and encouragement
Throughout my academic career

My late father, Mzee James Sumba Adenyi
For his commitment to hard work
And steadfast example

And

My wife Dorcas Marigu Sumba,
My dear children Esther, Juliet and step son Kevin
For their love, patience and moral support.

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ABSTRACT

This study investigates the effects of gender of household head on demand and expenditure patterns in South Africa. Effects of household income on household commodity expenditure shares and child nutritional status by the gender of household head are evaluated. Available literature on intra-household resource allocation, indicates an ongoing debate about whether income in the hands of women is a better investment as opposed to income under the control of men. Investment at household level refers to the broadening of opportunities for increased household welfare through education, health and socio-economic services to members. A demand model has been used to aggregate individual demands given an aggregate income constraint on the household. A collective model was used to conceptualize household preferences assuming household members have different preferences.

Empirical results show that female headed households generally do better in influencing child nutritional status but it is not clear which gender of household head has a bigger impact on the demand for household commodities.

CHAPTER 1

INTRODUCTION

An individual's welfare is based on a complex set of economic and social interactions. But as much as this is a widely recognized fact, development policies do not always acknowledge these interactions. The social interactions operate in institutions within which the individual is situated such as the family, household, business, club, etc (Haddad, Hoddinott and Alderman 1997). Within the household, the processes by which resources are allocated among individuals is referred to as "intra-household resource allocation". The understanding of how household resource allocation occurs is important for both policy and project design. Although many models and tools address specific aspects of the broad question of how families and households allocate resources among members, this study uses the Collective Model to explain household resource allocation behavior by headship gender. The collective model is chosen on the premise that preferences differ between genders heading the household.

Studies have used individual and household data to estimate the demand for both market goods and non-market goods (such as health care and human capital). One example of this kind of estimation was done in Indonesia. The objective was to measure the effects of food prices, access to health programs and clean water on the health of individuals (as measured by morbidity) and on the quantity of food nutrients consumed by households (Pitt and Rosenweig 1985). These estimates may help inform policy makers on how changes in food prices and welfare programs affect the health of

individuals but they don't say much about how households allocate resources among their members. One of the ways that analysts have approached this problem is by formulating intra-household conditional demand equations. Such equations show how the allocations provided to one household member affect the allocations to others. With this approach, questions such as how does one person's health, time allocation or food consumption affects others can be answered (Pitt 1997). To accomplish its objectives while avoiding complexities of interpersonal effects, this study measures outcomes at the household level.

1.1 STATEMENT OF THE RESEARCH PROBLEM

It is typically assumed that family or household income is spent as needs dictate, and that it does not matter who spends the available resources. However, recent studies of intra-household expenditure patterns suggest that there are major differences in the spending patterns of men and women. I theorize that these differences can be observed in the context of household demand for commodities, nutrition and health. If this new school of thought is supported by empirical evidence, then rejection of the traditional paradigm has implications for public policy. The main implication of this new model would mean, for example, that policies that lead to more resources in the hands of women would have different effects on household choices than policies that generate income for men.

This study aims at extending the literature on the debate by empirically quantifying these potential gender differences in the allocation of household income. It also looks at race as a potential variable in determining household expenditure behavior

patterns. The goal of this study, therefore, is to make empirically supported recommendations or suggestions to guide policy making and consequently appropriately influence public spending on economic development programs.

1.2 RESEARCH QUESTIONS

The basic question of this study is, how does the gender of the household head affect demand and hence expenditure patterns in households? The more specific questions are:

1. What is the difference between male and female-headed households in expenditure on household commodities and specifically on those that enhance human capital?
2. What are the effects of household head gender on the child's nutritional status as measured by anthropometric Z-score outcomes for boys compared to girls?
3. What are the potential impacts of race in determining expenditure patterns and/or anthropometric outcomes?

1.3 HYPOTHESES

Examination of the research questions, viewed in terms of the theory of household demand coupled with previous empirical studies, led to the formulation of the following hypotheses.

1. Generally, there is a significant difference between male and female headed households in allocation of household income; and specifically

    a) Households with female heads have a tendency to spend their incomes on goods that enhance human capital compared to male-headed households.

b) Households with female heads have a tendency to spend more of their incomes on nutritionally richer and diverse food items as compared to male-headed households.

2. Generally, there is a significant and positive association between female household heads and the nutritional status of the household's children; and specifically

(a) Children in female-headed households are likely to have higher anthropometric Z-scores compared to male-headed households.

(b) Boys are likely to have higher anthropometric Z-scores than girls irrespective of the gender of the household head.

3. Generally, there is a significant and positive association between overall expenditure outcomes and race; and specifically

(a) African households are likely to have higher commodity expenditure shares than Indian households, indicating the concentration of income in South Africa.

(b) Nutritional status and subsequent anthropometric Z-scores among African households will be lower compared to Indian households reflecting generally lower incomes among the African as compared to the Indian race (and perhaps other races) in South Africa.

1.4 OBJECTIVES

The main objective of this study is to examine the effect of gender on household expenditure allocation in KwaZulu-Natal Province of South Africa. The specific objectives are to:

1. Investigate the gender differences in commodity demand outcomes and especially for goods of a human capital nature.
2. Investigate the gender differences in child nutritional status as measured by child anthropometric indicators: height-for-weight, weight-for-height and height-for-age Z-scores.
3. Investigate racial differences, if any, in household commodity allocation and nutritional outcomes among children.

1.5 ORGANIZATION OF THIS THESIS

The next chapter describes the research setting, sample size and the sampling frame employed to select the sample households. It also highlights the advantages of clustered samples in the collection and analysis of household data. Chapter three gives a detailed description of the sources of income and expenditure categories in the research households. Chapter four reviews the relevant literature, stating some of the findings of similar studies. It also outlines the theoretical model used in the research. Chapter five explains the empirical model used for analyzing the data and estimating the parameters. Chapter six discusses the empirical results of the study and interprets its findings. Chapter seven, the last chapter, draws conclusions and makes policy recommendations based on the findings. The findings are discussed under three categories based on the three objectives that were the focus of the research questions and the hypotheses underlying these research questions.

CHAPTER 2

DESCRIPTION OF RESEARCH SETTING AND DATA SAMPLING

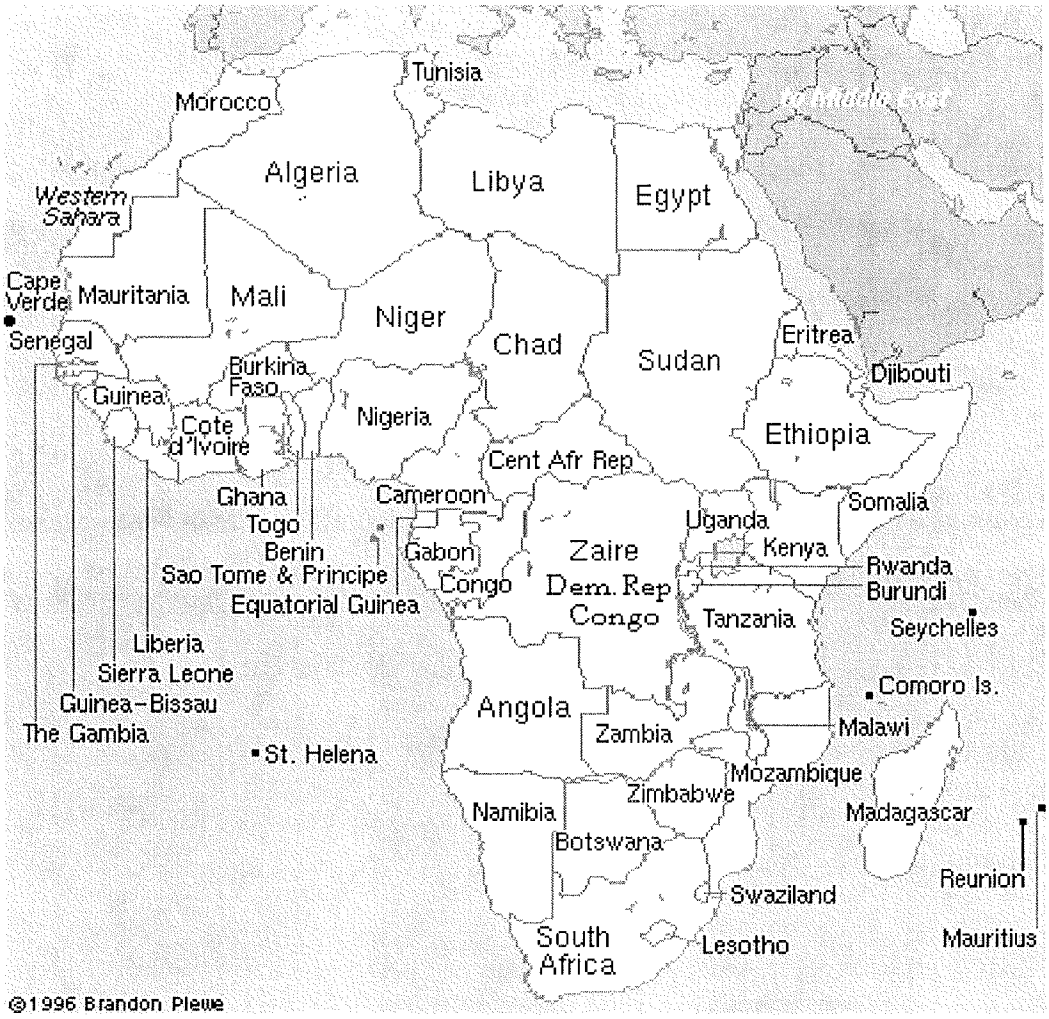
2.1 RESEARCH SETTING

Although South Africa (Figure 1) is considered an upper middle income country with a 1997 per capita GNP of approximately US$3000, income is distributed unequally with a majority of people living in poverty (Carter and May 1998). In the last decade the country has undergone dramatic political, social and economic change. Many of the racial policies underlying apartheid such as restrictions on mobility and residential location, have been dismantled. Following these changes, a new constitution, which puts gender equality firmly on the country's policy agenda, has been enacted. This makes South Africa an interesting albeit a complex case to study.

Data for this study comes only from KwaZulu-Natal province, which lies on the East Coast of South Africa (Figure 2) and therefore the findings relate solely to this area and not the entire country. Formed by combining the former Zulu Homeland and former Natal Province, KwaZulu-Natal Province is now South Africa's largest province in terms of population, containing one-fifth of the country's total population of 43 million inhabitants.

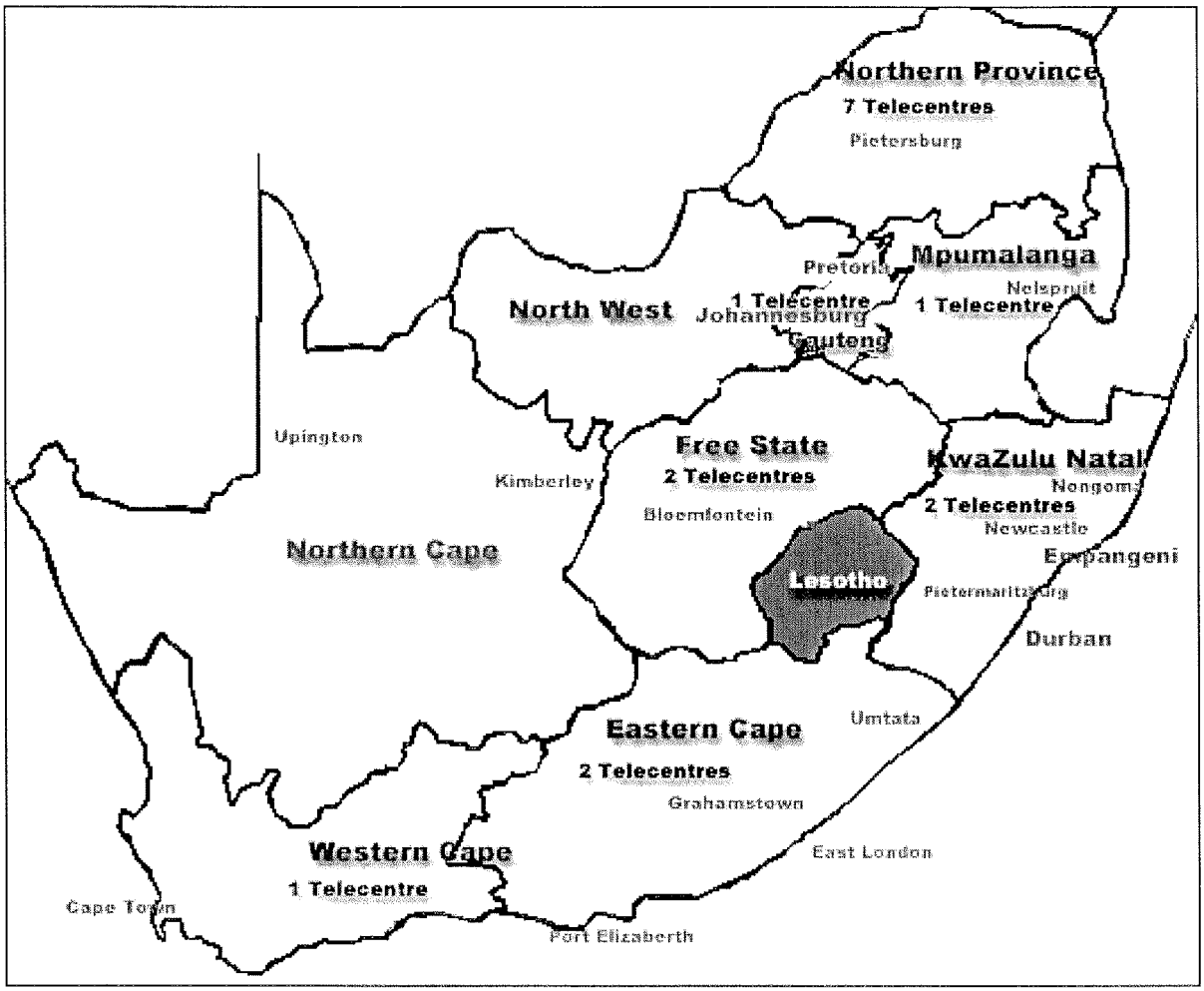
KwaZulu-Natal province is relatively poor, despite being quite urban. About 35 percent of the population live in towns and cities. Three-quarters of its people are Africans (mainly Zulu), 14 percent Indians, 7 percent white and 3 percent colored.

