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Targeting food subsidies to food-poor households in Zambia

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Targeting food subsidies to food-poor households in Zambia

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by

Brian Gilmore Lockett

A Thesis Submitted to the
Graduate Faculty in Partial Fulfillment of the
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Signatures have been redacted for privacy

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TABLE OF CONTENTS

	page
LIST OF TABLES	v
CHAPTER 1. INTRODUCTION	1
CHAPTER 2. BACKGROUND ON CONSUMER FOOD SUBSIDIES	6
Rationale for Food Subsidies	6
Income Transfer, Income Distribution, and Improved Real Purchasing Power	7
Reducing the Incidence and Severity of Nutritional Deficiencies	9
Food Security and Food Self-Sufficiency	11
Political Stability and Advantage	13
Types of Consumer Food Subsidies	15
Explicit Food Subsidies	16
Unrestricted Food Price Subsidies	17
Food Stamps	18
Rationing	21
Direct Distribution and Intervention	22
Implicit Food Subsidies	23
Uncompensated Price Controls	23
Overvalued Exchange Rates	25
Tariffs, Taxes and Quotas	26
Economic Effects of Food Subsidies	26
Microeconomic Effects of Food Subsidies	28
Impacts on Agriculture	29
Balance of Payments	31
Fiscal Costs and Inflation	32
Targeting	34
Targeting Characteristics	35
Targeting Schemes	37
Self-Targeting	37
Means Testing	40
Clinic Based Targeting	42
Geographic Targeting	43
Implications for This Study	44
CHAPTER 3. THE HISTORY OF MAIZE SUBSIDIES IN ZAMBIA	45
Pre-independence	46
Post-independence	51
CHAPTER 4. DATA SOURCE	58
The 1991 Household Expenditures and Incomes Survey (HEIS)	58

Sampling Scheme, and Sampling Weights of the 1991 HEIS	60
Survey Design and Data	61
Demographic Characteristics of the 1991 HEIS	66
Household Size and Composition	66
Characteristics of the Household Head	67
CHAPTER 5. DISTRIBUTION OF INCOME	69
Expenditures as a Proxy for Income	69
The Lorenz Function and Gini Coefficient	70
Creating Deciles	71
Ranking of Households	71
Dividing the Population	71
Estimating the Lorenz Function	72
Estimating the Gini Coefficient	73
Results	73
Conclusion	76
CHAPTER 6. MEASURES OF POVERTY	77
Poverty Datum Line	78
Adjusting for Household Size and Composition	80
Estimation of the Equivalence Scales	81
Results	84
Deciles	85
Determining the PDL	86
Comparison of Alternative Poverty Measures	88
Measures of Misclassification	89
Results	91
CHAPTER 7. THE DISTRIBUTION OF POVERTY AND CHARACTERISTICS OF THE POOR	95
Variables	96
Poverty Indices	98
Rural and Urban Populations	100
Provinces	103
Size Distribution of Households	104
Gender of the Household Head	106
Age Distribution of Households	108
Educational Level of Household Head	110
Marital Status of the Household Head	112
Employment and Sources of Income	113
Conclusions	114
CHAPTER 8. FOOD CONSUMPTION WELFARE	116
Independent Variables	116
Welfare Analysis	118

Probit Analysis	118
Results	119
CHAPTER 9. FOOD CONSUMPTION PATTERNS	126
Food Shares and Food Expenditures	126
Diet Composition	127
Expenditure Elasticities for Food	130
CHAPTER 10. SUMMARY AND CONCLUSIONS	131
The Policy Environment	131
The Contribution of the 1991 HEIS	132
Identifying Food Deficit Households	133
Common Characteristics of Food Deficit Households	134
Consumption Patterns of Food Deficit Households	136
Food Policy Alternatives	136
REFERENCES	140

LIST OF TABLES

		page
Table 1	Sampling frame for the 1991 Zambian HEIS	61
Table 2	Average number of household members by sex and age groups	66
Table 3	Distribution of households by number of members for rural, urban, and all Zambia	67
Table 4	Distribution of households by gender of the household head for rural, urban, and all Zambia	68
Table 5	Distribution of households by age group of the household head for rural, urban, and all Zambia	68
Table 6	Distribution of households by marital status of the household head for rural, urban and all Zambia	68
Table 7	Distribution of households by employment status of the household head for rural, urban, and all Zambia	68
Table 8	Share of national expenditure by decile groupings	74
Table 9	Mean annual household and per capita expenditures by rural, urban, and all Zambia	74
Table 10	Share of rural expenditures by decile groupings	75
Table 11	Share of urban expenditures by decile groupings	76
Table 12	Adult equivalence scales for each of the five age groups and age/sex groups	84
Table 13	Maximum and mean per adult food expenditures (Kwacha) by per adult food expenditure deciles	87
Table 14	A typical 2x2 misclassification table	90
Table 15	Misclassification of extreme poverty by alternative poverty definitions	93
Table 16	Misclassification of poverty by alternative definitions	94

Table 17	Poverty levels by rural, urban and all of Zambia	101
Table 18	Percent of households by rural/urban location	102
Table 19	Poverty levels by province	103
Table 20	Distribution of household size by deciles	105
Table 21	Levels of poverty by household size	105
Table 22	Poverty levels by gender of household head	107
Table 23	Food shares of male headed households and female headed households by deciles	107
Table 24	Mean dependency ratios by deciles	108
Table 25	Percent of household members less than six years old (preschoolers) by per adult deciles	109
Table 26	Level of poverty by age class of household head-All Zambia	109
Table 27	Level of poverty by age class of household head-Urban	110
Table 28	Level of poverty by educational status of head of household	111
Table 29	Misclassification measures for targeting to households headed by a person with no or primary schooling only. By rural, urban, and all Zambia	111
Table 30	Percent distribution of marital status of household heads by deciles	112
Table 31	Levels of poverty by marital status of household head	112
Table 32	Percent of deciles by employment status of household head - all of Zambia	113
Table 33	Levels of poverty by employment status of household head	114
Table 34	Average number of different income sources	114

Table 35	Ordinary least squares food expenditure estimation	123
Table 36	Probit estimation for the extreme poverty measure	124
Table 37	Probit estimation for the poverty measure	125
Table 38	Mean food budget shares by decile	127
Table 39	Share of total, national food expenditure by deciles	127
Table 40	Shares of food budget by foods and per adult deciles	129
Table 41	Mean share of the food budget by food groups	129
Table 42	Proportion of food expenditure that is purchased	130

CHAPTER 1.**INTRODUCTION**

From the mid 1970s through the 1980s, Zambia experienced a tremendous decrease in foreign earnings due to low international prices of its main export: copper. As tax revenues plummeted, the national debt escalated and the Government turned to the International Monetary Fund (IMF) for help. Conditionalities attached to the IMF loans caused Zambian officials to reconsider some of the mainstays of Zambia's social welfare programs. Among the most controversial of these programs was the urban maize subsidy which provided low cost maize meal to anyone that chose to purchase it. The maize subsidy was the single largest recurrent expenditure in the federal budget and was a significant contributor to the fiscal deficit. When the Government tried to terminate the maize subsidy program in 1986 there was extensive rioting and the program was reinstated.

How can the Government of Zambia continue to provide its poorest citizens with basic food needs while bringing the cost of the food subsidy program under control? A possible solution is to target the subsidy to only those households that are the most needy. By eliminating households that are not at risk of food shortfalls, the additional expense of

providing the subsidy to them is eliminated. However, there are large administrative costs and logistical problems if every household must undergo an extensive means testing. As an alternative to income based means testing, a household's eligibility status may be assessed according to characteristics common to needy households.

The 1991 Zambian Household Expenditures and Incomes Survey (HEIS) was undertaken by the Prices and Incomes Commission of the Government of Zambia with support from the U.S. Agency for International Development (USAID), and with cooperation from the Central Statistics Office and the United Nations Development Program. The HEIS was a national survey including 2,439 households from every province of Zambia. The survey provides information that can be used for evaluating food expenditures across Zambia and related characteristics of food deficit households.

The purpose of this study is to: 1) identify food deficit households, 2) identify the common characteristics of food deficit households, 3) examine the consumption patterns of food deficit households, and 4) consider alternative policy recommendations based on the results of the findings.

The second chapter is an overview of the rationale for food subsidy programs, alternative program schemes, and methods of targeting program benefits to the needy population. Food subsidies are a common feature of the social welfare programs

of many developing and developed countries alike. Although the food subsidy programs of developed and developing nations share many of the same characteristics, the objectives of the programs are often quite different. The discussion of food subsidy programs presented here is generalized to developing nations, since that is most relevant to Zambia.

Chapter 3 gives a brief history of maize subsidies in Zambia. It shows that maize subsidies have long played an important role in the labor and wage policies of Zambia and also examines the political climate surrounding the maize subsidy program.

Chapter 4 gives an overview of the 1991 Household Expenditures and Incomes Survey, with the various parts and types of questions included in the survey. The sampling frame and weighting system used for the data are explained. A tabular analysis of the distributions of household characteristics as revealed by the 1991 HEIS is also presented. Strengths and weaknesses of the data are discussed with the aim of explaining to the reader some of the limitations in analyzing the data and giving suggestions for future surveys.

Chapter 5 describes the distribution of income for Zambia, using expenditures as a proxy for income. A detailed explanation of the construction of deciles, estimation of the Lorenz curves and the calculation of Gini coefficients is

given before the results of these measures are reported.

Chapter 6 explains the methods used to define poverty for the purposes of this study. Two poverty lines were drawn defining an "extreme poverty group" and a "poverty group". The method for drawing the poverty lines is explained in detail and its relevance to food deficit households is explained. Household size and composition were adjusted for in order to create a uniform measure of food consumption welfare: per adult equivalent food expenditure. Misclassification analysis is explained and then used to examine the reliability of alternative measures of welfare as a basis for creating a poverty line for defining food deficit households.

Chapter 7 presents an analysis of each potential targeting indicator and various measures of the effectiveness of each indicator. The formulas for calculating the poverty measures and the implications for their use are presented first. The targeting indicators examined include: geographic area, size of household, age distribution of household, characteristics of the household head, and income sources.