FIGURE 1: MAP OF AFRICA



Source: http://www.ggwo.org/images/map-africa.gif

FIGURE 2: PROVINCIAL MAP OF SOUTH AFRICA



Source: http://www.communitysa.org.za/images/samap.gif

The province was first surveyed in 1993 and resurveyed between March and June 1998[1]. The current study uses data from the 1998 survey, which was called the KwaZulu-Natal Income Dynamics Study (KIDS). Details of the survey are given in the Data section of this chapter. White and colored households were not resurveyed in 1998, hence the analysis includes only African and Indian households both in the rural and urban areas of KwaZulu-Natal province.

Africans and Indians are very different economically. For example, while per capita expenditures for African households average just under $500, the average for Indian households is nearly four times as large. Consequently food expenditure share differences are quite pronounced, with African households spending over 50 percent of their budget on food, while Indian households spend about one-third.

2.2 SAMPLING DESIGN

Sampling used a two stage self-weighting design. In the first stage, clusters were chosen with probability proportional to population size from the census enumerator sub-districts (ESD) or approximate equivalents where an ESD was not available. In the second stage, all households in each chosen cluster were enumerated then randomly sampled by the Projects for Statistics on Living Standards and Development (PSLSD).

In 1993 the KwaZulu-Natal portion of the PSLSD sample was designed to be representative at the provincial level, conditional on the accuracy of the 1991 census and other information used in the sampling frame, and contained households of all races. In

[1] The 1998 re-survey examined in this paper was directed by a consortium comprised of the University of Natal, the University of Wisconsin and the International Food Policy Research Institute (IFPRI).

1998, however, it was decided not to re-survey the small number of white and colored households. "While there were minor disadvantages to retaining these groups, the relatively small number of households in each group (112 white households and 53 colored) would have precluded most comparative ethnic analyses" (IFPRI 2001). As a result, the 1998 sample includes only African and Indian households. Of the target sample, at least one core person from each of the 1132 households (83.6 percent of the original sample) was successfully re-interviewed (see Table 1).

TABLE 1: HOUSEHOLD ATTRITION RATES IN THE KWAZULU-NATAL INCOME DYNAMICS STUDY (KIDS) SURVEY, 1998[A] (PERCENT OF COLUMN)

Race	African		Indian	Total
Status	Non-Urban	Urban	All	All
Located and interviewed	688 (83.4%)	276 (87.9%)	168 (78.1%)	1132 (83.6%)
Moved and could not be located	60 (7.3%)	15 (4.8%)	18 (8.4%)	19 (6.9%)
Not known in area, refusal or death	77 (9.3%)	23 (7.3%)	29 (13.5%)	129 (9.5%)
TOTAL	825	314	215	1354

Source: IFPRI, 2001 [A]These are households used for commodity expenditure shares analysis and not the nutritional status analysis.

In developing countries, refusal rates are usually very low. This was also true for the KwaZulu-Natal Income Dynamics Study (KIDS) survey. Only eleven re-interviewed households refused an interview. Re-interview rates were highest for Africans in urban areas, where 87.9 percent of the target households were re-contacted. The KIDS survey was less successful in re-interviewing Indian households.

2.3 USE OF CLUSTERED SAMPLE

A two-stage sample design of selecting clusters and then households generates a sample in which sample households are not randomly distributed over space, but are geographically grouped. This arrangement makes it cost effective for the survey team to travel from village to village, spending substantial time in each, instead of having to visit households that are widely dispersed. It also facilitates repeat visits to collect information from respondents who may not have been present at the first visit, to monitor record keeping or to ask supplementary questions about previous responses that editing procedures had marked as suspect (Deaton 1997). The fact that several households are interviewed in each village makes use of village-level information on schools, clinics, prices or agro-climatic conditions that affect crops and livestock. For these reasons, nearly all surveys in developing countries use clustered samples.

2.4 DATA

The data used in this study come from the KwaZulu-Natal Income Dynamics Study (KIDS). The KIDS survey was carried out from March to June of 1998. Households in KwaZulu Natal Province, on the East Coast of South Africa were re-interviewed on a follow-up of an earlier, more broad-based 1993 South African national household survey. This earlier study was called Projects for Statistics on Living Standards and Development (PSLSD) and was conducted under the auspices of the South Africa Labor and Development Research Unit at the University of Cape Town (PSLSD 1994). KIDS was a collaborative work of the International Food Policy Research Institute, the University of

Natal-Durban, the University of Wisconsin-Madison, and the South African Labor and Development Research Unit at the University of Cape Town.

Some 1354 households in 67 communities were interviewed in the applicable portion of the 1993 PSLSD sample. However, after further cleaning, only 1043 observations were used in this study. The main component of this survey was a comprehensive household questionnaire that collected a broad array of information on social and economic conditions of households. Among other things, it included sections on household environment, education, food and non-food expenditures, remittances, employment and income, agricultural activities, health, and anthropometric measurements (weight and heights of children aged eight and under).

The household questionnaire was rigorous and to ensure data quality, survey enumerators were trained for more than two weeks. Training included practice interviewing of non-sample households in the field. There was also separate training for anthropometric data collection. The questionnaire took nearly three hours on average to complete, often requiring repeat visits to avoid respondent fatigue. Community data were obtained from questionnaires completed by interviews with key community leaders. This questionnaire included sections on local economic activities, infrastructure and prices.

Household data were collected with a one time cross-sectional household survey designed to get a snap shot of information on a representative group of households at a given moment in time. Data used in this study were collected on four main areas.

1. Income data were recorded by source, which includes agricultural income wages, non-wage earnings, asset income, non-asset income and remittance.

2. Expenditure data were recorded by type such as for food, housing, regular non-food expense, and occasional non-food and remittance expenses.
3. Household characteristics data were recorded for age, sex and education of each household member.
4. Community/administrative level data were recorded for food prices, wage rates, social amenities (schools, hospitals, banks etc) and access to other services.

The community-level data supplements the cross-sectional household data when the data sets are merged. In this study some of the administrative data came from the 1993 survey which was used by PSLSD as the basis for the 1998 data.

CHAPTER 3

INCOMES, EXPENDITURES CHILD ANTHROPOMETRICS IN RESEARCH HOUSEHOLDS

3.1 INCOME SOURCES

3.1.1 OVERVIEW OF HOUSEHOLD INCOME SOURCES IN RESEARCH AREA

The key sectors of South Africa's economy are mining, finance, insurance and food processing. These generate more than 90 percent of the annual gross domestic product (GDP) estimated in 1997 at US$146 billion.

The major determinant of household spending is income. Individual preferences also influence spending, but without income there is no spending. This study hypothesizes that the source of income (how obtained), its amount, reliability, and perhaps the gender of who heads the household are critical in influencing its expenditure on various types of goods. To measure these differences, this study hypothesizes that household expenditures and child nutritional status (measured by their anthropometric Z-scores) display gender-related patterns.

The KIDS data set records income sources under the following categories: regular wage income from formal employment, casual labor income, agricultural income, self-employment, owner-occupied rental income, remittances, subsidies on food, travel and housing, and other income. These categories fall into two groups: labor incomes, and non-labor incomes. I briefly discuss each of these, starting with labor income.

3.1.2 LABOR INCOMES

Labor incomes were earned in exchange for the provision of household labor. This form of income is reported in four sub-groups (a) regular wage income (b) casual wage income (c) agricultural income and (d) self-employment income.

- Regular wage income is obtained by formal employment as, for example, teachers, nurses, drivers, other government or private workers. This type of employment provides earnings on a regular monthly basis.
- Casual wage income is for work done by household members outside of regular employment or own-farm agricultural employment. It is normally received for jobs done for other people either on their farms, homes or for running errands for them.
- Agricultural income is mainly from own-farm crops and animal produce or sale of live farm-animals.
- Self-employment income is earned by household members engaging in economic activities that earn income. Such employment included owned businesses such as small shops, hawking of merchandize, provision of certain services outside regular jobs such as plumbing, radio repair, etc.

3.1.3 NON-LABOR INCOMES

Non-labor income is reported in three sub-groups: asset income, non-asset income and other non-labor income.

- Asset income is income from households' assets that accrue rent on a regular basis. These assets include rental houses owned by the households but rented out to other

users. The most common asset income in the sample occurred when employers paid housing allowances to workers for living in their own houses[2]. This form of income averaged about 14 percent of total income.

- Non-asset income includes remittances from relatives and friends. It also includes subsidy payments (in cash or in-kind) on housing, transport and food.
- Other non-labor income includes government transfers to households in form of unemployment benefits, medical benefits and other social programs to communities.

3.1.4 SUMMARY OF INCOME SOURCES

Tables A2, A3 and A4 in the Appendix give a summary of income by type and source category. Wage employment is the single largest source of income in KwaZulu-Natal Province. It contributes about 48 percent of the average total income of 2745 Rands[3] per household per month (Table A3). Wage employment is mainly in the service industries such as tourism, insurance and financial institutions. It is followed by the aggregated lump-sum category of other incomes, which average about 16 percent of the earnings. Self-employment is in small businesses such as small trades, shops and hawking. Households earn income from casual labor provided on other people's farms or homes.

Subsidies, which account for only about 2 percent seem to make an insignificant contribution to average household income, but are substantial for those households that receive them. Subsidies are paid on transport, food and housing. Households receive remittances from relatives or family members who live and work away from the

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[2] Owner-occupier payment is made to workers as compensation for house rent if they live in their own houses and if it is company policy.

[3] The Rand is the official currency of the Republic of South Africa

household. Like subsidies, this source of income is significant to families that receive it though it is insignificant on average.

3.2 HOUSEHOLD EXPENDITURE CATEGORIES

This section focuses on a set of eight expenditure categories; food, housing, human capital an aggregate of education, health and household service, leisure, household goods and adult goods. Apart from the food and housing, the rest of the categories are aggregates of many items for which most families report non-zero expenditure. The reason for using aggregates had to do with the relatively large number of goods for which households reported some expenditure. In addition, these other categories were reconstituted from the original groups, which are summarized in Table 2. More details are given in appendix tables A5 and A6.

Food expenditures account for 30 percent of the average total household budget. Food items varied by type and price.

Price information was recorded at the community level but this information was incomplete. Missing data precluded deriving a price variable for use in regression analysis. Hence the effect of local prices and other community variables were captured by community-level dummy variables, generated from research household cluster areas. Unfortunately price effects cannot be isolated from the dummy variable effects.

Housing expenditures were either actual or equivalents for all urban households in the survey. They account for over 20 percent of the budget of the average household. Regular non-food expenses included health/medical, education, household services,

personal items, transport, day care, water, electricity, other energy and other regular non-food. This category accounts for 26 percent of the household budget.

TABLE 2: EXPENDITURE SHARES IN THE INITIAL DATA CATEGORIES[A]

	Mean	Share
Food	648.98	0.30
Rent	454.76	0.21
Regular Non Food	546.81	0.26
Occasional Non-Food	450.25	0.21
Remittances	31.40	0.02
Other	31.83	0.02
TOTAL	2132.40	1.00

Source: Author's compilation. [a]Shares may not add to one due to rounding.

Occasional non-food expenditures included groups of related items that are purchased occasionally or rarely. The category also included leisure expenditures such as books, magazines, clubs and other recreational items plus expenditures on ceremonies such as birthdays, baptism, weddings, circumcision, funerals etc. The final sub-group in this category includes household equipment and semi-durable goods. These include expenditures on linen, furniture, and electrical equipment and farm tools. This group accounted for 21 percent of total expenditure with most households reporting expenditure on them.

Remittance expenditures are made to other households who may be members of the extended family or others in the community. They could also be contributions for community good. Families give cash and in-kind gifts to friends and relatives. This category accounts for 1.5 percent of the household expenditures.

For this study, regular non-food and occasional non-food items have been reorganized into four main categories; human capital goods, leisure, household goods and adult goods (Table 3). Human capital includes education, health and medical

expenditures and household services. Medical expenses include expenses for in-patient treatment, consultation and over the counter drug purchases. Education includes books, tuition and other related expenses. Household services include all domestic services

TABLE 3: EXPENDITURE SHARES OF THE RE-ORGANISED EXPENDITURE GROUPS

	Female-headed households		Male-headed households	
	Mean	Share	Mean	Share
Food	682.84	0.30	558.00	0.34
Housing	502.88	0.22	327.58	0.20
Human Capital	430.04	0.19	296.81	0.18
Leisure	132.06	0.06	75.77	0.05
Household Goods	199.33	0.09	132.57	0.08
Adult Goods	253.60	0.11	186.36	0.11
Other	68.28	0.03	65.65	0.04
TOTAL	2276.00	1.00	1641.18	1.00

Source: Author's Compilation. [a]Shares may not add to one due to rounding.

(except labor around the home) and charges for such items as telephone, electricity, internet and all other expenses related to improving the quality of life in the household. Leisure expenses include ceremonial expenses such as weddings, funerals, traditional and religious observances and recreational expenses such as books (non-educational), magazines, newspaper, and movies. Household goods include furniture, utensils, electronic equipment like radios, TV and VCRs. It also includes automobiles, bicycles and other household assets. These are rarely purchased goods and once bought are not subject, in the short-term, to replacement. Adult goods are difficult to differentiate from other household expenses. But for the purpose of this study, adult goods include expenses made exclusively for the sake of adults in the household. They include alcohol, cigarettes, tobacco, women's cosmetics and beauty products.

Because the proportions of remittances and other expenditures are so small, they are not included in Table 3.

3.3 CHILD ANTHROPOMETRICS IN RESEARCH HOUSEHOLDS

Anthropometric indices are used to indicate children's nutrition status. The three indices most commonly used are Z-scores that measure weight-for-height (WHZ), height-for-age (HAZ) and weight-for-age (WAZ). These scores are respectively used to assess wasting, stunting and under-weight. Although wasting, stunting and under-weight are all forms of malnutrition, wasting is the most discussed in the literature and is the most severe form of malnutrition.

Anthropometric measurements include the collection of height and weight data that permit the computation of growth indicators based on weight-for-height and height-for-age. With cross-sectional data, the use of weight-for-height and height-for-age is now recommended instead of weight for age for nutritional monitoring. This is because weight for age does not distinguish between current (acute wasting) and past (chronic stunting) malnutrition which weight-for-height and height-for-age respectively do distinguish (Mortorell 1982).

Weight-for-height measures acute or current malnutrition as suggested by wasting or "thinness". A low WHZ score is generally associated with failure to gain weight or loss of weight. Height-for-age measures chronic or long-term malnutrition in the form of stunting or retardation in linear growth (Austin 1990). A low HAZ score is associated with chronically poor overall economic conditions (Dean et. al. 1990).

Children's weight-for-height score is a measure of a child's weight compared to a reference weight for a child of the same height. Reference weights for each height are known as NCHS/WHO reference values and are derived from the combination of two distinct data sets, which cover two age groups[4]. The reference values are used to assess and compare individual or population nutritional status (Waterlow et. al. 1977; WHO 1983). Z-scores are the most used of the three methods by which a child or group of children is compared to a reference population. The other two are "percentage of the median" and "percentiles".

In 1978 the World Health Organization (WHO) designated the U.S. National Center for Health Statistics (NCHS) height and weight distributions of healthy American children as the height and weight reference standards of the world. The use of the American standard to determine growth adequacy in children of other ethnic backgrounds is considered acceptable because studies have shown that size variation in young children is more closely tied to socio-economic status than to race or genetics. Hence poverty plays a bigger role in child growth (stature and weight) than does ethnicity (Habicht et. al. 1974; Mortorell 1982; WHO 1983; Mason et al. 1984; Cassidy 1988). Z-Scores are derived as:

$$WHZ = \frac{(W_{ob} - W_m)}{\sigma},$$

where, WHZ is the weight-for-height Z score, W_{ob} is the observed weight of the child,

[4] (1) 2 to 18 years, based on a nation-wide data from US National Center for Health Statistics (NCHS) and (2) birth to 3 years from a more geographically and socially restricted sample from Fils Research Institute.

W_m is the median weight and σ is the standard deviation. Both the median weight and the standard deviation are taken from the normalized growth curves derived from the NCHS/WHO reference values for the given height.

Z-scores describe how far (in standard deviations) a child's weight is from the median weight of a child of the same height in the reference data. Z-scores are more sensitive descriptors than "percentiles" or "percentage of median" and have the advantage of recognizing that the spread of weights may vary according to height. The "percentage of the median" does not do this, so its use may mean that children who are actually malnourished are not identified. Z-scores are more useful than "percentage of the median" descriptors because they can (a) be applied to individuals or populations (b) pin-point any given weight or height, noting improvement or deterioration over time in relation to the reference values, (c) be used to classify children of all ages and sizes, and (d) allow an intermediate assessment of the severity of the nutritional problem in terms of percentage of individuals who fall below the score versus the number who would fall below if nutritional conditions were normal (Austin 1981).

For a reference population, Z-scores have a normal distribution with mean 0 and standard deviation of 1. This means that a WHZ of zero shows that a child has the same weight for height as the reference median. A Z score of range -1 to -1.99 is classified as mild protein-energy malnutrition (PEM). A Z-score in the range of -2 to -2.99 is classified as moderate PEM, while a z-score range of -3 to -3.99 is classified as severe PEM (Dean et al. 1990). These classifications apply to all Z score indices. The usual cuts off points are 80 percent weight-for-height and 90 percent height-for-age. Data is usually

sorted into four categories (normal, stunted but not wasted, wasted but not stunted and wasted and stunted). This classification permits a distinction between chronic and acute malnutrition and is credited to Waterlow (Mason et.al. 1984). Z-scores of less than -2 for the three indicators suggest failure in growth. This may be a symptom of an underlying nutrition or health problem and indicates high-risk environment (UN ACC/SCN 1990).

CHAPTER 4

A REVIEW OF THE LITERATURE

4.1 THE RATIONALE FOR GENDER OF THE HOUSEHOLD HEAD

The depiction of families and households in development theory and research differs from reality in Third World countries. Researchers have idealized families and households with a male head. This notion of a male head has been combined with convenient microeconomic theory assumptions that he is also the single decision-maker in the household and that other household members share his interests and follow his decisions. Past studies have shown neither assumption is true (Mayra and Mehra 1990).

Household members may have interests that contrast with those of the household head. These differences apply not only to resource disposal but also to acquisition. The allocation of work and resources differ by sex and age, as do negotiations among family members over household assets. Cultural and economic differences in spending patterns and responsibilities can be attributed to the gender of the household head. In some societies, distinct and separate male and female economies exist, while in others, resources are pooled (Mayra and Mehra 1990). In parts of West Africa, for instance, men and women have independent sources of income and independent spending responsibilities. In parts of South Asia, households behave more like the unitary model, with one purse and one decision-maker, even though these households often show significant intra-household inequalities in the distribution of resources (Dwyer and Bruce 1988).

Poats et. al. (1988) report that household headship gender affects who gains and who loses with technological change in agriculture. They state that most researchers and extension workers consider households as a homogeneous unit of production and consumption while ignoring the differing household arrangements and interests. For example, extension programs do not always assist women who head farm households.

In rural areas with high rates of male migration to cities, the women who are "left behind" become the *de facto* heads of farm households (whether they are farm owners or not). In most census surveys, household data does not reliably assess the incidence of these households. Estimates of women-headed households in Kenya, for example, vary from 22 to 40 percent in rural areas (Clark 1984). Staudt (1978) found that 40 percent of farms in two areas of western Kenya were female headed.

The distinction between male and female-headed households is important when female-headed households face problems of access to economic resources. Staudt found, for example, that strictly joint-managed farms were 4 times more likely to have a household member trained by an agricultural extension worker and 14 times more likely to have detailed information on farm credit. He observes that, over time, extension service's preference for targeting male over female farmers negatively impacted productivity of females and increased the income gap between the sexes. In a study in Botswana, Kossoudji and Mueller (1983) found that 36 percent of the households in a rural area were female-headed because men had migrated to work in the South African mines. This survey found that female-headed households had generally a lower income owing to the fact that, while they had similar economic burdens as male-headed

households, female-headed households had less access to productive assets such as land, cattle, and labor.

The Botswana study also found that children in female-headed households received more education than in male-headed households (Kossoudji and Mueller 1983). An earlier study done in Botswana by Chernichovsky and Smith (1979) found that this effect persisted even after allowing for differences in income, number of school age children, and household location. In a similar study in Zambia, Kumar (1985) found a significantly higher level of child nutrition given the income level in female-headed households than in jointly-headed and polygamous households. Kennedy and Cogill (1987) reported that children from female-headed households in southwestern Kenya, did significantly better on such long-term measures of nutritional status as height-for-age (HAZ) and weight-for-age (WAZ). In another Kenyan study, Greer and Thorbecke (1986) found that, after controlling for land holdings and household composition, female-headed households allocated a greater proportion of income toward high calorie foods.

The results of these studies agree with the hypothesis that there are gender differences in resource allocation preferences. What this means to policy makers is that there is a rationale for considering the household head's gender in household resource allocation.

4.2 GENDER AND INCOME ALLOCATION IN THE HOUSEHOLD

The unitary household model assumes that household income is pooled prior to consumption decisions. This assumption implies that the income earner does not affect household demand for goods and leisure. However, sociological and anthropological

studies find that incomes are not pooled in this manner and that households adopt other arrangements. For example in some households one person manages all finances and expenditures except for personal spending. In other households each individual has his or her own income and is responsible for certain pre-arranged expenditures (Pahl 1983). In this system, no individual has access to all household funds. The consequence of differential control of income is differential expenditure patterns.

Studies have shown that men spend a higher proportion of their income on goods of a personal consumption nature, whereas women are more likely to purchase goods for children and for general household consumption (Guyer 1980; Hoddinott, Alderman and Haddad 1997). Some of the personal goods men spend money on include alcohol, cigarettes, status consumer goods and "female companionship".

In a study conducted in the Gambia, Von Braun (1988) found that the quantity of cereals produced when women controlled income was positively correlated with calories consumed by households. In other words, female-controlled income is more likely to be allocated for household food production than male-controlled income. Grain cereals are the staple food crops for the Gambia as well as many other parts of the developing world. A similar study in the Philippines found that increased household acquisition and consumption of calories and proteins was associated with increased income shares attributed to women (Garcia 1990). However, this result may be biased because it treats women's income as a regressor, and assumes that labor supply decisions are exogenous, which is likely incorrect. Hoddinott, Alderman and Haddadd (1997) argue that there will

be correlation between the women's income explanatory variable and the error term that incorporates factors influencing labor supply decisions.

The endogeneity of labor income therefore means it is not a good choice for testing the income-pooling hypothesis[5]. The unitary household model may also fail to account for correlations between women's cash income and the acquisition of certain goods that reflects differences in purchasing power. For example, if the woman works as a trader in the food marketplace, the household would save on transaction costs by purchasing food in the market (and the man's income is used in purchasing other goods). It is difficult to distinguish this household from one in which an increase in women's earnings outside the household changes expenditure patterns because in both cases, income increases are associated with differential spending patterns. This result may reflect equity and efficiency considerations in resource allocation of resources (Behrman, Pollak and Taubman 1982).

In analyzing child health status in rural Cote d'Ivore, Hoddinott (1994) found that increases in the women's income is associated with increases in sons' health anthropometric status relative to daughters. Equity considerations take the form of a desire to equalize health outcomes across gender - specifically to compensate boys for their poorer initial health endowment. Efficiency considerations have to do with the perception that sons are a form of old age security and therefore investing in them yields a higher return compared to girls who marry and join other households. The fact that women's income has greater impact on boys' health than men's income and that women

see different gender specific returns to such investments, means that woman weigh equity concerns differently.

A method for testing the pooling hypothesis has been to use gender specific non-labor or non-earned income. Schultz (1990, 601-602) finds that directly testing this assumption using labor income is difficult because of income endogeneity. However, if non-labor income is independent of labor choices, then non-labor income of different family members may affect the household allocation of resources differently. If non-earned income (or ownership of the underlying asset) influences family demand behavior differently depending on who in the family controls the income (or owns the asset), then preferences must differ across individuals and families can not be assumed to completely pool non-earned income. Thomas (1990) claims that test results for the differences in preferences are robust whether we use non-labor income as an aggregate or use only asset income. According to his study in Brazil, both forms of income in the hands of women are associated with larger increases in the household budget shares devoted to human capital and leisure than income in the hands of men.

4.3 TESTING GENDER DIFFERENCES IN HOUSEHOLD EXPENDITURE

Different expenditure allocations across household members are consistent with both the unitary and collective models. The empirical challenge lies in testing whether such differences are consistent with either the unitary or the collective model of household. If the unitary model does not hold, then policy makers have an additional task of not only

[5] This hypothesis assumes that household income is put in one purse and is controlled by the household head.

availing resources for socially desirable programs but also targeting these allocations by gender if intended welfare outcomes are to be realized.

Given a set of instruments, it is possible to determine whether the distribution of total income within the household affects demand and investment patterns. The equality of the impact on expenditures of (instrumented) total income in the hands of different individuals will be tested. The problem lies in measurement of resources under an individual's control. If, in the survey, the reported assignment of income to an individual within the family is random (or if everything is perceived as being de facto jointly owned) then the equality of income effects should not be rejected. Consequently, the traditional economic model of common preferences is the appropriate empirical model (Thomas 1997).

The arguments likely to be encountered in this regard are that different income effects may simply reflect differences in measurement error. Also, non-labor income may be treated as predetermined because it results from past labor supply behavior. In a dynamic framework, non-labor income is appropriately treated as endogenous but not in the static case. These concerns are addressed in three ways. First, we can undertake an experiment using only asset income, which is mostly unrelated to recent labor supply choices. We can also undertake the same experiment with the rest of non-labor income.

The second experiment is to test whether differences in income effects reflect heterogeneity in the composition of non-labor income. In other words, this test indicates whether the demand effect of asset income is equal to the demand effects of non-asset income. Because it is unlikely that asset and non-asset income will share the same

measurement error, it is expected that such error would result in rejection of this equality. Non-labor income is preferred to total income as the argument because non-labor income is not affected by labor supply decisions (Maluccio and Quisumbing 2000).

To address our second objective, a third set of experiments focuses on child anthropometric outcomes and compares the impact of maternal and paternal household headship on child height and weight. The typical assumption in this experiment is that if income in male-headed households has greater effects on sons than on his daughters, then it can be concluded that fathers prefer sons to daughters. But mothers may also prefer sons to daughters. If this is the case then the results are consistent with both the more general collective model and the common preference model. However, if income affects the health of daughters more than that of sons in female-headed households then the evidence indicates that preference of mothers and fathers do differ and that the control over resources within the household or bargaining power differences affect allocation decisions. In this case the common preference model would be rejected.

We can find the difference between the effects of income on sons relative to daughters in male-headed households on the one hand and the difference between the effects of income on sons relative to daughters in female-headed households on the other hand. We can then find a difference-difference estimator that is robust to measurement error and also to general forms of unobserved heterogeneity. For each headship gender, measurement error in income is common across all children, so it will have the same impact on sons and daughters. This means that we can calculate unbiased estimates of the differential effects of income on sons relative to daughters. However it must be

remembered that it is the difference between mothers and fathers in the differential income effects that is of interest. This same argument can be used for other sources of unobserved heterogeneity, such as tastes for work, as long as they are not correlated with the gender of the child. By this argument we rule out women choosing to work because they have a son rather than a daughter.

From the above, we can observe that all household models have certain limitations. For example, wage income is an inappropriate variable to testing models of intra-household allocations, since that income reflects household choices about non-market activities as well as the allocation of leisure within the household. Thus non-labor income is used as an exogenous measure of resource control. Asset income is not assignable, hence it is difficult to assign asset ownership to one individual. Also, consumption of many goods of interest to policy makers, such as child health cannot be unambiguously assigned to one household member.