Chapter 8 presents another method for examining the usefulness of the same set of targeting indicators as presented in chapter 7. This analysis relies on ordinary least squares regression to examine the impact of the targeting indicators on per adult equivalent food expenditure,

and probit analysis to examine which targeting indicators are significant in predicting inclusion of households in the two poverty groups.

Chapter 9 is a summary of the results of the study and presents a discussion of the implications of the results for policy alternatives and their implications for effectively meeting the food needs of Zambians.

CHAPTER 2.**BACKGROUND ON CONSUMER FOOD SUBSIDIES**

Policy makers face many challenges in designing a food subsidy program. They must balance the interests of competing political objectives and economic sectors while meeting fiscal restraints in deciding which type of program is best suited to the needs of the affected population.

This chapter will broadly discuss the motives, objectives and design alternatives involved in creating food subsidy programs. A brief discussion of the economic implications, both macro- and microeconomic, of food subsidy programs is also included.

Rationale for Food Subsidies

Governments are entrusted with the responsibility of the well-being of the people which they serve. It is not surprising then that most, if not all, nations subsidize food to all or part of their citizenry. The rationale for such programs, be it stated explicitly or kept hidden from public scrutiny, varies from country to country and even from policy maker to policy maker. Some programs are dictated by the social goals of alleviating poverty, reducing infant mortality and/or improving the general nutritional status of the population. Other food subsidy programs directly serve the

political aims of a ruling party or are concessions to powerful industries seeking to exploit depressed wages. In the case of most poor countries, all of these objectives coexist to create an environment where specific policy goals are difficult to discern or to evaluate independently. It is possible, though, to describe the intended effects of various policy initiatives.

Income Transfer, Income Distribution, and Improved Real Purchasing Power

Food subsidies are a traditional way to increase the amount of food available to the poor, by decreasing the relative cost of food and, indirectly, providing income to those making food purchases. Therefore, an income transfer to some population group is inherent in all food subsidy programs, whether it is an explicit goal of the program or not. If the subsidy is generally applied to a commodity that is available for purchase by all people, the greatest transfer will go to those who purchase more of the good. If the commodity being subsidized is a normal good then wealthier buyers will receive a greater absolute transfer, proportionate to the quantity purchased.

Since income elasticities of demand for food are usually less than unity, poorer consumers will receive a larger transfer relative to their income because poorer populations tend to spend a greater proportion of their income on food.

Thus a 10% decrease in food prices may raise real incomes of households in the poorest decile by 6 to 8 percent while those households in the top decile may benefit by only a 1 to 3 percent increase (Pinstrup-Andersen, 1985). If the commodity being subsidized is an inferior good then poorer people will receive both larger absolute and relative transfers.

Targeting seeks to maximize transfers to a particular group (usually the most needy) while minimizing transfers to other groups.

Welfare goals are often tied to food subsidies due to the belief that the increase in food consumption will be greater than with a real income cash equivalent. This belief is well founded when the price subsidies are for unlimited quantities due to the combined income and substitution effects of the price change. Changes in relative prices lead to changes in the composition of the household's optimal food basket. The income effect is determined by the share of the household's budget going to the subsidized commodity and the income elasticity of that commodity. If the subsidy is limited to quantities less than what would have been purchased without the subsidy, so called *inframarginal* quantities, then the transfer is limited to a pure income effect.

The transfer of income to subsidy recipients is realized through increased real purchasing power. In addition to the increase in the consumption of the subsidized commodity that a

recipient may enjoy, he or she may also benefit by spending less on the commodity than would have been necessary without the subsidy, and spending the savings elsewhere. This increase in purchasing power is certainly realized in the short run, but if the subsidy program is of significant magnitude, real wages, sensitive to food prices, may adjust downwards. This suggests that if the redistribution of incomes is a policy objective, then the use of food subsidies may be an inefficient means of achieving this end.

Reducing the Incidence and Severity of Nutritional Deficiencies

Income and price elasticities of staple foods are higher (in absolute terms) for the poor than for higher income groups (Alderman, 1986). Therefore price subsidies can be very effective in increasing food consumption by poor households. Since the poorest segments of a population tend to experience the highest rates of malnutrition, effective targeting to poor households can be expected to reach those most in need. In addition to the direct effect through increased consumption of the subsidized food, savings realized from the purchase of subsidized staples (income effect) may be spent on food providing other essential nutrients, thus improving the general nutrition of the household. Particular commodities that address identified nutritional deficiencies in the population may be chosen to be subsidized. Subsidies are

sometimes applied to enriched foods in order to provide them at a similar price as the usual product, and provide particular micronutrients deficient in the general diet.

However, subsidies on particular foods may not meet specific nutritional deficiencies, because changes in relative prices may lead to cross-commodity substitution effects which are nutritionally less desirable. A subsidy on a preferred staple may be sufficient incentive to a poor consumer to purchase it over an inferior staple he or she would have bought in the absence of the subsidy, even if doing so actually decreases his or her overall intake of essential nutrients. But with good data and the tools of economics, these undesirable substitution effects can be identified and often avoided.

Targeted schemes that include health and nutrition education components may enhance the nutritional effects of the subsidy. Subsidized food schemes are often targeted to those who are either malnourished or at risk of becoming malnourished, such as children and pregnant and lactating women. Pregnant and lactating women are often targeted to improve prenatal nutrition, thus reducing low birth weights and subsequent infant mortality. Programs targeting children are designed to improve the physical and mental development of children which, in turn, increases the children's productivity for the rest of their lives. School feeding programs are

intended to enhance the performance of children in the classroom, thus increasing returns on education expenditures (Pollitt, 1990). However, these programs may not always effect any real gains in decreasing malnutrition among recipient children if their parents subsequently reduce the amount of food given to them at home. Programs which provide food through clinics to mothers with malnourished infants are sometimes criticized for providing an incentive to mothers to keep at least one of their children undernourished. These examples further illustrate the importance of cross-commodity substitution effects and related household behaviors in response to a food subsidy.

Food Security and Food Self-Sufficiency

Food security may be defined as the ability of a person, household or nation to ensure a steady and adequate food supply. In many countries where the food storage and distribution infrastructure is poorly developed the availability of food is highly correlated with the season. At harvest time there is a glut and food prices are low, but as stores are depleted, nearing another harvest, prices can escalate dramatically. Poor households that must rely on purchased food, or lack resources and storage facilities to bridge the harvest season, may be unable to afford sufficient quantities to meet their nutritional needs. Food subsidy

programs may be designed to stabilize prices across regions and time by providing the subsidized commodities in quantities to meet market demand at a predetermined target price. However, market distortions can result from speculation by private traders on future government interventions.

The most severe price fluctuations tend to be found in rural areas with the least developed markets (Sahn, 1989). Government initiatives to stabilize prices may discourage the development of a competitive private grain trading sector and may actually aggravate price fluctuations by reducing the number of private traders.

Food self-sufficiency is the ability of a country to meet its demand for food without having to resort to imports. A country that is food self-sufficient may still not be food secure if the food is too expensive for the poor to be able to purchase an adequate diet. Any increase in the food self-sufficiency of a country will not change the level of food security unless it is accompanied by an increase in the incomes of those households that are the most food insecure. A program to increase the production of a country's preferred staple while neglecting the traditional "poor people's foods" may further increase inequalities in income distribution by providing lower priced commodities to wealthier consumers.

Political Stability and Advantage

To be able to ensure the support of its citizens, governments enact entitlements to benefit key groups. In most developing nations these key groups are civil servants and urban workers. Therefore it is not surprising that in many countries food subsidies have come to be perceived as a social contract and any attempt to reduce or eliminate them is met with resistance, from both within and without the government.

Leaders act not only out of a desire to maintain power but also to pursue ideals of social justice, economic growth and improvement of the standard of living in the country. But before politicians can effect any altruistic goals, they must remain in a position of sufficient power to do so. Therefore it is not as cynical as it may at first seem to analyze the political calculations of food subsidy programs in terms of power politics.

Whether food subsidies originate from a populist movement which seeks to redistribute wealth, or an emergency situation, once a bureaucracy is established or a policy is designed to benefit particular special interest groups, it can be very difficult to remove. Subsidies become an important source of income for some groups, be they direct recipients or businesses tied to the production, processing or transportation of the commodity, forming powerful special interest blocks. Even people who may benefit very little or

even not at all from food subsidies tend to form strong opinions about these policies. The safe thing for any politician to do is support the program or better yet, expand it.

Governments may institute food subsidies as a means of subsidizing wages in some sectors of the economy, and extracting revenue from the farm sector. Real wages may adjust downward in response to lower food prices, benefiting any industry that relies on wage earning laborers. The government itself may be the largest single employer and the largest benefactor of lower wages. In countries with a large traditional farming sector it is difficult to tax the earnings of farmers directly. If the government imposes a system of food subsidies that places the burden of the subsidy on farmers, through lower producer prices, then they can effectively tax farmers to support the operational costs of the government.

Rural producers need not always be the losers. They may benefit from food subsidies through increased demand, especially when government expenditures on the program are financed through tariffs and taxing urban workers. An alternative method of keeping food prices low is to subsidize agricultural inputs or transportation services. In these ways, rural voters as well as transportation service and agricultural support sectors benefit.

Types of Consumer Food Subsidies

Food subsidy policies may be placed into two categories: explicit and implicit subsidies. Explicit subsidies entail direct costs to the government while implicit subsidies do not. Examples of explicit subsidies would be food stamps or food commodities that are purchased by the government and then resold in the market below cost. Implicit subsidies are policies designed to affect the price of foods without any government outlay, such as price controls, exchange rates, tariffs and quotas. Most countries maintain a variety of policies that are often contradictory in their impact on food prices. The degree of taxation or subsidization of food is the net effect of all policies in the country's food policy regime.

Food subsidies must entail some costs: fiscal, economic, noneconomic, or most likely, all three. Fiscal costs are those paid directly by the government to procure the food, transport and distribute it, and administer the program. Economic costs are more difficult to quantify and are the source of much of the controversy surrounding food subsidies. These economic costs result from inefficiencies in the production and consumption of agricultural produce due to the imposition of taxes, tariffs, quotas and price controls designed to benefit some particular sector. The benefits of food subsidies are often less easily measured. They may

include the value of increased labor productivity, human capital gains through improved educational achievement, reduced health care costs, etc., as well as the subjective value that a society places on the consumption gains accruing through increased food consumption/welfare of the poor. Policy makers must consider fiscal, economic and noneconomic costs along with potential benefits of the program when taking new policy initiatives.