4.2 MODEL

To model household allocation patterns I have used a welfare function similar to the Bergson-Samuelson model (Bergson1938). Household welfare W, in any period is represented as

$$W = W\left[\ U_1(\mathrm{X}, \lambda, \mu, \omega), \ldots U_M(\mathrm{X}, \lambda, \mu, \omega)\ \right] \tag{4.1}$$

where U_m is the utility of each household member, m(m=1,....,M), and depends on the consumption of X_{im}(i=1,...,G) goods, as well as the consumption of leisure, $\lambda=(\lambda_1,...\lambda_M)$ by each household member. The model includes a set of observed individual and household specific characteristics, μ, which may affect tastes and therefore utility

$U_m(X, \lambda, \mu, \omega)$, and ω which captures the unobserved community heterogeneity. But how do the household members reconcile their different preferences to arrive at their consumption decisions? Haddad, Hoddinott and Alderman (1997) discuss how decisions are made given this collective framework. They state the following:

"Concerns over the theoretical underpinnings of the unitary model have given impetus to a number of approaches that focus on the individuality of household members and explicitly address the question of how individual preferences lead to a collective choice" (Haddad, Hoddinott and Alderman 1997).

Modelling household decision making under the collective approach to household resource allocation has been subdivided into two broad categories; (1) the household cooperative bargaining model, in which individuals bargain amongst themselves in order to arrive at a production or consumption decision and, (2) the household non-cooperative bargaining models, in which members make decisions autonomously, taking into account other members' behaviors.

The difference between the cooperative and the non-cooperative bargaining models is that the later does not assume that members necessarily enter into binding and enforceable contracts with each other. Whilst both approaches can assume individuals have a utility function that includes goods that are exclusively consumed and those that are consumed in common, the co-operative model assumes income is pooled while the non co-operative model does not (Haddad, Hoddinott and Alderman 1997).

Marjorie McElroy (1997) extends the bargaining concept under the cooperative model by imposing more structure on the household demand function. She assumes a

household made up of two married individuals. Their cooporation depends not only on their personal utility based on consumption of common household goods, exclusive individual goods, and leisure, but also on their levels of personal utility if they were to get a divorce. This level of utility would reflect their individual endowments including non-earned income, and other "extra-household environmental parameters" (EEPs) – factors that shift individuals' threat points (McElroy 1997). Thus the cooperative bargaining models comprise two forms of income, (1) the earned (labor) income and (2) the non-earned income. The later form of income influences the "fall back position", which determines the individual's threat point[6]. The welfare function (4.1) is maximized subject to a pooled household budget constraint given by,

$$p\mathrm{X} = \sum_{i=1}^{M} \left[w_i (T - \lambda_i) + y_i \right] \tag{4.2}$$

where the vector p is the set of prices of all goods in X, and all household members are assumed to face fixed commodity prices. The opportunity cost of time for each household member is w_i, so that that individual's total income consists of earned income, $w_i(T - \lambda_i)$, and non-labor income, y_i Household income is the sum of the incomes of each household member.

In the non co-operative model, members do not necessarily enter into binding and enforceable contracts with each other (Carter and Kartz 1997). The distinct difference from the co-operative model is that income is not pooled. In this case, members have

[6] The individual's threat point refers to the maximum level of hardship, abuse or other threatening situations imposed by one's spouse beyond which the marriage breaks.

separate income controls such that their individual budget constraints are different and can be represented by the following functional forms,

$$p_f \mathrm{X}_f = w_f (T - \lambda_f) + y_f$$

for the wife (i = f) and,

$$p_m \mathrm{X}_m = w_m (T - \lambda_m) + y_m$$

for the husband (i = m). The Marshallian demand functions for the j^{th} commodity can be represented by,

$$\mathrm{X}_j = g(p, w_f, w_m, y_f, ..., y_m, \mu, \omega) \tag{4.3}$$

Under the assumptions of this collective household decision making, the commodity consumption, health and nutrition depend on all prices (p), wages (w), household characteristics (μ), *individual* non-labor income $(y_1, ..., y_m)$, and unobserved community heterogeneity (ω).

In contrast to this collective model, the traditional household economic model assumes either that all members have common preferences (U_m is identical for i=1,2,...,M in (4.1)), or that one member dictates all allocation decisions (the aggregator function, $w(.)$, assigns a zero weight to all but the dictator's utility function). Under these assumptions the demand functions (4.3) depend not on individual non-labor incomes but on their sum:

$$\mathrm{X}_i = g\left(p, w, \sum_1^M y_m, \mu, \omega \right) \tag{4.4}$$

If all members are altruistic (Manser and Brown 1980), household demand will also depend on total household non-labor income. Therefore altruism, common preference, and dictatorial models are observationally equivalent, in terms of their specification of the impact of individual income on household commodity demand.

Under the assumptions of the traditional household economic model, household members are treated as if they pool their incomes, so that the distribution of resources within the household has no impact on their allocation (Thomas 1997). This means that observed consumption and investment patterns are unaffected by the gender of the source of income. This prediction is key to the common preference model, and is not shared by the more general models that permit heterogeneity in the preferences of household members. Common preferences are tested by determining whether non-labor income attributed to a man has the same impact on demands as non-labor income attributed to a woman as head of the household.

Non-labor income represents a small fraction of total resources available to a household and is unlikely to be measured without error. In addition, the intuition of a bargaining framework (McElroy 1992), which suggests that the bargaining power depends on the resources that one would control if the household were to break up, implies that non-labor income is an error ridden proxy for control over those resources.

To examine the demand impact of each individual's total income Y_m, the demand functions are represented thus,

$$X_i = \gamma\left(p, Y_f, \ldots, Y_m, \mu, \omega\right) \tag{4.5}$$

where,

$$Y_i = w_i(T - \lambda_i) + y_i \tag{4.6}$$

Because each household member's utility depends on consumption of leisure, and perhaps the utility of other members, it will be inappropriate to assume that labor supply ($T-\lambda_i$) is exogenous and thus treat total income as predetermined. Intuitively, household members are likely to negotiate over the allocation of resources to goods, X, and leisure, λ, simultaneously.

The maintained assumption is that current non-labor income is exogenous, that is, that it is unaffected by current choices and therefore it is a valid instrument for total income. This is a strong assumption and therefore the results of experiments with alternative identification for assumptions will also be discussed.

CHAPTER 5

EMPIRICAL MODEL ESTIMATION AND ANALYSIS

5.1 MULTIPLE REGRESSION ANALYSIS

Multiple regression analysis enables us to understand the relationship among several factors (independent variables) and a dependent variable. This study uses several dependent variables; commodity expenditure shares, and child anthropometrics. A functional statement, in the form of a model, is represented by a regression equation. The regression equation measures the simultaneous effects of the independent variables while also determining their individual importance vis-à-vis the dependent variable. The F-statistics give an indication of how well the regression fits the data, while the t-statistic gives the significance of each independent variable in the equation. R-squared indicates the proportion of variation in the dependent variable explained by variation in the independent variables included in the regression equation (Burk and Pao 1980). Before undertaking the estimation and analysis processes, some empirical tests had to be performed on the data.

5.2 EMPIRICAL TESTS

5.2.1 ENDOGENEITY TEST

Ordinary Least Squares (OLS) procedure was used to analyze the effect of non-labor income on the dependent variables. This is because non-labor income is assumed to be exogenous. Parameter estimates obtained from OLS are unbiased if no endogeneity

problems are detected. In case of endogeneity of explanatory variables, the two-stage least squares (2-SLS) method would be used to evaluate total income effects (Thomas 1997). The Wu-Hausman test is used to test for endogeneity of an explanatory variable. The test compares parameter estimates from OLS and 2-SLS. If the OLS and 2-SLS results are not significantly different, then we fail to reject the null hypothesis and conclude endogeneity is not a problem so the OLS estimates are unbiased. A rejection of the null hypothesis means that OLS coefficient estimates are biased due to endogeneity. Hence we use 2-SLS estimates which are consistent.

The procedure for the Wu-Hausman test is as follows. The null hypothesis is that b=B, where B is the more consistent estimates obtained from the 2-SLS but less efficient than b, the regression coefficient estimates obtained from OLS (Johnston and DiNardo 1997). A chi-square value is obtained such that,

$$\chi^2(df) = (b - B)'[V(B) - V(b)]^{-1}(b - B)$$

where, V(B) is the variance of B and V(b) is the variance of b.

5.2.2 RELEVANCE TEST

This test is performed to identify the best combination of instrumental variables for the endogeneity test. The procedure for this test is: first, the regression model is run with all variables including all instruments for total income; these are assumed to be all the household assets. An F-statistic is obtained for the test of all the instruments. Next, the regression is run with the instrument set progressively reduced, then tested again. Different combinations of the instruments are similarly tested. The best list of

instruments is one that gives the highest F-statistic. Before we proceed with the test, a discussion of the variables follows.

5.3 DEPENDENT AND INDEPENDENT VARIABLES

Research has revealed that a number of factors determine household utility as measured by food consumption and nutritional status. These factors include education, other household characteristics, and community attributes (Calendos 1979; Monke and Fox 1993, Von Braun et. el. 1992). Furthermore, the person who controls the income influences spending patterns. It is hypothesized that the relationship between women's income and the nutritional status of the children, is positive and greater than the relationship between men's income and the nutritional status of the children.

In order to address this hypothesis, this study examines the relationships between income, gender of household head and expenditure shares on household goods and nutritional status of the children. As discussed in the previous chapter, the relationship between expenditure patterns and gender of the household head, can be conceptualized as follows: household commodity expenditure shares and child nutritional status are dependent on income and other household and community factors. The independent variables fall into the following categories (a) household income, (b) household head characteristics (gender, age, and education), household size, race and (d) community characteristics (e.g. price of commodities, access to social amenities, location (sector) of household, etc).

Variable selection was both a procedural as well as a theoretical process. The literature gives the general nature of factors that determine household outcomes. Hence,

the most important categories of variables were income, household characteristics and community factors that influence household expenditure behavior.

5.3.1 DEPENDENT VARIABLES

Dependent variables are discussed in two subgroups: household commodity expenditure shares and child nutritional status.

5.3.1.1 COMMODITY EXPENDITURE SHARES

Commodity demand and consumption as discussed in Chapter 3 are reflected by household expenditure patterns. This study focuses on the differential effects on demand and consumption of male versus female household heads. The demand effects are proxied by expenditure shares for aggregate and sub-aggregate goods for which most of the households report non-zero expenditure. Aggregates are used because of the relatively large number of goods for which households report purchases. Besides, KIDS reports expenditures for variable recall periods, ranging from a week, for commonly consumed foods, to a year, for infrequently purchased goods such as durables and semi-durables. All expenditure values were converted to per capita levels. The expenditure aggregates are

- FOOD = Share of total monthly expenditure on food by research households.
- HOUSING = Share of total monthly expenditure on housing by the research households.
- Human Capital Variables

  EDUCATION = Share of total monthly spending on education.

  HEALTH = Share of total monthly spending on medical and health related services.

HSERVICE = Share of total monthly expenditure on household services including transport, day care, water, electricity, clothing, insurance.

- HGOODS= Share of total monthly spending on household goods including furniture, vehicles, utensils, electronics, etc.
- LEISURE= Share of total monthly expenditure on leisure goods including recreational (newspapers, magazines, books, movies, etc.) ceremonial (burial, wedding/marriage, circumcision) and remittances.
- ADULT= Share of total monthly spending on goods of adult nature such as cigarettes, alcohol, drugs, cosmetics, hair-dos, etc.

A summary of these variables is given in Table 4.

TABLE 4: DEPENDENT VARIABLES AND DESCRIPTIVE STATISTICS

Commodity Variables	Share	Mean	Standard Deviation
FOOD	0.29	738.84	456.12
HOUSE	0.26	662.71	1106.86
HCAPITAL	0.22	568.22	542.55
EDUC	0.04	111.51	241.92
HEALTH	0.06	157.63	344.16
HHSERV	0.12	299.08	405.41
LEISURE	0.06	145.41	418.53
HHGOODS	0.09	236.18	417.33
ADULT	0.08	211.61	215.96
TOTAL	1.00	2581	2545.09

Author's compilation, N=1043.

5.3.1.2 CHILD ANTHROPOMETRIC Z-SCORES

Three nutritional status Z-scores reflected the nutritional status of children in the research households. These were:

- HAZ= Mean child height-for-age Z-score in 1998
- WAZ= Mean child weight-for-age Z-score in 1998
- WHZ= Mean child weight-for- height Z-score in 1998.

A summary of these variables is given in Table 5. Chapter 3 discussed commodity expenditures and child nutritional status Z-scores in greater detail.

TABLE 5: DEPENDENT VARIABLES AND DESCRIPTIVE STATISTICS (CHILD ANTHROPOMETRICS)

Anthropometric Variables	Mean	Standard Deviation
HAZ	-0.94949	2.25546
WHZ	1.51212	3.11426
WAZ	-0.15107	1.52543

5.3.2 INDEPENDENT VARIABLES

Independent variables are grouped as (a) income (b) household characteristics (gender, education, and age of household head, household size, race of household) and (c) community characteristics (commodity price, wage rate, access to social amenities). However, because of insufficient data, community characteristics were represented by dummies for cluster areas.

5.3.2.1 INCOME

Income variables are household total income and household non-labor income. Total income consists of labor and non-labor income, each of which is discussed below. Values are per capita.

5.3.2.1.1 LABOR INCOME

This is income arising from remuneration for one's labor services provided, and was computed as a sum of the following incomes.

- HHYCAS = All casual labor income (income earned but not on a regular wage basis).
- HHYREG = All regular wage income plus bonuses.
- HHYAGR = All income from agricultural related labor.
- HHYSEMP = All income from labor of a self-employment nature.

5.3.2.1.2 NON-LABOR INCOME

This is income obtained from sources other than those for which labor service was provided. It includes:

- HHYNLAB = All household income from non-labor sources, divided into "private" or capital sources and state/government transfers.
- HHYHOUS = Imputed rental income derived from owner occupied housing.
- HHYTRAV =Transport subsidies.
- HHYEAT= Food subsidies.
- HHYREM = Remittance income in cash and in-kind.
- HHYOTHR = Other non-labor income.

5.3.2.2 HOUSEHOLD CHARACTERISTICS

Household characteristics refer to attributes particular to each household. These variables include

- GENDER = Gender of household head (1= male, 0=female).
- HEDUC = Education of the household head.

- AGEH = Age of household head.
- HHSIZE= Size of household.
- RACE= Race of household (1= African, 0= Indian).
- CGENDER = Gender of the child.
- AGEYR= Age of the child.

To obtain the per capita non-labor income under the control of male household heads, GENDER would be multiplied by household non-labor income. Similarly, to obtain female controlled non-labor income, household non-labor income would be multiplied by (1-GENDER). The same procedure would be used to obtain household total income controlled by each gender.

5.3.2.3 COMMUNITY CHARACTERISTICS

Community characteristics include variables that are common to everyone in a community such as wage rates, commodity prices and access to various community services like schools, commodity markets, social and financial services. For example access to farm credit is a social as well as financial service that is assumed equally available to all individuals and households in the community. Access affects production and income of all community members equally. The degree of access was not used due to insufficient data. Dummies for household clusters were generated and used instead.

Table 6 gives the summary statistics of the independent variables that were used in the regression analysis.

The impact of non-labor income on household budget shares was evaluated for both male and female heads of households. A comparative estimate using total household

incomes (treated as endogenous) was done. Both OLS and 2SLS methods are used in order to control for presence of measurement errors. The 2SLS method yields consistent parameter estimates in case of endogenous explanatory variables (Pitt, 1997).

TABLE 6: INDEPENDENT VARIABLES AND DESCRIPTIVE STATISTICS (N=1043-1850)

	Mean	Standard Deviation
Continuous Variables		
PCNLI	83.55	177.79
AGEH	54.75	13.98
HEDUC	4.04	3.666
HHSIZE	7.23	4.39
GENDER	0.6183	0.4858
AGE	53.61	14.00
CGENDER	0.4962	0.5001
AGEYR	6.07	3.105

Source: Author's compilation.

For both estimation techniques, the income effects on expenditures are estimated based on a model that includes the income of the household. The regression model for the household commodity shares is

$$w_j^i = \alpha + \beta_{1j} GENDER(m=1) + \beta_{2j} PCNLI + \beta_{3j} PCNLISQ + \beta_{4j} PCNLIGDR$$
$$+ \beta_{5j} PCNLIGDRSQ + \beta_{6j} HHSIZE + \beta_{7j} HHSIZESQ + \beta_{8j} AGEH \qquad (5.1)$$
$$+ \beta_{9j} HEDUC + \beta_{10j} RACE + \beta_{11j} CLUSTNUM_1 +,...,+\beta_{73j} CLUSTNUM_{63} + u_j$$

where, w_j^i is the expenditure share of the i^{th} good in the j^{th} household.

GENDER = gender of household head

PCNLI = per capita household non-labor income

PCNLISQ = per capita household non-labor income squared

PCNLIGDRSQ = cross product of non-labor income and gender squared

HHSIZE= household size

HHSIZESQ = household size squared

AGEH= age of household head

HEDUC = number of years of education for the household head

RACE= race of household

$CLUSTNUM_i$ = dummies for the research household cluster numbers

All income measures were expressed at per capita levels.

The regression model for the children anthropometric Z-score equations differs due to the inclusion of the cross products of gender with all other variables and the inclusion of age and gender of the child.

$$Z_j^i = \alpha + \beta_{1j} GENDER(m=1) + \beta_{2j} PCNLI + \beta_{3j} GENDER * PCNLI$$

$$+ \beta_{4j} HHSIZE + \beta_{5j} AGEH + \beta_{6j} HEDUC + \beta_{7j} RACE$$

$$+ \beta_{8j} CGENDER + \beta_{9J} AGEYR + \beta_{10j} GENDER * HHSIZE + \beta_{11j} GENDER * AGEH \qquad (5.2)$$

$$+ \beta_{12j} GENDER * HEDUC + \beta_{13j} GENDER * RACE$$

$$+ \beta_{14j} CLUSTNUM_1 +,...,+ \beta_{77j} CLUSTNUM_{63} + u_j$$

where, Z_j^i is the anthropometric Z score of the i^{th} child in the j^{th} household,

CGENDER = Gender of the child and

AGEYR= Age of the child.

Marginal effects of non-labor income on the anthropometric Z scores are derived as partial derivatives of the expenditure shares and the Z scores with respect to income given households head gender. Thus, the income effect on the household expenditure shares given from (5.1) is

$$\partial\omega^i_j/\partial PCNLI=\beta_{2j}+2\beta_{3j}PCNLI+\beta_4 GENDER+2\beta_5 PCNLI*GENDER \quad (5.3)$$

For a female-headed household (GENDER=0), the effect is

$$\beta_{2j}+2\beta_{3j}PCNLI$$

while for a male headed household (GENDER=1), this effect is

$$\beta_{2j}+2\beta_{4j}+2(\beta_{3j}+\beta_{5j})PCNLI$$

From (5.2) the non-labor income effect on Z^i_j is

$$\beta_2+\beta_3 GENDER.$$

The empirical results are discussed next.

CHAPTER 6

EMPIRICAL RESULTS

The model developed in the previous chapter allows an assessment of the differential impact of income on expenditures by male versus female-headed households. The motivation for this analysis is the hypothesis that the gender of the household head affects the household's demand and expenditure patterns. The first set of results focuses on expenditure shares allocated to various commodities while the second set assesses the impact of parental income on child nutritional status. Because the empirical specifications and levels of aggregation differ between the two analyses, they are discussed separately. And because the focus of the study is on income, income effects are emphasized. Bear in mind that the regressions included other regressors and controls as postulated. Before we look at the results, a statistical summary of the data and empirical tests conducted are presented.

6.1 SAMPLE SUMMARY STATISTICS

Survey data were analyzed at the household and individual levels. Household data include 1043 observations on household characteristics, income and expenditure allocations.

Table A1 in the Appendix summarizes some of the characteristics of the households in the data set. Female-headed households have an average of 7.8 members while male-headed households have 5.9 members. The average age for female household

heads is 57 years while the average for male household heads is approximately 51 years. The average age of children is about the same in both types of households. It is 6.1 and 6.0 for female-headed and male-headed households respectively. Female household heads who had some education have an average of 5.2 years of schooling while their male counterparts have an average 6.8 years.

From this table we can observe that male household heads are generally younger, more educated and have fewer household members than their female counterparts. However, the average age of children raised under the headship of either gender of parents is not significantly different.

A summary of income sources is given in the Appendix, Tables A2, A3 and A4, and a summary of expenditure allocations is given in the Appendix, Tables A5 and A6. Anthropometric data collected on individual children in the research households were used together with income data to evaluate the impact of parental income on child nutritional status. 1875 observations were contained in this data set. After removing those observations that were suspected to have errors, the new data set remained with 1672 observations. Appendix Tables A7 and A8 summarizes these data. A more detailed discussion of the data was given in Chapter 3.

6.2 RESULTS FROM THE EMPIRICAL TESTS

The Wu-Hausman test for the endogeneity of total income failed to reject the null hypothesis of no endogeneity for both the child anthropometric measures HAZ, WHZ and WAZ, and the household commodity expenditure shares. This implies that the OLS estimates are unbiased and efficient.

However, the highest F-statistic obtained for the relevance test was 1.52 with a P-value of 0.2081. The failure to show any significance for any household assets means none of the assets was truly relevant as an instrument for total income. . Therefore total income cannot be used in this analysis as an endogenous variable. In light of the Hoddinott, Alderman and Haddad's (1997) argument that total income should not be considered as an explanatory variable due to its influence on/by labor supply decisions, we cannot use it as an explanatory variable.

6.3 RESULTS FROM THE MULTIPLE REGRESSION ANALYSIS

This section presents the main analysis of the study. Results are presented under two general headings: household commodity expenditure shares and individual child nutritional status. As an extension of this last heading, I discuss the effects of race on individual child nutritional outcomes.

6.3.1 COMMODITY EXPENDITURE SHARES

The OLS results of regressing non-labor income and household head gender on commodity expenditure shares are presented. The marginal expenditure shares are summarized by household head gender in Table 8, while Table 7 shows the full regression results. Table 8 was obtained from Table 7 by taking the marginal effects of non-labor income given the respective gender of the head of household. The derivation for marginal effects of income given the gender of the household head is given in the last part of Chapter 5.

To obtain the marginal effects of non-labor income on food (Table 8), for example, in a female-headed household, we added the coefficients for PCNLI (β_1) and 2 times that for PCNLISQ (β_2) (Table 7) multiplied by PCNLI. The marginal effect of non-labor income given a male-headed household is given by the partial effects of the variables PCNLI, PCNLISQ, PCNLIGDR (the cross product of gender and income) and its square, PCNLIGDRSQ (Table 7). The marginal effect of non-labor income on food in a male-headed household is therefore obtained by adding the coefficients on PCNLI, 2 times that of PCNLISQ multiplied by PCNLI, the coefficient on PCNLIGDR multiplied by G(=1) and 2 times the coefficient of PCNLIGDRSQ multiplied by PCNLI and G. Marginal effects of non-labor income on the rest of the expenditure shares were obtained in the same way.

The linear functional form that combines both the quadratic and the cross-product between gender and non-labor income was used. Logarithmic, linear-cross products and polynomial forms did not yield better results.

The results in Table 8 show that more non-labor income in female-headed households increases the budget shares spent on housing, education, health and leisure, and decreases budget shares spent on food, household services, household goods and adult goods. Increasing non-labor income in male-headed households increases budget shares spent on housing, education, health and leisure.

TABLE 7: PARTIAL EFFECTS OF ALL VARIABLES ON HOUSEHOLD EXPENDITURE SHARES[A,B,C]

Independent Variables	----------Dependent Variables----------			
	FOOD	HOUSING	EDUCATION	HEALTH
PCNLI	-0.1855***	0.2578***	0.0123	0.0194*
	(-5.47)	(-7.11)	(-0.91)	(-1.65)
PCNLISQ	0.0000162***	-0.0000226***	-8.55E-07	-1.91E-06*
	(-4.89)	(-6.40)	(-0.65)	(-1.67)
GENDER	-23.7626**	3.5558	-1.901	6.579*
	(-2.34)	(-0.33)	(-0.47)	(-1.88)
PCNLIGDR	0.0593*	-0.1183***	-0.00972	-0.00808
	(-1.62)	(-3.03)	(-0.67)	(-0.67)
PCNLIGDRSQ	-0.0000577*	0.0000109**	8.61E-09	8.82E-07
	(-1.54)	(2.72)	(-0.01)	(-0.71)
HHSIZEP	-7.8102***	5.7629*	5.283***	0.3757
	(-2.58)	(1.78)	(4.39)	(-0.35)
HHSIZEPSQ	0.2474**	-0.1978*	-0.1569***	-0.0107
	(-2.00)	(-1.49)	(-3.19)	(-0.25)
AGEH	-0.6269*	-0.3107	-0.0578	0.191*
	(-1.78)	(-0.82)	(-0.41)	(1.57)
HEDUC	-7.5851***	1.4975	1.3027**	1.1811**
	(-6.36)	(1.17)	(2.75)	(2.86)
DRACE	-59.2308	50.2111	-57.0011	85.496*
	(-0.44)	(0.35)	(-1.07)	(1.85)
CONSTANT	633.5036***	54.4373	60.5862	-94.064*
	(4.4)	(0.35)	(1.06)	(-1.89)
F-Statistic	10.14	6.69	2.09	4.46
R-Square	0.4337	0.3359	0.1363	0.2519

TABLE 7 (CONT.): PARTIAL EFFECTS OF ALL VARIABLES ON HOUSEHOLD EXPENDITURE SHARES[A,B,C,D]

Independent Variables	----------Dependent Variables----------			
	HOUSEHOLD SERVICE	LEISURE	HOUSEHOLD GOODS	ADULT GOODS
PCNLI	-0.1006***	0.024	-0.00396	-0.0408**
	(-4.12)	(0.97)	(-0.19)	(-2.21)
PCNLISQ	0.0000104***	-2.63E-06	2.33E-07	0.00000294*
	(4.39)	(-1.09)	(0.12)	(1.64)
GENDER	-5.767	-8.2781	3.9457	7.8893*
	(-0.79)	(-1.11)	(0.65)	(1.43)
PCNLIGDR	0.0817***	0.00711	0.0132	-0.00207
	(3.1)	(0.27)	(0.6)	(-0.10)
PCNLIGDRSQ	-9.06E-06***	1.12E-07	-1.17E-06	0.00000188
	(-3.43)	(0.04)	(-0.52)	(0.92)
HHSIZEP	-8.6325***	-1.2186	5.5648***	-1.1032
	(-3.96)	(-0.55)	(3.07)	(-0.67)
HHSIZEPSQ	0.2875**	0.044	-0.1623**	0.0166
	(3.23)	(0.48)	(-2.19)	(0.25)
AGEH	-0.399*	0.1048	0.0506	0.3202*
	(-1.57)	(0.41)	(0.24)	(1.67)
HEDUC	-2.0698**	2.0025**	1.9874**	0.0186
	(-2.41)	(2.29)	(2.78)	(0.03)
RACE	-180.0516*	171.8898*	-76.6191	-43.3424
	(-1.87)	(1.75)	(-0.95)	(-0.60)
CONSTANT	450.8957***	-178.2372*	706.709	166.9781**
	(4.36)	(-1.69)	(0.82)	(2.14)
F-Statistic	3.36	1.4	1.7	2.11
R-Square	0.2024	0.0954	0.1141	0.1374

[A]Values in parentheses are t-statistics. [B]Cluster area dummies were internally computed but were too many to include in the table. [C]Effects are multiplied by 1000 and F (72, 953).

TABLE 8: MARGINAL EFFECTS OF HOUSEHOLD INCOME ON EXPENDITURE SHARES[A, B, C,D] WITH RESPECT TO GENDER OF HEAD.