Explicit Food Subsidies

A food subsidy is said to be explicit if it is programmatic in nature and funded through government outlays. Explicit subsidies may be categorized as either project or nonproject programs. Nonproject programs are general subsidies that reduce the price of the commodity in the open market where anyone may take advantage of the subsidy. General subsidies such as this will not have a progressive effect on the distribution of income if wealthier consumers purchase more of the commodity. Project subsidies, which offer a subsidized commodity as part of a structured project, are designed to transfer income to lower income groups as well as to ensure that these groups achieve a desirable level of nutrition. As the group designated to benefit from the program becomes more narrowly defined and as more measures are taken to avoid nondesignated groups from benefiting, the fiscal cost

attributed to the administration of a project increases.

Unrestricted Food Price Subsidies

Unrestricted food price subsidies are not rationed and consumers are allowed to purchase as much as they want of the subsidized commodity at the below-market price. Nor are unrestricted food price subsidies targeted to any specific group, although the program may be limited to particular times of the year when there are seasonal shortages. The below market price is maintained through direct government market interventions such as import subsidies, subsidies to processors, or sale of stocks at below free market price. Any stigma attached to participation in the program is often small if the subsidy is on a common staple and all people can readily take advantage of it. Since consumers may purchase unlimited quantities, consumption will increase through both income and substitution effects for normal goods.

Unrestricted subsidy programs have very low administrative costs because there are no expenditures for means testing or targeting criteria, issuing and printing of ration books, or ration shops to maintain. Also, unrestricted subsidies do not require large numbers of skilled personnel for administration; a key consideration in a poor country with a shortage of highly educated workers that could be put to better use elsewhere.

These programs do incur often large operating costs in the areas of procurement and distribution due to the very large quantities of food involved. The costs of such unrestricted subsidy programs tend increase over time because the large numbers of people participating in the program come to regard the subsidy as a social contract and are very sensitive to any change in the nominal value of the commodity. Even a small increase in the price at which the government (or parastatal) purchases the commodity can lead to large increases in the cost of the program.

Consumers that are not needy may participate in these programs which costs the government more than if only poorer consumers were to receive the benefit. While this constitutes *leakage* of subsidy benefits, it may be more expensive to initiate a program to screen out higher income participants if a large proportion of the population is poor and eligible. One approach to avoid this problem is to subsidize inferior goods that only poor people will buy. Another alternative has been to sell the subsidized products only in stores or markets with a high proportion of poor customers.

Food Stamps

Food stamps are stamps or coupons that may be used like cash in the purchase of food. Any state or private retailer participating in the program accepts the stamps at face value

and can redeem them for cash at a bank or government office. The number of stamps issued to a consumer depends on some income or targeting criteria.

Since food stamp programs utilize the existing market for the eligible commodities, there are no program costs associated with procurement, storage and distribution. Administrative costs can be significant though, due to the bureaucracy necessary for determining eligibility of households and preventing ineligible households from participating, as well as monitoring and reimbursing store claims. The cost of printing and securing the coupons may be substantial, especially if the issuing country does not have the facilities to print them domestically. Food stamps must be of sufficiently high quality paper and printing to deter counterfeiting.

If potential recipients cannot gain access to the program or are unable to utilize the stamps in their local market then they do not benefit from the program. If vendors are unable to readily exchange the stamps for cash or even if they feel that the government may default in honoring the stamps then they may decline to accept them or refuse to accept them at their face value. Only a well organized and efficient administration of the program can assure participants.

The principal advantage of a food stamp program over other types of food subsidies is that price distortions that result

from other schemes are largely avoided. The increased demand due to larger purchases of the program goods by those receiving the stamps, may even stimulate production and trading activity. While these benefits will be realized in a competitive market, if the market is subject to price fixing then the increased purchasing power that stamp recipients enjoy may be nullified by higher prices and non-recipients suffer a decrease in purchasing power.

Food stamps that apply to a large number of foods may be limited in their ability to effect changes in the composition of food purchases. For households receiving an amount which is less than the amount they would have spent on eligible goods in the absence of additional income, the food stamp benefit is, in effect, an income transfer only. If one objective of the food stamp program is to boost the food consumption of a particular commodity by a target amount, then a food stamp program may be less efficient than an alternative program because the quantity increase in consumption is only affected by the income transfer inherent in the subsidy. Thus, food consumption will be increased through the income effect but not through substitution effects, which are often significant in unrestricted food price subsidy schemes.

Food stamps have a face value that may only be realized by purchasing food or, in some cases, specified foods. However, recipients can sell the stamps at below face value in order to

procure cash for other purposes. Although the recipient still receives an income transfer it is reduced and another person receives part of the transfer targeted for the original recipient. This sort of leakage can be very difficult to control.

Rationing

Rationing involves restricting the quantity of a subsidized product to a per capita or per household limit. The main aim of rationing is to limit the availability of the subsidized food to within the fiscal constraints of the program. Rationing also helps to ensure that there will be sufficient supply of the subsidized commodity for the eligible households.

Rationing most often restricts quantities to less than would have been purchased in the absence of the ration and, as such, limits the income transfer inherent in the subsidy. This is important in reducing the absolute transfer to higher income households while providing a substantial relative transfer to lower income households. Targeting may be achieved also because higher income households may deem the process of obtaining a ration card or waiting in line for the subsidized product not to be worthwhile given the limited quantities.

In planning a rationing program it is necessary to evaluate

whether the savings in expenditure over an unrestricted food price program are sufficient to cover the increased administrative costs. Any reduction in expenditures through procuring, storing and distributing a smaller amount of food in a rationing program will be weighed against increased administrative costs of issuing ration cards and preventing any abuse, and the costs of operating ration shops and coordinating delivery points. Skilled local administrators, often in short supply, are needed to implement such a program.

Direct Distribution and Intervention

Sometimes food is distributed free of charge to individuals or households as either relief aid or as part of a social welfare program conducted through, for example, clinics or schools. In the case of relief programs, the recipients are too poor to buy a sufficient amount of the commodity at any price, as happens in famine situations. More often though, direct distribution of food is tied to an existing social program as an incentive for participation in the program or to increase returns realized through the program. Examples of such distribution are dried milk given to mothers participating in a well-baby program or a school feeding program that provides a meal to all school children every school day.

Food distribution often enhances returns to other program

expenditures. For example, children that receive food during the school day perform better leading to a greater return realized on education expenditures (Pollitt, 1990). Women participating in prenatal programs who receive adequate nutrition tend to give birth to fewer low birth weight children and therefore reduce child mortality (Kennedy, 1988).

Implicit Food Subsidies

An implicit subsidy allows the government to affect food prices while entailing no direct fiscal costs. This is done by constructing policies that distort prices and lead to income transfers between private sectors, often from producers to consumers. The costs involved in implicit subsidies are therefore economic and the source of much inefficiency and controversy. The twin objectives of providing low-cost food to urban residents while maintaining producer incentives are often incompatible if the government is unable to expand fiscal expenditures.

Uncompensated Price Controls

An uncompensated price control is a government decree which sets the price of a good below free market equilibrium to which traders are legally bound to comply. There is no direct subsidy expenditure on the part of the government as with unrestricted food price subsidies. These policies do not, in

the short run, entail any curtailment of supply, so that the effectiveness of the price control is dependent on the government's ability to enforce the law. Given the dispersed and informal nature of food markets in many developing countries these laws are ineffective without substantial expenditures in policing.

If price controls are enforced then there will be excess demand for the good and consumers will compete for it by queuing and trying to gain privileged access. These activities have social costs in terms of societal disruption and loss of time for productive activity. Lower prices are a disincentive to producers unless there is a compensative output or input pricing policy. The extent of these problems depends on the difference between the controlled price and the free market equilibrium. Although in the long-run, producers facing lower prices will decrease production, thus exacerbating the degree of the price distortion and leading to possible shortages.

Uncompensated price controls have shown to be effective only under exceptional conditions. In times of economic duress, such as war or famine, such price controls may work because the citizenry of a country recognize the importance of such measures and suppliers may be willing to support them in the short run.

Overvalued Exchange Rates

Many developing countries utilize exchange rate policy to achieve a number of economic goals, and lower consumer food prices are often an unintentional, yet significant, side effect. Typically, overvalued exchange rates are implemented as part of an import substitution policy regime that supplies cheap inputs to nascent industries while placing high import tariffs on finished goods. Overvaluation may also be the result of the "Dutch Disease"; that is, a boom in an enclave industry, earning large amounts of foreign currency and increasing the value of the domestic currency, while effecting no growth in other sectors of the economy.

Agricultural products, though, are usually not protected to the degree of the amount of the subsidy implicit in the overvaluation of the domestic currency. Subsequently, an overvalued domestic currency depresses domestic food prices in two ways. The first is by subsidizing imports through increasing the purchasing power of the domestic currency on the international market. The second is by creating an export barrier to domestic agricultural produce by making domestic produce more expensive on the world market.

Overvalued exchange rates further affect agricultural production through shifts in resource allocation between sectors. An overvalued currency will cause the price of tradable agricultural products to fall relative to the price

of nontradables and imports in the nonagricultural sector. In the long run, investment will be attracted away from agriculture and into nontradables and import competing sectors. As the agricultural sector contracts, there will be an increased demand for imported foods with high opportunity costs involved in financing those imports.

Tariffs, Taxes and Quotas

The government may pursue policies designed to lower food prices by affecting the supply of food in the domestic market. These policies are generally implemented at the border and take the form of export taxes and quotas. Such measures divert potential exports to the domestic market by physically limiting the amount exported, in the case of quotas, or by reducing price incentives to exporters as with export taxes. Trapping exportable commodities within the country increases the domestic supply and depresses prices to consumers.

Economic Effects of Food Subsidies

The impact that food subsidies have on other sectors of the economy can be profound, especially in poorer countries where food expenditures represent a very large share of household expenditures and where farming households make up a large proportion of the population. It is important to note that the relationship between food policy and micro- and

macroeconomic variables is integrated. That is, food policies not only affect other aspects of the economy, but are in large part constructed to meet objectives concerning those same economic aspects. This realization has brought food policy into the mainstream of economic policy making.

In countries where economic planning stresses capital-intensive industry rather than more labor-intensive forms of production, poor households may not be able to achieve incomes sufficient to meet their basic needs. Consumer food subsidies may be necessary to increase the level of welfare for poor households when few opportunities exist for adequate employment or the marketing (storage and distribution) of agricultural produce is so ineffective as to cause household food insecurity. Food subsidies may increase the productivity of household members through improved nutrition and health status.

Consumer food subsidies impact the whole range of macroeconomic variables, which is why they become a central issue in structural adjustment programs. The role of food subsidies is intertwined with the government budget, inflation, investment, wages, the balance of payments, and earnings in the agricultural sector. A careful examination of all the implications of a proposed food policy change is important to be sure that the policy serves the country's overall economic objectives.

Microeconomic Effects of Food Subsidies

Microeconomic effects of food subsidies are those effects that directly impact households (or producers) through relative price changes and income transfers embodied in the subsidy and through the increased productivity of household members whose nutritional status has been improved. If the additional real income transferred to poor households through the subsidy is, all or in part, spent in a way as to improve the health of household members then additional gains in human capital will be realized. Food subsidies change the size and composition of the household's food basket through increased purchasing power as well as changes in relative prices. Households may expend some of the increase in real income on more nutritious foods, or a greater variety of foods, thus meeting micronutrient needs as well as caloric.

Nutritional effects of food subsidies are often difficult to assess due to a lack of information on intrahousehold food distribution. It may be that those household members that are discriminated against at the household level distribution of food before a subsidy, will continue to be discriminated against after the imposition of a subsidy. Although some discrimination of particular household members may continue after the subsidy, this does not imply that the intrahousehold distribution of food is not optimal. It should be expected that the most productive members of the household will have

priority in the distribution of household resources. The productivity of some members of a household may show a greater absolute increase, for a fixed caloric investment, than other members. Through the greater productivity of particular members, the whole household may benefit proportionately more than through a more equitable initial intrahousehold distribution.

To the extent that food subsidies benefit children and pregnant and lactating mothers, long-run productivity gains may be expected to result from enhanced child development and better school performance. Once growth needs are met, children utilize additional calories to increase activity (Beaton and Ghassemi, 1982). Lethargy among malnourished children hinders the natural learning process and studies show that properly nourished children perform better in school (Pollitt, 1990).

Impacts on Agriculture

The effect that consumer food subsidies have on domestic agriculture depends on the design of the subsidy scheme, the financing of the subsidy, the agricultural policy regime of the country and characteristics of the agricultural sector. Further, the effect of consumer food subsidies on the agricultural sector can be either negative or positive depending on the supply response of farmers, and the degree to

which farmers consume their own produce.

Implicit subsidies tend to depress producer prices and, in turn, farm incomes and production. The effect of explicit subsidy programs is much less certain though. Explicit subsidy schemes enhance the purchasing power of subsidy recipients who, in turn, increase their demand for food. If the increased demand is met mostly through increasing imports then domestic producers benefit less than when the increased demand is for domestic products. If the subsidy is financed through forced procurement at below border prices (e.g. through a government sanctioned marketing board) then the effect on farm incomes and supply may differ by size of farm, region and other aspects of agricultural production.

The degree of targeting of the subsidy program will affect the nature and dimensions of the impact that the subsidy has on agriculture. Programs targeted to the poor will increase their food demand and put upward pressure on food prices. If the subsidy is sufficient to cause a shift in the composition of the poor's food basket to more preferred foods, then producers of the inferior foods may suffer.

The level of processing of subsidized foods at which they are offered to the consumer may have consequences for farm incomes. On-farm processing may be an important component of the value added to foods sold in the market by farming households. Subsidy programs that subsidize processing

enterprises, such as millers and bakers, cannot provide similar subsidies to farming households and farmers may lose a significant portion of their income generating potential.

Subsidy programs that provide their own storage, transportation and distribution systems wrest those operations from the hands of farmers and private traders. On-farm storage is discouraged through fixed price subsidies that remove the incentive to speculate on seasonal price movements. And finally, consumer food subsidies and agricultural development projects are often linked administratively and therefore compete for limited funds. Rising subsidy expenditures may lead to falling absolute or relative public investment in the agricultural sector with a negative effect on producer margins and output.

Balance of Payments

As most subsidized foods are internationally tradable, most, if not all, subsidy schemes will have an impact on trade in the subsidized good, trade in other goods, and foreign exchange holdings. In an open economy, depressed food prices as a result of a subsidy program, will cause a shift of resources out of food production and into the production of other tradables, most likely nonfood export crops. Expanded demand for food caused by lower food prices in this case could only be met through imports, thus offsetting gains in export

earnings. To the extent that the poor have a lower marginal propensity to consume nontradable goods than the rest of the population (Hazell and Roell, 1983), a subsidy targeted to the poor would further erode the country's balance of payments.

The source of funding for the subsidy program may also affect the balance of payments. If the program is funded through higher taxes then the effect on the balance of payments depends on the marginal propensity to consume tradables by those households paying the tax. If the program is funded by diverting government spending from other areas then one must consider whether the funds are drawn from the purchase of products (tradables) or from civil service salaries (nontradables).

Fiscal Costs and Inflation

The bottom line in the design and implementation of a subsidy scheme is the cost to the government. Consumer food subsidies can be very expensive in terms of the share of the government budget, the contribution to the government deficit or even the share of the gross domestic product. Large subsidy expenditures are not necessarily indicative of inefficient (in terms of a cost-benefit analysis) subsidy programs though, just as large expenditures on education, health, and defense are not indicative of inefficient resource

allocation.

Once food subsidy programs are established they can be very difficult to eliminate or even to reduce in terms of the size of the subsidy. Even small changes in food prices can lead to significant changes in the cost of the program. Rapidly rising subsidy program expenditures, without a sufficient increase in revenues, can lead to a number of problematic responses by governments. Governments may finance the program through borrowing (either domestically or abroad) increasing the fiscal deficit, or by expanding the monetary base. To accommodate larger subsidy expenditures, resources may be withdrawn from other areas; often agricultural sector investments. There is also the temptation to shift the burden of financing the subsidy onto other sectors of the economy; especially agricultural producers.

The use of foreign aid or borrowing to finance food subsidies (consumption), rather than for investment, transfers resources from future generations to the present. If deficit financing results in inflation then the burden of subsidies is put upon persons with fixed incomes, and if the subsidies maintain fixed price commodities which are largely consumed by the poor, then inflation will hit middle income consumers hardest.

Depressed producer prices as a result of decreased agricultural sector investments and fiscal burden sharing may

lead to input subsidies in an attempt to widen producer margins. These producer subsidies are an additional cost of the subsidy program.

Civil service salaries may be paid in part with food subsidies. The fiscal cost of subsidy programs is then overstated because it includes part of the public sector wage bill. Thus, any savings realized in the reduction of the amount of the subsidy may, in part, be offset by demands for pay raises by public servants.

Targeting

General food price subsidies incur relatively large fiscal costs and impact all levels of agricultural marketing. To abate these problems while still trying to provide nutritionally at-risk households with an adequate diet, programs are often targeted to households or individuals most in need or likely to benefit from the program. Most often, food subsidy programs target poor households, although households with pregnant or lactating women, small children, elderly persons or any other group that has been identified as nutritionally at-risk may be targeted.

Those households that are not at-risk do not receive the subsidy, thereby lessening the costs associated with the procurement and distribution of the food. There are costs incurred in excluding noneligibles, though. As the target

group becomes more narrowly defined, administrative costs increase and some needy households may be omitted. Targeted programs may demand large numbers of skilled administrative staff to operate which may be an inefficient allocation of personnel in a country with a shortage of highly educated workers. The degree of targeting in a food subsidy program must represent an optimal use of resources in meeting social and economic goals.

The method of targeting depends on the characteristics of the target population and the source of that population's food insecurity or shortfall. Programs may be targeted to poor households through means testing, locating outlets for the subsidized food in poor areas, or by subsidizing inferior foods that only poor people consume. Pregnant and lactating women can be targeted through well-baby programs and children through school feeding programs.

Targeting Characteristics

Individual testing for need could be very costly, so programs are usually targeted to subpopulations likely to be at nutritional or other health risk. Households that are eligible for participation in a targeted food subsidy program often qualify by having particular characteristics of food deficit households, regardless of their actual food balance situation. Those characteristics by which households are

defined for eligibility are variables which are highly correlated with observed food deficit or poverty. Households that have been defined as being in poverty are often included in targeted food subsidy programs either because it is assumed that poor households are food deficit or because of the income transfer objectives of the program.

The degree of effectiveness in reaching food deficit or poor households through a targeted scheme lies in the quality of information available to policy makers. Large household expenditure surveys are necessary for an analysis of food deficit and poor households, and are, in themselves, fraught with bias and inaccuracies. Further, there are conceptual issues in defining just what is meant by "food deficit" or "poor" households. The variables that are associated with one definition of "poor" may not be associated with another definition of "poor", and likewise with "food deficit".

The basic aim of targeting is to reduce the size of the recipient population to fiscally feasible numbers. In poor countries it is often the case that the proportion of the population that may be defined as poor is very large. At this point, the definition of a recipient population must be made to conform to an administratively feasible size so only the very poorest or most food deficit households may be included. To effectively do this there must be some measure of the degree of poverty built into the targeting variables as well.

Targeting Schemes

In designing targeted food subsidy programs one must consider the cost effectiveness of the transfer of income, the cost of the program, coverage of target households, and leakages of benefits to non-target households. The ultimate choice of a scheme, or combination of schemes, depends on existing circumstances and objectives of the program.

A measure of the cost effectiveness of an explicit food subsidy program is the share of the total cost of providing a unit of the subsidized food that is transferred to the intended recipient. The larger the share the more cost effective is the subsidy. Cost effectiveness erodes when there is leakage of benefits to non-target households or when the administrative costs of preventing leakages offset the savings from reduced subsidies.