Expenditure Category	Non-Labor Income Ordinary Least Squares (OLS)			Gender Significance
	Female	Male	Difference	F-Value
Food	-0.17975*** (-5.47)	-0.14092*** (-4.81)	0.03883* (1.62)	5.47***
House	0.24978*** (7.11)	0.13535*** (4.97)	0.11443*** (3.02)	0.1
Human Capital	-0.06617** (-2.75)	-0.00517 (-0.27)	-0.06100** (-2.36)	0.14
Education	0.01200 (0.91)	0.00228 (0.245)	0.00972 (0.67)	0.22
Health	0.01872* (1.65)	0.01096 (1.25)	0.00777 (0.64)	3.52***
Household Service	-0.09691*** (-4.12)	-0.01842 (-1.00)	-0.07849*** (-3.10)	0.61
Leisure	0.02307 (0.96)	0.03022* (1.62)	-0.00715 (-0.26)	1.24
Household Goods	-0.00388 (-0.2)	0.00891 (0.59)	-0.01278 (-0.6)	0.42
Adult Goods	-0.03976** (-2.21)	-0.04116*** (-3.0)	0.0014 (0.1)	2.05***

[A]Effects are multiplied by 1000. [B]T-values are in parentheses below the income effects and their differences. T-values under the differnce column have been computed from the F-values for the equality of effects by gender. [C]Significance levels are *=0.1, **=0.05 and ***=0.01. [D]F (72, 953).

But increasing non-labor income in male-headed households is also associated with decreases in budget shares spent on food, household service and adult goods. The income effect on food is negative for both the female and male-headed households alike though the effects are significantly greater for female-headed households than male-headed

households. The difference between the genders is significant at 0.1 level. The decline in food spending is clearly in conformity with Engel's Law[7].

The effects on housing expenditure are both positive, significant and the income effects for female-headed households are double that of male-headed households. The difference between the genders is significant at 0.01 level. Education, health and household services expenditures are regarded as investments in human capital and they are directed mostly toward children. In this category, increasing non-labor income in female-headed households is associated with increased budget shares spent on both education and health but a decrease in budget share spent on the household service expenditure sub-category. On the other hand, a similar increase in non-labor income to male-headed households is associated with increased budget shares spent on all the three human capital sub-categories (education, health and household service). In this category, the difference between the genders is significant at 0.05 level but for the sub-categories, only household service is significantly different between the genders.

For the leisure category, the effects are positive but not significantly different in magnitude. There is no significant difference between the genders for either household goods or adult goods. In general, this set of results shows that differences between the male and female-headed household heads exist in their marginal budget shares spent on food, housing and household services. The rest of household expenditures do not differ at usual significance levels. While other factors may influence spending behavior, we can say that given non-labor income, gender of the household head certainly influences

[7] According to Fredrick Engels (1820-1895), the share of spending on food goes down as incomes increase.

spending patterns. These results show some clear evidence for gender difference in household expenditure patterns in KwaZulu- Natal Province. However, because we can not see clear differences among the rest of the household commodities we hold this view only with caution. To help determine whether gender has an effect on expenditure shares, I tested for effect of gender alone on expenditure shares. As indicated in the last column of Table 8, F-values were obtained to indicate levels of significance from the null hypothesis that gender is not important in determining household expenditure patterns. The results show that gender is important in influencing household expenditure shares on food, health and adult goods. The rest of the budget shares were not significant at usual levels. The next section of the analysis will further analyze these results.

6.3.2 CHILD NUTRITIONAL STATUS

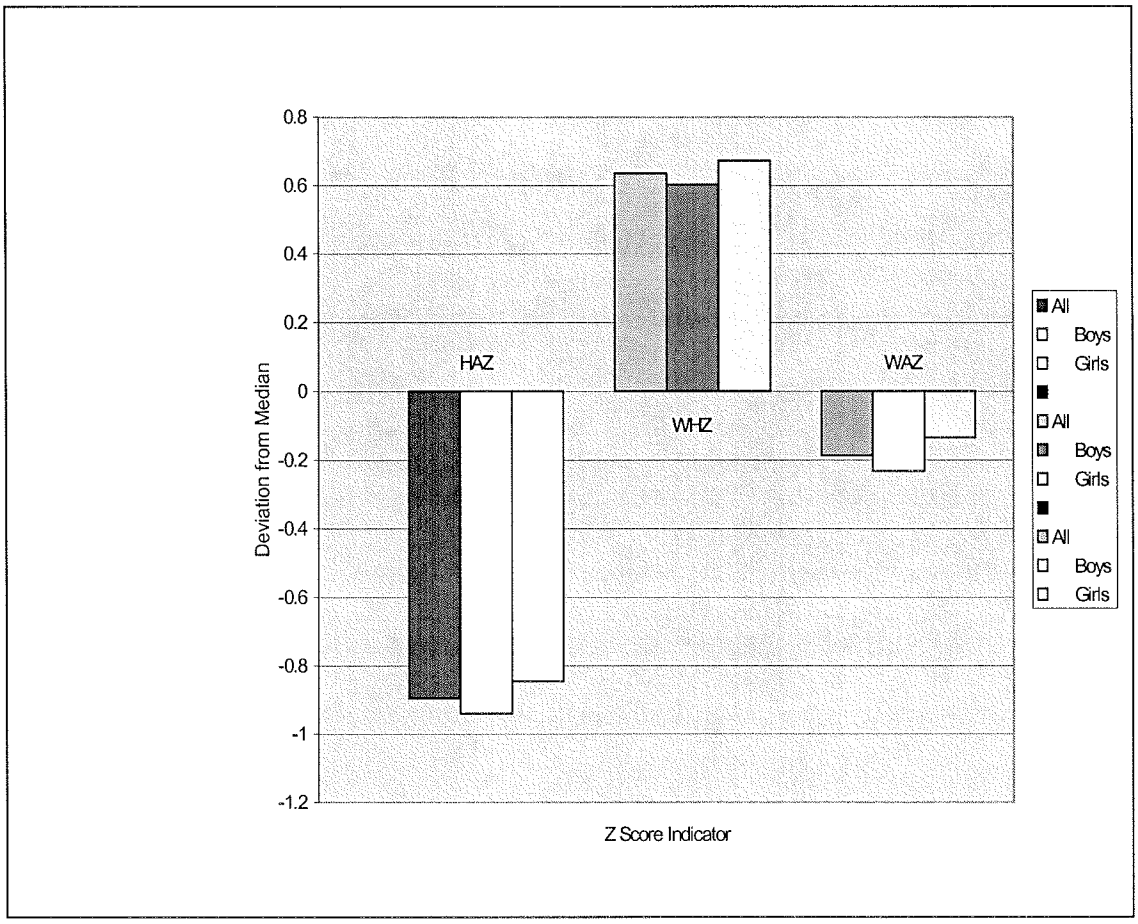
Each child's height is standardized by comparing it to the height of well-nourished children of the same age and gender in the reference population (see Chapter 3 for details). HAZ is expressed as a Z score by subtracting the median and dividing by the standard deviation of the reference population. WHZ and WAZ are similarly standardized.

A descriptive comparison of the data indicates that children of the South African province of KwaZulu-Natal are on average 0.8 deviations shorter for their age (HAZ) than those in the reference population (Figure 3). They are 0.6 standard deviations heavier for their height. And, they are slightly lighter for their age.

The results of estimating anthropometric outcome models are reported in Table 9. Some linear and cross product estimates are significant. Together with income, the

presence of parents, their education, age, race and gender of the child are also included in the regression. Other functional forms attempted did not yield better results. These included quadratic, logarithmic and linear with no cross-products models.

FIGURE 3: CHILD ANTHROPOMETRIC Z SCORES



6.3.2.1 EFFECTS OF PARENTAL NON-LABOR INCOME ON THE NUTRITIONAL STATUS OF CHILDREN

The estimated marginal effect of non-labor income given the gender of the household head for HAZ are obtained as follows:

TABLE 9: PARTIAL EFFECTS OF ALL VARIABLES ON NUTRITIONAL OUTCOMES OF ALL CHILDREN[A,B,C,D]

Independent Variables	----------Dependent Variables----------		
	HAZ	WHZ	WAZ
PCNLI	-0.000414*** (-4.27)	0.0005053*** (3.54)	0.0002803*** (3.76)
GENDER	1.12448* (1.68)	1.668861 (1.13)	2.118133*** (4.01)
PCNLIGDR	0.0005254* (1.67)	-0.000766* (-1.69)	-0.0002747 (-0.95)
HHSIZEP	-0.0311141** (-2.08)	-0.0143799 (-0.63)	-0.0117122 (-0.92)
AGEH	0.0113072* (1.95)	0.0280667*** (3.32)	0.0205222*** (4.49)
HEDUC	0.0013518 (0.04)	0.0738302* (1.58)	0.0349416* (1.89)
RACE	-0.6779702 (-0.64)	-0.474466 (-0.34)	-0.6772006** (-2.02)
CGENDER	-0.044123 (-0.29)	-1.324919*** (-5.87)	-0.0282377 (-0.25)
AGEYR	-0.0864276*** (-3.05)	0.3039999*** (6.88)	-0.1025665*** (-5.22)
SIZEGDR	0.0431115** (2.27)	-0.0244481 (-0.88)	0.0153707 (0.98)
AGEGDR	-0.0222506** (-2.70)	-0.0104396 (-0.88)	-0.0177104** (-2.84)
EDUCGDR	-0.0161621 (-0.41)	-0.0417712 (-0.77)	-0.0260727 (-1.27)
RACEGDR	-0.4058307 (-0.90)	-0.7992729 (-0.63)	-1.020434** (-2.62)

TABLE 9(CONT.): PARTIAL EFFECTS OF ALL VARIABLES ON NUTRITIONAL OUTCOMES OF ALL CHILDREN[A,B,C,D]

Independent Variables	----------Dependent Variables----------		
	HAZ	WHZ	WAZ
CGENDERGDR	-0.1667191 (-0.84)	0.305769 (1.03)	-0.0256751 (-0.18)
AGEYRGDR	0.0202686 (0.55)	0.0218468 (0.38)	-0.0151348 (-0.63)
CONSTANT	-0.7645589 (-0.56)	0.3582374 (0.18)	-0.2158862 (-0.33)
F-Statistic	6.80	7.09	15.45
R-Square	0.1006	0.1968	0.1785

[A]Values in parentheses are t-statistics. [B]Cluster area dummies were internally computed but were too many to include in the table. [C] F (76, 1596).

$$\partial HAZ/\partial PCNLI|_{G=1}=-0.000414+0.0005254*PCNLI$$

for male-headed households, and

$$\partial HAZ/\partial PCNLI|_{G=0}=-0.00414*PCNLI,$$

for female headed households.

Table 10 reports the effects of parental non-labor income on children's anthropometric Z-scores by the gender of the household head. The result shows that increasing non-labor income in female-headed households is associated with significant increases in children's WHZ and WAZ Z-scores, whereas the HAZ Z-score decreases. On the other hand, increasing non-labor income in male-headed households is associated with increases both in HAZ and WAZ and a decrease in WHZ Z-scores.

For all three Z-scores (Table 10), the effect of non-labor income given the female household headship is significant at 0.05 or 0.01 levels but that of male-headed households is not significant. The impact of income on HAZ of female-headed households is negative and significantly different from that of male-headed households. Similarly, the effect of income on WHZ of female-headed households is also larger than that of male-headed households. The effects of non-labor income on WHZ and WAZ are significantly larger for female heads than for male heads. However, the effects on HAZ are negative for female-headed households whereas they are positive in male-headed households. The difference between the genders is significant for HAZ and WHZ Z-scores albeit at 0.1 level.

A casual glance at the figures in Table 10 reveals that for the most part (indicated by the positive entries of columns 2 and 3) families with larger non-labor income are likely to have children who are better off nutritionally than those with lower non-labor income. This is perhaps because non-labor income adds to the total household income and therefore has a bearing on overall welfare. Both WHZ and WAZ indicate that children raised in female-headed households are generally better off than those raised in male-headed households. However, these results must be stated cautiously because the differences are not significant.

TABLE 10: MARGINAL EFFECTS OF HOUSEHOLD INCOME ON ANTHROPOMETRIC Z-SCORES WITH RESPECT TO GENDER OF HEAD

	Non-labor Income Ordinary Least Squares(OLS)		
	Female	Male	Difference
Height-for-Age	-0.4140***	0.1114	0.5254*
	(-4.27)	(0.37)	(1.67)
Weight-for-Height	0.5053***	-0.2607	0.766*
	(3.54)	(-0.61)	(1.69)
Weight-for-Age	0.2803***	0.0056	0.2747
	(3.76)	(0.00)	(0.95)

T-test statistics for joint significance of income *variables* are below the estimates. The differences between female and male income effects are in the third column of each panel. Effects are multiplied by 1000, ***=0.01 percent significance, **=0.05 significance and *0.1=significance, F (76, 1596).

This result concurs with the previous analysis whereby increasing non-labor income had no clear and distinctly different impacts on household expenditure shares for female and male headed households. In this case, although an increase in income generally has positive impact on children's health, the effects are greater if females rather than males head the household only for the case of WHZ and WAZ.

6.3.2.2 EFFECTS OF PARENTAL NON-LABOR INCOME ON THE NUTRITIONAL STATUS OF GIRLS AND BOYS

Table 11 shows the impact of parental non-labor income on the nutritional status of children by the child's gender. As indicated by the OLS results in this table, increasing non-labor income to households with female heads has a positive effect on WHZ and

WAZ for boys while HAZ increases for girls but declines for boys. However, in male-headed households, increasing income is associated with an increase in all three Z scores for boys but decreases in all three Z-scores for the girls.

HAZ represents a long-term Z score. Female-headed households display a positive income effect for girls, while male-headed households display a positive income effect for boys. However, in the short-term (represented by WHZ), both genders display a positive income effect for boys and a negative income effect for girls. Non-labor income in female-headed households has a differential effect by child's gender depending on the timeframe. There are significant effects on the Z-scores of both sons and daughters. The income effect for male-headed households is generally smaller than for female-headed households. The t-statistics in parentheses show that the difference between female and male heads is significant for boys but not for girls. The difference between the genders of the children given parental gender is significant for HAZ and WAZ in male-headed households. But this difference is not significant in female-headed households.