Fiscal costs increase as the coverage of the subsidy program expands to provide benefits to all eligible recipients. Not only does the cost of the subsidy outlay increase due to the greater number of participants, but there will likely be an increase in leakages as well. Therefore, there is some conflict between coverage and leakage.

Self-Targeting

If one is able to identify a food that is in high demand by the target population but rarely consumed by the non-target

population, then a subsidy on that food will benefit primarily the target group. The subsidy will, in effect, target itself because, although all households have access to the subsidy, only the target group takes advantage of it.

When the target population is poor households, effective self-targeting is achieved by selecting foods to subsidize which are commonly consumed by poor households, have a negative price elasticity of demand among the poor (and a relatively small price elasticity among wealthier consumers), and a negative income elasticity among higher income groups (an inferior good). An example of such an inferior good is yellow corn meal in an area where white corn meal is preferred.

Children are often targeted in this manner as well. Subsidies may be put on milk, enriched weaning foods or baby formula. These foods will probably not be inferior goods, and may well be considered luxuries, but the nature of the product tends to confine the subsidy to households with small children.

The primary advantage of a self-targeted program is that it is administratively simple, thus reducing administrative costs, and the targeted nature of the program reduces leakage and controls operating costs. The program operates as a generalized price subsidy where all people are eligible to participate and therefore coverage is maximized. There is

some accounting for the level of poverty because the mix of the subsidized good and preferred foods in a household's food basket will shift with changes in income. Income transfer will be maximized through both income and substitution effects.

There are some disadvantages to self-targeting schemes though. By subsidizing an inferior, and often less expensive, food the income transfer inherent in the subsidy may be much smaller than that of a subsidy on a more preferred food, which may represent a larger share of the budget of the poor. The consumption of the product may carry a social stigma identifying the household as poor and eligible households may not participate, thus limiting coverage. Since all households are free to participate it is not possible to exclude better-off households that choose to consume the product from participating.

It may not be possible to identify a staple with the characteristics necessary for an effective self-targeting program. Even if there is such a commodity, it may not be suitable for a subsidy program due to seasonal availability, limited storage life or inadequate supply.

It is important to consider the structure of the agricultural sector before implementing a self-targeting program. The subsidization of a particular food will likely affect producer prices for that food. It may be that poor

farmers operating on marginal lands and small holdings will be most affected by the price change. Shifts in relative prices will lead to changes in the mix of agricultural output. Supply responses by the agricultural sector will be important in determining the eventual cost and feasibility of the program.

Means Testing

An administrative procedure may be incorporated into the subsidy program to certify households for participation in the program according to some set of criteria. Typically, in a poverty oriented program the set of criteria include household income, size, and composition. Means testing for participation eliminates leakages to wealthier households. Means testing is generally employed in the distribution of ration cards and food stamps where the amount of the subsidy allocated to a household is adjusted by the income level of the household.

Although means testing is a common feature of many food subsidy programs, it presents a number of, often significant, problems. Means testing is administratively complex, requiring a great number of highly literate and numerate staff and a highly structured organization. The process of certification must be dynamic in that there must be a mechanism built into the administration whereby participants

can be added and dropped from the rolls. The size and demand for skilled personnel of such an organization may account for a very large proportion of the total cost of a subsidy program.

In a program that uses income level as the primary criterion of eligibility for participation, the quality of income reporting determines the effectiveness of the program. In many developing countries there are no records of earnings and people may be unable or unwilling to accurately report their incomes. This is especially true of the self-employed and workers in the informal sector who are often among the poorest. Pervasive under-reporting of incomes by informal sector workers may discriminate against formal sector workers whose earnings are recorded but actually earn less than their informal sector counterparts.

The use of other wealth indicators such as property holdings, especially land holdings, has difficulties as well. Poorly defined land tenure or traditional land tenure systems make the use of land ownership problematic and is only appropriate in rural areas. Ownership of other assets may be difficult to verify also. Subsequently, means testing is often based on targeting indicators which are more readily apparent but may be less strongly associated with actual poverty (e.g. female headship, number of children, housing conditions, ethnic group, age and pregnancy status).

Clinic Based Targeting

Many food subsidies are targeted to children and/or pregnant and lactating women. These subsidies are often in the form of free rations provided as a component of an integrated health and nutrition project that aims to reduce infant and maternal mortality. The allocation of the subsidy and the subsidized food product depends on the objectives of the program. The subsidy may be an incentive to participate in the program or may be intended to provide the mother or child with a minimum level of nutritional adequacy.

Children are the most sensitive to nutritional insults due to the extra demands of the growth process. Anthropometric measurements such as weight for height or skin fold thickness are used to determine whether and to what degree a child may be malnourished. The presence of a malnourished child is often used as a targeting indicator for food deficit households, the assumption being that one malnourished child implies that all members are at-risk. Allocation of the subsidy may vary with the degree of malnutrition of a child.

There tends to be significant amounts of intrahousehold leakage associated with such programs. If a child receives food through a clinic or school based feeding program the parents often reduce the amount of food given to the child at home. If the ration is taken home, then it is often shared among other members of the household. While this represents a

leakage from the intended recipient (the child), the adult members of the household are often calorie deficient themselves. Allocations of food rations must take leakage into consideration if some degree of improvement in the nutritional status of the child is a goal of the program.

Geographic Targeting

Areas with a high proportion of poor households or malnourished children may be targeted for food subsidies. The geographic areas targeted may be as broad as urban areas or some provinces, or be as narrowly defined as specific villages or city neighborhoods. Often the information necessary for such targeted programs is already available through census data or nutritional surveillance programs. The subsidy functions through ration shops that are located in the identified areas or certification for participation in the program based on place of residence.

Leakage can be controlled by selling rations in small quantities so that travelling from outside the area to buy at the ration shop is not worthwhile. Rarely, though, is any area homogeneous in terms of income or consumption and so some households that do not need the subsidy will have access to it and some poor households in otherwise well-off areas will be excluded from the program.

Implications for This Study

In considering any change in the food subsidy policy framework, it is important to evaluate who will benefit from and who will be hurt by the change, what kinds of costs are entailed, and what policies best fit the economic conditions of the country. A set of politically and administratively feasible objectives must be established and then used to guide the data analysis to derive pertinent information.

This chapter has examined many issues that are relevant to the design of the analysis used for this study. A thorough understanding of food subsidy issues is essential in evaluating Zambia's past experience with food subsidy programs; as will be shown in the next chapter.

Much of the analysis of the 1991 HEIS that follows is directed towards addressing many of the issues discussed in this chapter. Chapter 5 looks at the distribution of income in Zambia; offering some insight into the potential and need for income transfer programs. In chapter 6 two poverty definitions are presented that have implications for the scale of a potential targeted food subsidy program. Chapters 7 and 8 examine the characteristics of the poor and evaluate which characteristics could be used as targeting indicators. Food consumption patterns of the poor are presented in chapter 9 to identify potential self-targeting commodities and those foods that would provide effective subsidy transfers to the poor.

CHAPTER 3.

THE HISTORY OF MAIZE SUBSIDIES IN ZAMBIA

From the earliest conception of an economic framework for what would become Zambia, agriculture was considered of secondary importance to mining. Rural communities were viewed as little more than labor reserves and markets for cheap manufactured goods. The growth of the mining sector though, required large consignments of foodstuffs to feed the miners. Commercial farms, operated by European settlers, were established to provide maize to the mines. This relationship between the mining companies and commercial farms became ingrained as the mining sector grew to dominate the economy. A series of government policies served to strengthen that relationship while ensuring continued privileges for the minority European population. One significant policy to this end was subsidies on maize. The colonial administration used maize pricing policies to generate rents for the commercial farmers and to set wage levels in urban areas, while transferring much of the burden of the subsidy onto the backs of small African producers.

Independent Zambia inherited this set of policies but made few fundamental changes. The Zambian economy continued to be dominated by the copper mines while agriculture stagnated. Consumer subsidies for maize became a matter of social

contract, jealously guarded by the mine worker's union. The crash in copper prices in the early 1970s resulted in ever increasing budget deficits as revenues fell and the cost of maintaining subsidies mushroomed. The administration of President Kenneth Kaunda faced a series of tough choices; how to bring the budget under control while not alienating his party's political base.

Pre-independence

The genesis of maize subsidies may be traced back to the labor policies of the British South Africa Company (BSAC). The BSAC administered the territories of Northern and Southern Rhodesia where it held the rights to extensive mineral deposits. In its early expansionist fervor, the BSAC built a railroad crossing the Zambezi River and north to the coal and lead deposits. These mines proved unprofitable in the short term though, especially given the large base-infrastructure expenditures necessary to exploit them. The most productive mines were in Southern Rhodesia diverting attention away from future development of Northern Rhodesia. The BSAC viewed the north primarily as a labor reserve for the southern mines, to be extorted through the imposition of a 'native tax' payable only in British sterling.

The mines paid their African employees in part with food. The provision of large consignments of foodstuffs to the

mines required a reliance on maize which is suited to the soils of the Central Plateau region of Northern Rhodesia and stores well. Maize then became the new staple of the African miners, replacing sorghum, millet and cassava.

The demand for agricultural products generated by the mining proved a boon to many African farmers, so much so that the BSAC began to grant the best farm land along the line of rail to European settlers in order to profit from transportation revenues and land speculation. As the large commercial farms of the white settlers expanded, African farmers were squeezed out through increased land rents. This pushed the Africans to the native reserves where the land was so poor that commercial farming was unfeasible and working in the mines was the only way to meet their taxes and buy manufactured goods.

At the same time, policies ostensibly meant to encourage soil conservation, placed restrictions on traditional agricultural systems that employed slash and burn cultivation. The marketing infrastructure for African produce was left undeveloped and the administration even went as far as physically blocking indigenous agriculturalists from entering the cash market (Fry, 1979). These policies acted in concert to provide a cheap source of labor to the mines and commercial farms with little regard for the impact they had on the traditional economy. As a result there was substantial labor

migration from the traditional, rural economy to the urban mining sector, leaving the rural areas with a labor shortage and a subsequent shortfall in agricultural production (Fry, 1979).

In 1924 the BSAC turned the unprofitable administration of the territory over to the British Government. The new colonial administration took a somewhat more enlightened attitude in its relations with indigenous peoples and living standards for those living in urban areas improved. In 1927 some mines began to transport wives and even whole families to accompany the miners, resulting in an increased rate of urbanization (Fry, 1979). Still, European settlers enjoyed significantly more privileges than their African counterparts.

With the introduction of the plow into native farming systems in the 1930s, African farmers were able to move from a negligible surplus production to capturing 40% of the local maize market (Fry, 1979). European producers became concerned that this increase in production would result in an oversupply of maize and, subsequently, low prices. In 1935 the white settler farmers successfully lobbied the government to establish the Maize Control Board. By the late 1930s the colonial government had constructed a system of price and marketing controls that discriminated against African produce on grounds of inferior quality or under the assertion that increased African production would result in soil exhaustion.

The Maize Marketing Board held a monopoly on maize purchases that impeded the development of private marketing networks and enforced the quotas designed to protect European farmers (Kean and Wood, 1992). These quotas set the producer price for African farmers at 30% less than that received by European producers (Kumar, 1988).

After WWII agricultural production expanded but was still unable to keep up with the demand of the new urban population. Urban consumer subsidies were expanded as the mining sector boomed. European farmers continued to enjoy price advantages in the market, albeit less than import prices, but still 25-30% higher than prices paid to African Farmers (Kean, Wood, 1992). Though the "Native Tax" was altered to be payable in-kind, cheap labor was ensured to European farmers in the 1940s through the African Labor Corps who were conscripted and then provided to the land owners at a 50% wage subsidy (Fry, 1979).

Urban wages were increasing at this time, in part due to new minimum wage laws and, in part due to the realization by the mining companies that higher wages resulted in healthier, more productive workers. In 1945 the ratio of average urban-African wages to the earnings of their rural counterparts was 1.9 but by 1953 it had increased to 3.0 (Fry, 1979). Higher urban wages were further enhanced by government maize subsidies. The resultant rural to urban migration as wages increased and new jobs opened up in the expanding mining

sector further entrenched consumer subsidies of maize into the national economy.

In the mid 1950s the Maize Control Board was eliminated and the new Grain Marketing Board centered pricing policies around the method of cultivation rather than the race of the farmer (Fry, 1979). Effectively there was no change in the discriminatory nature of the pricing policies though, as European farmers still received the higher, subsidized prices guaranteed to "improved farms" and most African farmers continued receive the lower prices. There was by this time an exportable surplus, although at a depressed world price. The large commercial farmers continued to receive subsidized maize prices, now well above export parity, while most African farmers actually received less than they had previously (Fry, 1979). Producers also enjoyed an export subsidy that encouraged increases in production beyond that which a free market would bear (Fry, 1979).

In 1957 the mining industry suffered another slump and the colonial Government responded to decreases in tax revenues by removing the export subsidy and reducing domestic consumer subsidies. The reduction in consumer subsidies also reflected a policy aimed at stemming the rural to urban migration as the mines could no longer absorb the extra workers. In the early 1960s consumer and producer subsidies were reestablished that again emphasized maize subsidies, guaranteed producer prices

and a state-run marketing board with monopoly rights. These policies stayed with the country well into independence.

Post-independence

Northern Rhodesia gained independence in 1964 but the basic grain marketing policies did not change. One exception was the removal of those policies meant specifically to protect European farmers at the expense of the small African farmers. By this time though, the large commercial estates had little to worry about from small farmers after decades of pricing policies which had put small farmers at a marketing disadvantage.

The Grain Marketing Board became the National Agricultural Marketing Board (NAMBOARD), a parastatal but without any sanctioned monopsony. But due to a pricing structure that did not allow sufficient profit margins for the unsubsidized private trade to be viable, NAMBOARD effectively operated as a monopsony (Kean and Wood, 1992). NAMBOARD bought grain from farmers at a controlled (government determined) producer price and then resold the maize to private millers who distributed the maize meal at controlled consumer prices. Estimated margins were built into the difference between the price at which the whole grain was sold to the mills and the price at which the meal could be sold. The mills, however, were also reimbursed by the government for any losses that they may have

incurred on their operations.

In an attempt to address the disparity of incomes between the large, predominantly European, farmers and the small, predominantly African, farmers the Zambian Government introduced a policy of uniform pricing for maize. NAMBOARD established buying facilities in remote areas and paid all farmers the same price for their maize. Supplying agricultural inputs at subsidized prices was also included in the mission of NAMBOARD. While this marketing structure was very effective in drawing African farmers into the maize market, the inefficiencies associated with it were significant (Kydd, 1988). Uniform pricing in conjunction with subsidized inputs encouraged maize production on marginal soils better suited to other crops.

This pricing structure was the result of a policy that aimed to achieve self-sufficiency in food production while maintaining a cheap supply of staple foods in the urban areas. The two objectives are often at odds.

Consumer subsidies became important policy tools for realizing a variety of political and economic objectives. These included setting wage levels, controlling inflation and disbursing entitlements to politically favored groups. The benefits from such initiatives accrued mainly to urban consumers, often to the detriment of rural producers. Urban consumers proved to be very sensitive to any price changes for

maize meal and any move to reduce the subsidy was met with resistance by powerful labor unions. The Government had incentives of its own to maintain the consumer subsidies. Payroll expenditures for the large civil service and burgeoning public enterprises could be reduced by depressing wages through food subsidies, part of the cost of which was borne by farmers.

In attempts to limit costs associated with the subsidy program, producer prices were depressed below export parity (Pletcher, 1986). Maize producers had no other option but to accept these prices because the over-valued Kwacha precluded export. From 1965 to 1970 the value of agricultural exports fell by nearly half while the value of agricultural imports more than doubled (Hawkins, 1991). Chronically low producer prices led to a deterioration of rural-urban terms of trade (Kean and Wood, 1992) which was estimated to have fallen by 65% from 1964 to 1980.

The early 1970s saw a slump in world copper prices and foreign exchange earnings from the mining sector fell. Higher world grain prices meant that the government now had to expend more of its foreign exchange holdings to procure sufficient maize to meet the demand created by the low, subsidized prices. The already substantial government deficit mushroomed and there were severe restrictions placed on access to the depleted national foreign exchange reserves. The large

commercial farmers who had previously provided most of the marketed maize in Zambia now were unable to procure the foreign exchange necessary to buy agricultural machinery and other inputs, and that sector of the economy stagnated too.

In 1977 the consumer subsidy on maize meal was 72%, the highest it had ever been, costing the Government of Zambia 33.5 million kwachas and representing over 10% of GDP in agriculture and 6% of the government budget (Kumar, 1988). This was clearly an unsustainable state of affairs, but by this time consumer subsidies had become regarded by urban residents as an entitlement and there was strong opposition, especially from the miner's union, to any move to reduce or abandon the subsidy. Maize subsidies had evolved from a policy to protect European farmers and subsidize the mining industry to being a political tool and a perceived right by urban workers.

By the late 1970s, in accordance with International Monetary Fund (IMF) loan conditionalities, the Government began to increase producer prices and fertilizer subsidies to try to stimulate domestic maize production. By 1980 subsidies going to NAMBOARD represented 10% of government recurrent expenditure and total subsidies to the food and agricultural sector, of which 95% went to directly or indirectly subsidize the production and consumption of maize, reached 18% of government recurrent spending. The government budget now

represented 14% of GDP (Kumar, 1988). While maize subsidies were substantially reduced in the early to mid eighties they were not eliminated.

Under sustained pressure from the IMF and donor countries to reduce consumer maize subsidies as part of its four year austerity program, the Government of Zambia announced in 1986 a change in maize subsidy policy. Self-targeting was introduced whereby the preferred grade of maize meal, called breakfast meal, was no longer going to be subsidized while the less preferred grade of maize meal, roller meal, would continue to be subsidized. The intent of this new policy was that wealthier Zambians would purchase the preferred product while poorer, needier Zambians would continue to have access to the low cost, but inferior, staple. The government would save money by no longer subsidizing the most popular maize product, which was purchased primarily by the relatively wealthy. All roller meal was quickly bought up and not restocked as merchants switched to the now more profitable breakfast meal. The price of breakfast meal increased by 120% (Mukela, 1987) while the subsidy program was effectively eliminated overnight. In early December, riots broke out in the northern mining towns of Kitwe and Ndola leaving fifteen people dead.

In 1987 President Kaunda reestablished the former subsidies stating that, "[the Government] would be committing suicide to

remove subsidies on [breakfast] meal at a time of low salaries and high unemployment." But he also added, "The economy will remain static. We will be spending the money we should have spent on social services on subsidizing consumption." He then announced the nationalization of all of the country's maize milling industries, blaming them for the food shortages.

In 1988 IMF pressures persuaded Zambian policy makers to abandon general maize subsidies for a targeted, maize coupon program. The coupon program was introduced in January of 1989 as the generalized subsidy was being phased out and other price controls were relaxed. Urban consumers could exchange the coupons at face value in the purchase of either maize product while rural consumers, with the exception of civil servants, were excluded. Initially all urban households were included in the target group so that the coupons served as a rationing scheme, limiting the amount of the subsidy each household could receive. The quantity of coupons given to a particular household was based on the number of people residing in that household, regardless of income. Targeting of the coupons began in July of 1989 after the general subsidy had been completely phased out. Any formal sector worker had to apply for coupons through his/her place of work and was ineligible if the combined income of his/her spouse was more than 20,500 kwachas per month. All informal sector workers continued to receive coupons through the government but the

number of dependents covered was limited to six.

In 1989 NAMBOARD was dissolved due to inefficiency and mounting costs, while cooperative unions were allowed to begin to function in its place. In 1990, millers, traders and cooperatives began to compete as well and producer prices rose by 25-30% while consumer prices actually began to fall due to the ability of millers to purchase directly from farmers (Kean and Wood, 1992). There was not complete liberalization of the maize market though, because the into-mill and retail prices of maize meal remained controlled.