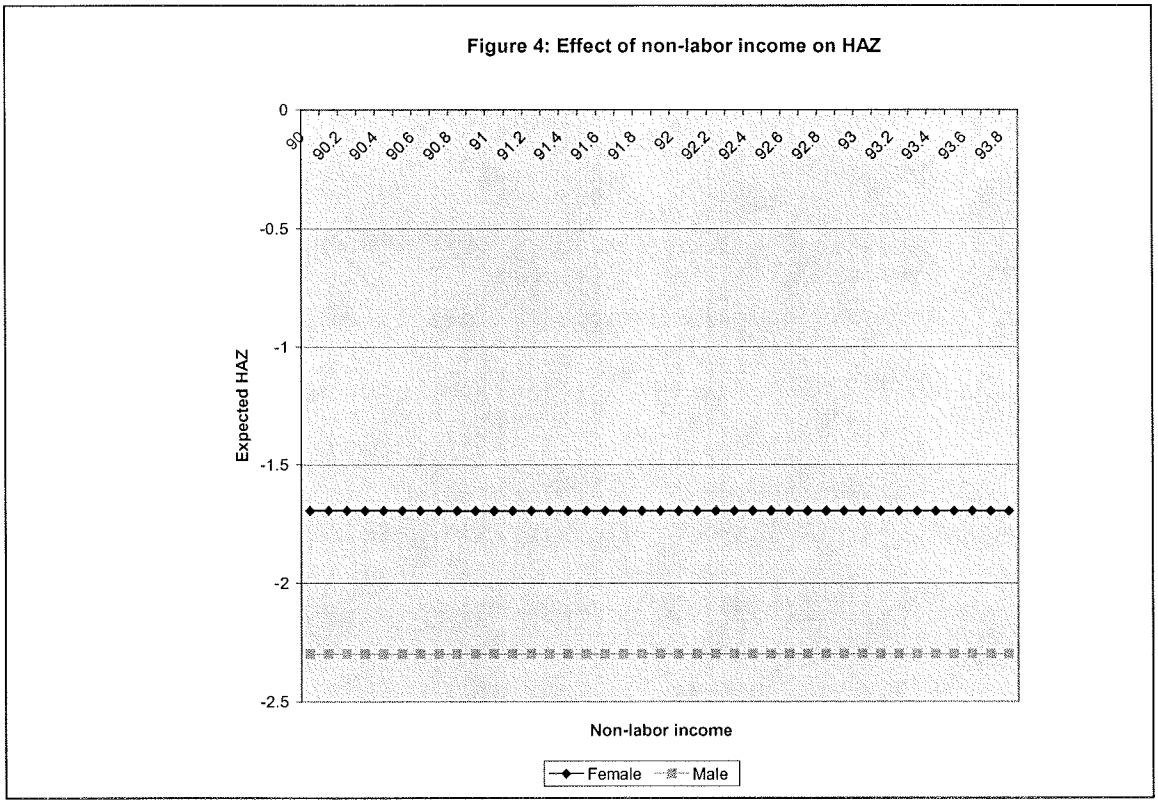
The results of the expenditure analysis and individual child nutritional outcomes generally show differences in income allocation according to the gender of the household head. But while household head gender variably affects income expenditure relationships, these results do not significantly show that female-headed households have entirely better child nutritional outcomes associated with additional income. Note that the results discussed so far are based on marginal effects of non-labor income on household expenditure shares and child anthropometric Z-scores.

TABLE 11: MARGINAL EFFECTS OF HOUSEHOLD INCOME ON ANTHROPOMETRIC Z-SORES OF SPECIFIC GENDER OF CHILDREN WITH RESPECT TO GENDER OF HEAD

	Non-Labor Income Ordinary Least Squares(OLS)		
	Female	Male	Difference
HAZ			
Sons	-0.4202***	0.6444*	-1.0646**
	(-4.50)	(1.55)	(2.51)
Daughters	0.5455	-0.1504	0.6959
	(0.36)	(-0.57)	(0.45)
Difference	-0.9657	0.7948**	-1.7605
	(-0.64)	(1.72)	(1.08)
WHZ			
Sons	0.5103***	0.1835	0.3268**
	(3.74)	(0.26)	(2.47)
Daughters	-0.5726	-0.4893	-0.0833
	(-0.22)	(-1.04)	(0.00)
Difference	1.0829	0.6728	0.4101
	(0.42)	(0.85)	(0.14)
WAZ			
Sons	0.2807***	0.5542**	-0.2735**
	(3.81)	(1.89)	(-1.93)
Daughters	-0.0439	-0.2711*	0.2272
	(0.0)	(1.40)	(0.28)
Difference	0.3246	0.8253**	-0.5007
	(0.32)	(2.53)	(-0.14)

T-statistics are in parentheses below income effects. Independent variables are parental income, education of head of household, race, cluster number dummies, age and gender of the child. Effects are multiplied by 1000, F (78, 1594).

FIGURE 4: EFFECT OF NON-LABOR INCOME ON HAZ



From the discussion above we find that marginal effects of income on anthropometric Z scores give quite inconclusive results. To enable clearer conclusions, I generated the overall intercept resulting from the effect of all the variables given gender of the household head. And, with the slope generated by the marginal effects of non-labor income given the respective gender of household, I plotted the slope of the expected Z-scores for each gender of the household head. Figure 4 shows this expected Z score given the level of non-labor income.

Let us discuss how to obtain the overall intercepts. These are obtained as follows. First, the respective equations are;

$Z|_{G=1}=\alpha_1+(-0.000414+0.0005254*G)*PCNLI,$

where α_1 is the overall intercept given gender is male (G=1), and

$Z|_{G=0}=\alpha_2 -0.00414*(PCNLI),$

where α_2 is the overall intercept given gender is female (G=0).

The overall intercept α_1 is derived from equation 5.2 as follows;

$\alpha_1=\alpha+\beta_1 GENDER+\beta_4 HHSIZE+\beta_5 AGEH+\beta_6 HEDUC+\beta_7 RACE+\beta_8 CGENDER+\beta_9 AGE$
$YR+\beta_{10} GENDER*HHSIZE+\beta_{11} GENDER*AGEH+\beta_{12} GENDER*HEDUC+\beta_{13} GENDE$
$R*RACE.$

And, α_2 is similarly derived from equation 5.2 as follows;

$\alpha_2=\alpha+\beta_4 HHSIZE+\beta_5 AGEH+\beta_6 HEDUC+\beta_7 RACE+\beta_8 CGENDER+\beta_9 AGEYR.$

Note that α(=-0.7645589) is the regression intercept and is the same for the two overall intercepts irrespective of the gender of head of household. Now, back to our results in figure 4.

The average per capita non-labor income for both household-head genders lie within the income range shown on the x-axis. Irrespective of the income effects, figure 4 shows that female-headed households have significantly higher HAZ scores than male-headed households. A similar analysis was done for WHZ and WAZ. In both cases, female-headed households have higher Z scores than male-headed households (Figures 5 and 6)

Thus while the marginal effects discussed above showed little significance in differences between the genders this analysis shows significant differences between the genders in the absolute effects. The significance of the difference between female and

male-headed household heads is given in Table 12 below. For all three Z-scores, the female-headed households show significantly higher scores than male-headed households. This corresponds to the results indicated in the charts 4, 5 and 6 above.

TABLE 12: F-TEST OF EQUALITY BETWEEN FEMALE AND MALE-HEADED HOUSEHOLDS IN CHILD ANTHROPOMETRIC Z-SCORES

	HAZ	WHZ	WAZ
F-Value	1673254***	5933367***	3066033***
Prob.>F	0.0000	0.0000	0.0000

FIGURE 5: EFFECTS OF NON-LABOR INCOME ON WHZ

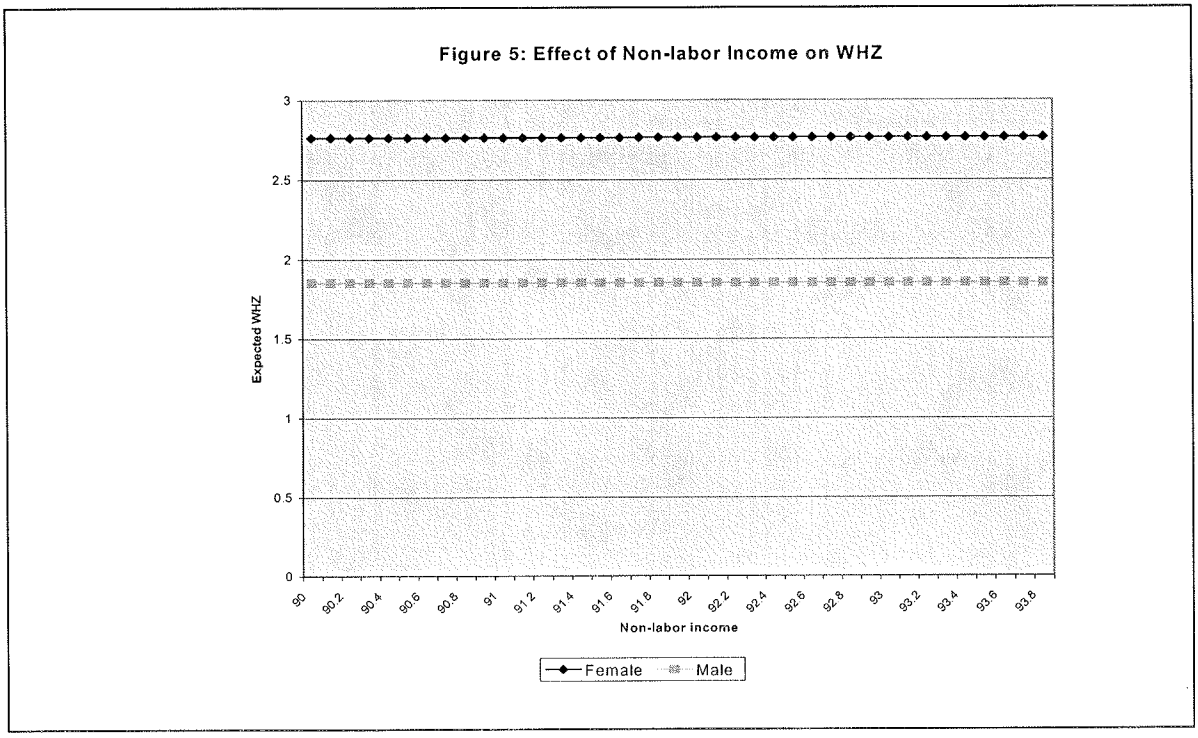
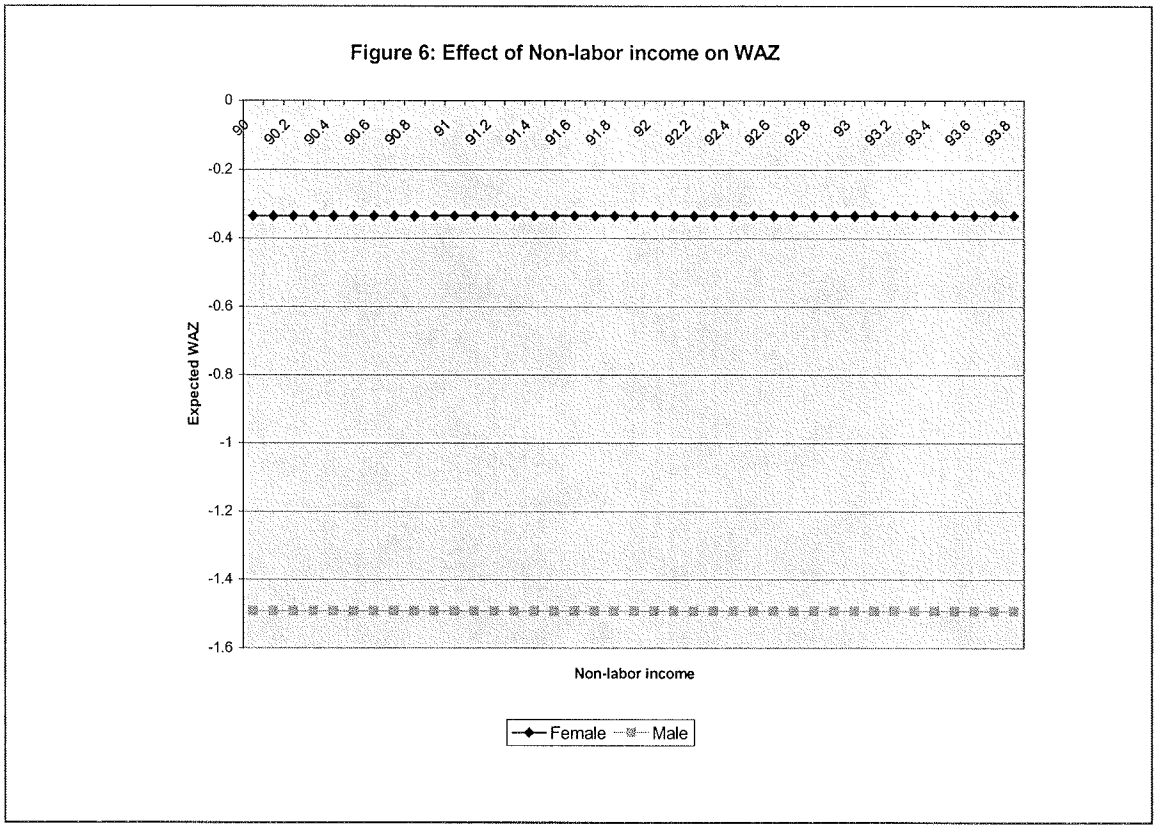


FIGURE 6: EFFECT OF NON-LABOR INCOME ON WAZ



6.3.3 RACE AND CHILD NUTRITIONAL STATUS

We now turn to the impact of household income on the nutritional status of children with respect to race. Table 13 shows that the effects vary by race as well as by the gender of the household head. In households headed by African women, the effect of income on HAZ, a long-term Z score, is negative whereas it is positive for households headed by Indian women. But the opposite scenario is observed in the short-term score, wherein households headed by African females, income has a higher impact on the WHZ of their children compared to their Indian counterparts. WAZ is positive for women in both races. For male-headed households, income seems to impact children's long-term Z-cores positively for African heads compared to their Indian counterparts. In the short-term the opposite is the case.