In 1991 Zambia held its first multi-party election since the imposition of one-party rule more than twenty years before. The new president, Frederick Chiluba, ran on a platform of economic reforms including privatization of state enterprises, market liberalization, flexible exchange rates and reduced government expenditures. As part of these market reforms the coupon program was phased out and had been completely eliminated by late 1991.

While the maize subsidy program was being terminated, a drought was spreading over Southern and Eastern Africa devastating the maize crop. Zambia imported 1 million tons of maize, mostly by concessional arrangements through international relief agencies. This imported maize was both sold commercially and distributed in the worst affected rural areas through food-for-work programs.

CHAPTER 4.**DATA SOURCE**

This paper presents the results of an analysis of the 1991 Zambian Household Expenditures and Incomes Survey (HEIS). An overview of the structure and design of the survey will provide the reader with an understanding of the nature of the data. The sampling frame and weighting of observations is explained. A discussion of some of the strengths and weaknesses of the HEIS data is included with an examination of the measure of welfare, food expenditures. Finally, there is a tabular presentation of demographic variables to give a picture of the population as represented by the HEIS data.

The 1991 Household Expenditures and Incomes Survey (HEIS)

In June of 1991 the HEIS was undertaken by the Prices and Incomes Commission of the Government of Zambia with support from the U.S. Agency for International Development (USAID) and in cooperation with the Central Statistics Office of the Government of Zambia and the United Nations Development Program. The survey was undertaken with several objectives in mind, including:

- (i) To update the consumer price index to reflect current expenditure patterns
- (ii) To establish a poverty line to be used as a criterion for

eligibility for participation in the maize subsidy program

- (iii) To conduct a descriptive analysis of incomes and expenditures
- (iv) To evaluate the dietary status of households
- (v) To conduct an analysis of the distribution of income
- (vi) To evaluate parameters affecting demand for food
- (vii) To evaluate food policy alternatives.

Many of the programs supported by the Government of Zambia and world donor organizations contain poverty reduction goals. To facilitate the efficient design of programs and to effectively allocate program resources, information is needed about the characteristics of the populations that the programs are intended to serve.

The analysis presented here incorporates many aspects of the stated objectives of the survey in identifying key poverty groups, their expenditure patterns, and their sources of income. The closely related concepts of a poverty datum line and the distribution of income are important in understanding the income transfer effects of the maize subsidy program or any proposed food policy change. An analysis of the characteristics of poor households and their consumption patterns will provide information for effectively targeting food assistance programs to those most in need.

Sampling Scheme and Sample Weights of the 1991 HEIS

A multistage, stratified sampling scheme was used for the survey with the household being the unit of measure. Zambia has nine provinces which are further divided into districts. Every province was represented in the sample but the Eastern province was over-sampled in order to provide sufficient data for a separate analysis (not included here). Districts were defined as being either rural or urban and were further broken down into Census Supervisory Areas (CSA's) based on those defined for the 1990 Census of Population, Housing and Agriculture. Ten households were randomly selected from each CSA.

The three strata were: (1) the Eastern Province (which contained one urban and two rural districts), (2) rural districts and, (3) urban districts distributed among the other eight provinces. Table 1 shows the distribution of districts within strata and number of households sampled. Due to the non-random nature of the sampling scheme, weights were developed and assigned to each household in order to represent a national distribution (Loughin, Fuller, Carriquiry, 1992). This national distribution was based on the 1990 census and is constructed such that the sum of the weights is the total number of households in Zambia. All statistics presented here have utilized this weighting system.

Table 1 Sampling frame for the 1991 Zambian HEIS

Strata	Province	District	Number of Households Sampled	Number of Weighted Households
Eastern	Eastern	Chadiza	93	25,864
		Chipata	349	88,258
		Petauke	324	89,041
Rural	Central	Kabwe Rural	157	110,645
		Mkushi	73	52,872
	Luapula	Mwense	71	43,514
		Samfya	110	66,797
	Northern	Chilubi	31	18,558
		Mporokoso	57	35,113
	North-Western	Zambezi	55	65,717
	Southern	Choma	111	121,548
		Kalomo	121	145,242
	Western	Mongu	104	115,120
Urban	Luapula	Mansa	184	109,625
	Southern	Livingston	53	40,812
	Copperbelt	Kitwe	212	144,542
	Lusaka	Lusaka Urban	334	157,655
Total			2,439	1,430,923

Survey Design and Data

The 1991 HEIS collected information concerning household level expenditures, transfers and business expenses. Individual level information was collected on demographic variables and incomes. The information was collected in June of 1991, weekly for four weeks. There were 2930 households in the original sample but the data used for this report consists of 2439 households. Households were dropped from this analysis if they did not have complete identifying information or did not report food transactions in all four of the interviews. Failure to report food transactions in all four interviews was used as an indicator of an incomplete survey.

The survey consisted of six parts.

1. **Household Identification Information** includes the location of the household and name of the household head.
2. **Particulars of Household Members** includes demographic information on all individuals in the households.
3. **Household Consumption and Expenditures** includes expenditures, barter, and consumption of home production for food, beverages, and tobacco. It also includes expenditure on clothing, housing, medical care, education, recreation, transportation, communication, furniture, gifts given, and other goods and services. Quantity and value of goods were recorded.
4. **Sources of Income** includes individual level information on cash and in-kind income from salaries, wages, agriculture, manufacturing, repairs, marketing, food and catering services, informal sundry services, mining, and other sources. Other sources of income include rent, interest payments, pensions, bonuses, etc. Agricultural income includes type and quantity of foods produced as well as quantity sold, retained, and consumed. Income also includes gifts received, scholarships, and other transfers.
5. **Operational Expenses on Self-Employment Activities** includes information on business expenses incurred from agricultural, manufacturing, repairs, formal and informal marketing, food services, sundry services, other business, and mining operations.
6. **Maize Meal Coupon Survey** includes information about the household's participation in the coupon program as well as the amount of maize meal obtained through the coupon program.

Not all information was collected at each of the four visits. The food expenditures and income sections were completed on each visit while the household particulars were collected only at the first interview and the maize meal information at the last. The reporting periods varied by question so that frequent incomes and expenditures were

recorded weekly and less common incomes and expenditures were recorded for longer periods of time. These different reporting periods more accurately represent average incomes and expenditures.

The HEIS data are excellent in many ways for an analysis of poverty and expenditure patterns in Zambia but, unfortunately, much useful information was not included. The HEIS data were particularly thorough in food expenditures data though, making them well suited to an analysis of food deficit households and their consumption patterns. Also, there is information on nonfood expenditures that make it possible to examine complete household budgets. Detailed information on household food expenditures were recorded and broken down by home produced and purchased foods. The sample was sufficiently broad to include households from all regions and levels of urbanization. Food consumption patterns of various regions may be accurately identified using these data. There is a lack of information on foods consumed away from home though, and this is especially pronounced in the consumption patterns of older children. The food expenditures data then should be considered to represent the consumption patterns of households and not the consumption patterns of individual members of the household.

There are other limitations to the data. In addition to the information gathered in this survey, other factors need to

be included. The collection period was one month (June), and this period immediately follows the maize harvest. Data collected over the period of a year, rather than a single month, would more accurately represent the expenditure and income patterns of rural households, especially. Also, no information was available on the seasonal price and consumption fluctuations in which are particularly important in the post-maize harvest period. There are no data on asset holdings of households such as land, buildings, livestock, etc. Such data would provide insight into the wealth status and access to productive resources of households that expenditure and income data cannot. Nor were data on household stores of grain or food included that would provide estimates of food availability throughout the year.

For the purposes of this analysis, expenditure includes cash outlay for goods and services as well as consumption of home-produced foods during the reporting period. Income in-kind, gifts and barter were not included due to the quality of the data. Total expenditure was the sum of all expenditures and valued consumption from home-produced foods. All expenditure values were annualized since reporting periods varied for different survey items. The annualization used appropriate period weights; for example, weekly reported values were multiplied by 52.

Rental values for owner-occupied housing were not imputed

in the calculation of total expenditures. This may create differences between households who pay and report rent, compared with others. In Zambia more urban households reported rental housing costs than did rural households; hence, the reported total expenditures could be biased downwards in rural areas. However, on closer examination of the data, the bias was determined not to be a major problem. For those rural Zambians that did report housing costs, the average housing share was only about 3 percent.

Because the HEIS was undertaken during a one month period, June 1991, and not throughout the year, no seasonal variation was covered and June expenditures are assumed to be representative of annual expenditure patterns. The month of June follows the maize harvest and is a time of relative abundance during the year. Since the survey occurred at this time, the reported expenditure levels (especially for food) may be somewhat higher than if the data were collected at other times of the year. Consumption of home produced commodities is an important factor in household expenditure (especially in rural areas), and therefore the seasonal nature of the data may bias the calculated annual expenditure upwards. Using the current data there is no way to calculate the extent of this bias.

Demographic Characteristics of the 1991 HEIS

Tables 2 and 3 show the distribution of households by particular characteristics for the 1991 HEIS. The numbers and percentages of households are calculated using the weights developed by Loughin et al. (1992). The distributions are further broken down by rural and urban location with approximately 70% of HEIS households in rural areas and 30% in urban areas.

Household Size and Composition

In Table 2 the average number of household members is broken down by age and sex groups. Urban households have a larger contribution to household size from adults age 18-55 years than do rural households, but rural households have a larger contribution to average size by older adults (56+ years).

Table 2 Average number of household members by sex and age groups

Sex/Age Group	Rural	Urban	All Zambia
Females <5	0.4346	0.3650	0.4149
Females 6-12	0.6066	0.6661	0.6234
Females 13-17	0.3790	0.4523	0.3998
Females 18-55	1.1850	1.2964	1.2166
Females 56+	0.1208	0.0383	0.0974
Males <5	0.4234	0.4752	0.4381
Males 6-12	0.6777	0.6009	0.6559
Males 13-17	0.3971	0.4183	0.4031
Males 18-55	1.0086	1.3307	1.1000
Males 56+	0.1409	0.0488	0.1148
Total	5.3737	5.6920	5.4640

Table 3 shows how households are distributed by size class. Urban households have a much larger percentage of households with 9 or more members, and this is consistent with the larger average household size of urban households.