TABLE 13: MARGINAL EFFECTS OF NON-LABOR INCOME ON CHILD ON CHILD ANTHROPOMETRIC OUTCOMES, BY PARENTAL RACE AND HOUSEHOLD HEADSHIP

	Female			Male		
Indicator	Africans	Indians	Difference	Africans	Indian	Difference
HAZ	-0.4260***	1.4802	-1.9062	0.2289	-0.5847	0.8136
	(-4.49)	(0.79)	(-1.02)	(0.75)	(-0.57)	(0.77)
WHZ	0.5152***	-1.2571	1.7723	-0.2361	0.4348	-0.6709
	(3.72)	(-0.28)	(0.4)	(-0.59)	(0.28)	(-0.33)
WAZ	0.2752***	1.0394	-0.7642	0.0553	-0.2898	0.3451
	(3.69)	(0.82)	(-0.6)	(0.17)	(-0.73)	(0.75)

T-test statistics for joint significance of income variables are below the estimates. The differences of African to Indian income effects are in the third column. T-statistics for equality of racial effects by individual gender are given in parentheses below the differences. Significance levels are *** = 0.01, ** = 0.05 and * = 0.1. Effects are multiplied by 1000, F (78, 1594).

The differences in the marginal effect of non-labor income on anthropometric Z scores by household head gender for both races are indicated in Table 14. The impacts of income with female heads of either race are comparatively larger (in absolute terms) than for their male counterparts. But again, the differences are generally not significant. The marginal impact of non-labor income on child anthropometric measures are not significantly different from zero for either race, nor are there significant differences between the races.

TABLE 14: PARENTAL DIFFERENCES ON CHILD NUTRITIONAL OUTCOMES BY RACE[A]

	African			Indian		
Indicator	Female	Male	Difference	Female	Male	Difference
HAZ	-0.426***	0.2289	-0.6549**	1.4802	-0.5847	2.0649
	(-4.49)	(0.75)	(-2.03)	(0.79)	(-0.57)	(1.15)
WHZ	0.5152***	-0.2361	0.7513	-1.2571	0.4348	-1.6919
	(3.72)	(-0.59)	(0.17)	(-0.28)	(0.28)	(-0.20)
WAZ	0.2752***	0.0553	0.2199	1.0394	-0.2898	1.3292
	(3.69)	(0.17)	(0.68)	(0.82)	(-0.73)	(0.79)

T-test statistics for joint significance of income variables are below the estimates. The differences of African to Indian income effects are in the third column. T-statistics for equality of racial effects by individual gender are given in parentheses below the differences. Significance levels are *** = 0.01, ** = 0.05 and * = 0.1. Effects are multiplied by 1000, F (78, 1594)=8.77, R-Square=0.1013.

CHAPTER 7

SUMMARY AND CONCLUSIONS

From the many findings discussed in the literature, it is indisputable that the household head's gender is among the factors that determine household expenditure patterns. Other factors that impact expenditure are income levels (Calendos 1979; Monke and Fox 1993, Von Braun et. el. 1992); household characteristics and perhaps, community related factors such as wages, access to amenities and commodities prices. Theory and empirical evidence suggests that household expenditure shares are strongly affected by household income.

General household welfare and the nutritional and health conditions can be positively affected by decisions concerning what food to buy and consume; what household items to buy; how much income to spend on housing, and consumption of personal items, leisure, charity contributions, and so on. But what is unclear is whether the impact on household expenditures resulting from these decisions is dependent on who makes them as head of the household. Hence the main objective of this study has been to evaluate the effects of the household head gender on the allocation of income.

This study has examined the extent to which variations in the income level explain variations in household expenditure patterns on food, housing, human capital, leisure, household goods and adult goods, as well as variations in child anthropometric outcomes, while controlling for the head of household gender.

The results show that the household head's gender plays a role in household expenditure allocations. More specifically, the results show that increasing incomes in

female-headed households has a greater short-term impact on children's nutritional status compared to their male counterparts. Secondly, the study shows that irrespective of their racial background, women are likely to spend their non-labor income in a manner that achieves a higher welfare for their children than men. Whereas the result from the analysis of household expenditure shares did not clearly indicate whether increasing non-labor income in female-headed households entirely has a greater impact on the household expenditure shares as compared to male-headed households, the second set of results under child anthropometric Z scores came out clearly to show that indeed female heads of households have a greater impact on child nutritional status than their male counterparts.

From this study, we can conclude that gender differences exist in household expenditure patterns. Although the general indication is that female-headed households have larger marginal human capital expenditure, it is not clear which gender of household head devotes larger marginal expenditures to education and health, which are key components of this household expenditure category.

These findings have some implicit policy implications. Some of the major concerns why gender-based-targeting in household welfare programs may be crucial are that:

- The effect of public transfers may differ depending on the gender of the recipient. If this is the case, income transfers may have smaller nutritional effects if the transfers are directed to the male-headed households than to female-headed households (Quisumbing and Maluccio 2000).

- The response of non-recipients of the income transfer must also be considered. If the household reallocates resources away from the transfer recipient the intended effect of income transfer may not be realized.
- At the household level, the unitary model predicts that it does not matter to whom policy initiatives are addressed, since information (including that on household income) is shared. But results from this study and examples from other developing countries imply that targeting one individual rather than another may lead to non-adoption of particular policies or unintended consequences of adopted policies (Myra and Mehra, 1990).
- Household headship determines a range of policies that can be used to affect household allocation outcomes. These may include changes in access to common property resources, credit, public works schemes and legal and institutional rights.

The common preference model postulates that the distribution of income within the household should have no impact on demand. However, this study shows that this may not be the case. My analysis of household income allocation patterns in South Africa indicates some obvious differences in expenditure patterns between female and male household heads. The results indicate that non-labor income in female-headed households is associated with higher child nutritional status as indicated by anthropometric Z-scores. It is not clear which household head gender has a greater impact on budget shares spent on general household goods, but female-headed households show superior outcomes on housing, health and leisure. The proportion of the budget spent on food declines as income rises regardless of the gender of the household head but it decreases more if the

head is female. In addition to this outcome, other studies have also shown that while the budget shares on food declines, food composition changes, with nutrient intakes rising faster with increases in women's income (Thomas 1997).

Racial differences exist in the effects of parental income on the nutritional status of children, both within and between the respective genders, but the differences are not significant. The effects do not appear to differ very much by race for male-headed households.

One policy implication of this study is that while development policies have to be designed around the needs of communities and households, the understanding of intra-household interactions may be just as important to the success of the intended programs. More specifically, the allocation of governmental or non-governmental assistance to households may yield more benefits if programs are gender specific in targeting household headship. It appears that programs that target children's nutritional status are likely to benefit them more if implemented by women rather than men. But further research needs to be done to ascertain which household head gender has an edge over the other as far as the overall welfare of the household is concerned.

APPENDIX: HOUSEHOLD SUMMARY STATISTICS

TABLE A1: HOUSEHOLD CHARACTERISTICS

	Mean	Standard Deviation	Min	Max
Average household size				
Female heads	7.8	4.7594	1	27
Male heads	5.9	4.2215	1	34
Average age of household head				
Female heads	57	15.5577	19	100
Male heads	51	13.2365	24	85
Average age of children				
Female heads	6.1	3.1021	0.50	13.21
Male heads	6.0	3.1378	0.53	13.86
Education of household head[A]				
Female literate	5.2	4.1087	1	21
Male literate	6.8	4.8417	1	22

N=1043; Female heads=439, male heads=604. [A]23 percent of research household heads were illiterate

TABLE A2: HOUSEHOLD INCOME TYPES AND GENDER OF HOUSEHOLD HEAD[A,B]

	Mean	Standard Deviation	Minimum	Maximum
Total Income	2745	4484.44	0	75432
1. Labor Income	1744	2838.21	0	41000
2. Non-labor	1002	3040.53	0	66174
(a) Asset Income	372	808.19	0	16250
(b) Non-Asset Income	629	2886.92	0	65470
Male Head				
Total Income	2954	4421.78	0	75432
1. Labor Income	1968	3047.19	0	41000
2. Non-Labor Income	991	2665.40	0	56445
(a)Asset Income	409	925.00	0	16250
(b)Non-Asset Income	582	2449.83	0	55470
Female Head				
Total Income	2278	4590.81	0	69974
1. Labor income	1253	2244.46	0	20827
2. Non-Labor Income	1025	3735.86	0	66174
(a) Asset Income	292	450.29	0	3521
(b)Non-Asset Income	733	3667.25	0	65470

[A]N=1043: (Male household heads=604, Female household heads=439)

[B]Labor Income = Income from all wage employment (regular, agricultural, self-employment). Non-labor = (All income from remittances, subsidies and assets). Asset income = owner-occupier. None asset income = remittances and subsidies.

TABLE A3: AVERAGE HOUSEHOLD INCOME BY SOURCE CATEGORY[A]

Category	Share	Mean	Standard Deviation	Minimum	Maximum
Regular Wage	0.484	1322	2201.39	0	18727
Other Income	0.163	445	2797.88	0	65470
Owner-occupier	0.145	396	844.71	0	16250
Self-employment	0.081	221	1834.26	0	40000
Remittances	0.046	124	268.28	0	4000
Casual Labor	0.041	111	414.66	0	5500
Agricultural labor	0.020	53	330.50	0	7358
Subsidies					
Transport	0.005	13	151.16	0	4300
Food	0.001	3	25.86	0	430
Housing	0.017	45	225.87	0	2600
Total	1.000	2736	4443.593	0	75432

N=1043. [A]Calculated means are based only on those households that reported incomes from those sources

TABLE A4: HOUSEHOLD INCOME SOURCES BY GENDER OF THE HEAD OF HOUSEHOLD[A]

	Male (N=604)				Female (N=439)			
Category	Mean	Standard Deviation	Min	Max	Mean	Standard Deviation	Min	Max
Regular wage	1536	2205.33	0	17616	1060	2091.15	0	18727
Other Income	390	2415.05	0	55470	456	3051.90	0	65470
Owner-occupier	415	923.17	0	16250	308	610.65	0	9208
Self-employment	332	2248.64	0	40000	50	498.59	0	5400
Remittances	116	255.34	0	2667	125	270.16	0	4000
Casual labor	109	411.73	0	5500	124	407.53	0	2905
Agricultural Subsidies	53	364.35	0	7358	44	228.37	0	2905
Transport	20	185.78	0	4300	2	20.21	0	280
Food	7	39.06	0	430	3	23.28	0	300
Housing	45	212.06	0	2400	37	226	0	2600
Total	3022	4437.995	0	75432	2209	4030.45	0	69974

N=1043. Other incomes are those from government transfers and other social programs.
[A]Mean incomes were rounded to the nearest whole Rand (the South African Currency)

TABLE A5: AVERAGE HOUSEHOLD EXPENDITURE ALLOCATIONS[A]

	Mean	Standard Deviation	Minimum	Maximum
Food	659	419.1187	97	3775
Housing	475	891.82	1	16250
Regular Non-Food				
Personal Items	174	199.59	0	1550
Transport	153	288.08	0	4300
Day care	8	38.85	0	600
Water, Electricity	114	195.74	0	1720
Other Energy	61	111.27	0	1215
Occasional Non-Food				
Household Items	108	323.82	0	5058
Clothing	77	111.37	0	1333
Health care	25	81.98	0	2083
Educational	80	204.24	0	2750
Insurance	85	268.04	0	3400
Others	89	344.03	0	5000
Remittances	22	81.26	0	900
TOTAL	2581	2545.09	140	30411

[A]These expenditure groups are as recorded in the data set

TABLE A6: MEAN HOUSEHOLD EXPENDITURE ALLOCATIONS BY HOUSEHOLD HEAD IN 1998[A]

	Male (N=604)				Female (N=439)			
	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max
Food	805	483.48	97	3775	630	384.18	105	3369
Housing	769	1241.7	1.08	16250	490	814.81	1.6	9208
Education	116	247.85	0	6033	104	231.87	0	2723
Health/Medical	195	396.23	5	3405	97	223.81	5	1725
Household Service	331	461.35	5	2755	247	285.43	5	1963
Leisure	163	482.71	10	5010	117	283.28	10	2927
Household Goods	277	497.32	10	5235	171	220.93	10	1493
Adult Goods	237	228.37	5	1555	170	187.00	5	1005
Total	2950	2915.3	140	30411	1983	1620.6	166	10249

[A]These expenditure categories were re-organized from the original groups in the table A2a

TABLE A7: CHILD ANTHROPOMETRIC (Z-SCORES) IN 1998

	Mean	Standard Deviation	Min	Max
Height-for-Age	-0.8961	1.7799	-8.86	8.66
Boys	-0.9396	1.8175	-8.86	8.66
Girls	-0.8456	1.7352	-7.84	5.40
Weight-for-Height	0.6353	1.6284	-5.30	7.92
Boys	0.6034	1.6504	-5.30	7.92
Girls	0.6722	1.6029	-5.24	7.21
Weight-for-Age	-0.1872	1.2958	-3.83	8.49
Boys	-0.2327	1.2772	-3.54	5.57
Girls	-0.1345	1.3161	-3.83	8.49

Source: Author's compilation. N=1672. Boys=841, Girls=831

TABLE A8: CHILD ANTHROPOMETRIC (Z-SCORES) IN 1998 BY HOUSEHOLD HEAD GENDER

	Mean	Standard Deviation	Min	Max
Height-for-Age	-0.9286	2.0333	-8.82	8.66
Female	-0.9626	1.9824	-7.59	8.66
Male	-0.9053	2.0680	-8.86	7.96
Weight-for-Height	1.5675	3.2513	-5.30	8.58
Female	1.5161	3.1732	-5.30	8.54
Male	1.6025	3.3046	-5.24	8.58
Weight-for-Age	-0.1611	1.4898	-3.83	8.49
Female	-0.1500	1.5336	-3.54	8.49
Male	-0.1685	1.4527	-3.83	5.57

Source: Author's compilation. N=1672. Boys=994, Girls=678

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