Table 3 Distribution of households by number of members for rural, urban and all Zambia

Number of Members	Rural		Urban		All Zambia	
	Number	Percent	Number	Percent	Number	Percent
4 or Less	432913	42.23	151169	37.25	584082	40.82
5-6	268034	26.15	101773	25.08	369807	25.84
7-8	216765	21.15	84971	20.94	301736	21.09
9-10	62301	6.08	50279	12.39	112580	7.87
11 or More	45070	4.40	17648	4.35	62718	4.38
Total	1025083	100.00	405840	100.00	1430923	100.00

Characteristics of the Household Head

The head of a household is generally the greatest income earner in the household and makes many of the household's expenditure decisions. Characteristics of the household head offer some insight into the ability of the household to generate income and to command resources. Table 4 shows that rural households are more likely to be headed by a woman than are urban households. This may be due to rural to urban migration of men in search of wage employment. Table 5 shows that rural households are much more likely to be headed by an older person and this is consistent with the greater number of older people living in rural areas. Table 6 shows that there are more single headed households in urban areas but more divorced headed households in rural areas. Table 7 shows that

self-employed headed households are more common in rural areas while wage and salaried employed headed households are more common in urban areas.

Table 4 Distribution of households by gender of the household head for rural, urban, and all Zambia

Gender	Rural		Urban		All Zambia	
	Number	Percent	Number	Percent	Number	Percent
Male	797270	77.78	339786	83.72	1137056	79.46
Female	227813	22.22	66054	16.28	293867	20.54
Total	1025083	100.00	405840	100.00	1430923	100.00

Table 5 Distribution of households by age group of the household head for rural, urban, and all Zambia

Age Group	Rural		Urban		All Zambia	
	Number	Percent	Number	Percent	Number	Percent
18-55	845240	82.46	384841	94.83	1230081	85.96
56+	179843	17.54	20999	5.14	200842	14.04
Total	1025083	100.00	405840	100.00	1430923	100.00

Table 6 Distribution of households by marital status of the household head for rural, urban, and all Zambia

Marital Status	Rural		Urban		All Zambia	
	Number	Percent	Number	Percent	Number	Percent
Single	61067	5.96	51602	12.71	112669	7.87
Married	778196	75.92	308738	76.07	1086934	75.96
Widowed	81612	7.96	20303	5.00	101915	7.12
Divorced	104208	10.17	25197	6.21	129405	9.04
Total	1025083	100.00	405840	100.00	1430923	100.00

Table 7 Distribution of households by employment status of the household head for rural, urban and all Zambia

Employment Status	Rural		Urban		All Zambia	
	Number	Percent	Number	Percent	Number	Percent
N/A	20997	2.05	6793	1.67	27790	1.94
Self-Employed	831272	81.09	93644	23.07	924916	64.66
Employee	138898	13.55	288404	71.06	427302	29.86
Unemployed	33916	3.31	16999	4.19	50915	3.56
Total	1025083	100.00	405840	100.00	1430923	100.00

CHAPTER 5.**DISTRIBUTION OF INCOME**

The concepts of poverty and income distribution are closely related because poverty is generally defined relative to some standard level of welfare. An analysis of the distribution of income as evidenced by the 1991 HEIS indicates how households are disbursed in the lower income ranges and the potential for progressive social welfare programs within the economy.

Expenditures as a Proxy for Income

Reported income in an expenditures and income survey such as the HEIS is often not a good measure of household income. Prior experience with expenditure and income data shows that many households are reluctant or unable to report income accurately. Poor households with irregular employment and various income sources may not know their actual incomes. Individuals that rely on the informal marketing sector may be reluctant to report their incomes accurately. Reported expenditure data tend to be more reliable and less prone to error than income data. For most households, especially in developing countries, there are few household resources available for savings so expenditure data closely approximate income.

A particular limitation to the use of consumption data for

an analysis of income distribution is differences in price levels. Respondents were asked how much of a commodity they consumed and how much they paid for it. In the case of home-produced foods, the respondents were asked to value the foods themselves. Rural households were the largest consumers of home-produced foods and the values attributed to the foods consumed may have reflected the wholesale price they would have expected to receive from a trader rather than the retail market price at which they would have had to purchase the food. It is also possible that the households reporting consumption of home-produced foods had not sold some commodities for a long period of time and were therefore unaware of current market prices. A detailed price analysis was conducted for maize products (Stampley, Jensen, and Johnson, 1992) but not for other commodities due to limited data, non-standard unit measures and the time and effort involved in such an undertaking. The food values reported by households were assumed to be accurate and representative of local prices for the purposes of this analysis. No adjustments were made for differences in prices levels across regions.

The Lorenz Function and Gini Coefficient

The distribution of income within a population is often described using two related concepts, the Lorenz function and

the Gini coefficient. The Lorenz function describes the cumulative share of the total population's income accruing to households as households become wealthier. The Gini coefficient is a summary statistic, ranging from 0 to 1, that is useful for comparing inequality in income distribution for two or more populations.

Creating Deciles

Before the Lorenz function could be estimated the households were ranked from poorest to wealthiest in terms of household expenditure and then divided into ten equal groups. The ten equal groups are referred to as deciles, with the first decile being composed of households with the lowest household expenditures and the tenth decile being those households with the highest expenditures.

Deciles were created in the following manner:

Ranking of Households All of the households in the survey were ranked according to the value their expenditure, with the household with the lowest value being ranked first and the household with the highest value ranked last.

Dividing the Population Deciles were drawn by assigning those households that make up the poorest (in terms of household expenditure) one tenth of the sample to the first decile. The next poorest one tenth of households were assigned to the second decile, and so on until the wealthiest

one tenth of households were assigned to the tenth decile. These deciles are called here "household deciles".

A set of individual expenditures was created as well to describe the distribution of expenditures among individuals. The same technique as above was used except that individuals were ranked by the per capita expenditure of the household to which they belong. Per capita expenditure is simply the household expenditure divided by the number of people living in that household with no adjustment made for household composition. Deciles contain equal numbers of individuals rather than households. These deciles are called here "individual deciles".

Decile means were calculated as the arithmetic average of the values of the variable in question for that decile.

Estimating the Lorenz Function

A discrete Lorenz function was estimated using the deciles as constructed above. Household expenditures were summed across each decile and then divided by the sum of household expenditures for the entire data set to yield the share of total, national expenditure going to that decile. The Lorenz function is then the running total of the decile shares. The same process was used for estimating the individual Lorenz function.

Estimating the Gini Coefficient

The calculation of the Gini coefficients was independent of any decile designation and was calculated from continuous valued data. The Gini coefficient was calculated as presented by Fei, Ranis and Kwo (1979) using the following technique.

$$G_y = \alpha\mu_y - \beta$$

where

$$\alpha = 2/n,$$

$$\beta = (n+1)/n, \text{ and}$$

$$\mu_y = \delta_1 Y_1 + \delta_2 Y_2 + \dots + \delta_n Y_n, \text{ where}$$

$$Y_1 \leq Y_2 \leq \dots \leq Y_n \text{ and}$$

$$\delta_1=1, \delta_2=2, \dots, \delta_n=n.$$

In this formula y is either the household expenditure of the i^{th} household or the per capita expenditure of the i^{th} individual, and n is the number of households or individuals in the population. δ is the income rank of the i^{th} household or individual.

Results

Table 8 shows the share of national expenditure by household and individual decile groupings. The household shares indicate a higher degree of inequality than do the individual shares due to the effect of household size. Larger households tend to be wealthier in absolute terms but poorer in per capita terms than do smaller households. Therefore, the use of household level expenditure overstates inequality.

The Gini coefficient for household level expenditure distribution is .4586 while that for individual level expenditure distribution is .4354. Both per capita and household expenditure showed a great amount of variance with CV's ($CV = (\text{std}/\text{mean}) * 100$) of 696% and 285% respectively.

Table 8 Share of national expenditure by decile groupings

Decile	Households		Individuals	
	Share	Cumulative Share	Share	Cumulative Share
1 (lowest)	.0176	.0176	.0214	.0214
2	.0299	.0474	.0344	.0557
3	.0393	.0868	.0429	.0986
4	.0485	.1353	.0534	.1521
5	.0598	.1951	.0638	.2159
6	.0747	.2698	.0763	.2922
7	.0967	.3666	.0933	.3855
8	.1244	.4909	.1177	.5032
9	.1665	.6574	.1564	.6596
10 (highest)	.3426	1.0000	.3404	1.0000
	G=.4586		G=.4354	

Note: deciles are either household or individual

The Zambian economy shows a strong differential between rural and urban expenditures and the distribution of expenditures. Table 9 shows that both household and per capita expenditures are about twice as high in urban as in rural areas.

Table 9 Mean annual household and per capita expenditures by rural, urban and all of Zambia

Expenditure	Rural	Urban	All Zambia
Household	42,540	91,030	56,293
Per Capita	7,916	15,993	10,302

Table 10 shows the share of rural expenditure by household and individual deciles. Households show substantially greater inequality than do individuals, again due to the effect of household size. The Gini coefficient for rural household level expenditure distribution is .4410 while that for individual level expenditure distribution is .3985.

Table 10 Share of rural expenditures by decile groupings

Decile	Households		Individuals	
	Share	Cumulative Shares	Share	Cumulative Shares
1 (lowest)	.0207	.0207	.0248	.0248
2	.0338	.0544	.0387	.0635
3	.0439	.0984	.0492	.1127
4	.0531	.1515	.0573	.1700
5	.0630	.2145	.0678	.2378
6	.0748	.2894	.0812	.3190
7	.0907	.3800	.0947	.4137
8	.1161	.4961	.1190	.5327
9	.1574	.6536	.1556	.6883
10 (highest)	.3464	1.0000	.3117	1.0000
	G=.4410		G=.3985	

Note: deciles are either household or individual

Table 11 shows the share of urban expenditure by household and individual deciles. Unlike rural and national expenditure distributions, the urban expenditure distributions show greater inequality at the individual level than at the household level. While urban households show no particular trend in household size across household deciles, larger households tend to be poorer in per capita terms and therefore their members are more likely to fall into the lower individual deciles. The Gini coefficient for urban household

Table 11 Share of urban expenditure by decile groupings

Decile	Households		Individuals	
	Share	Cumulative	Share	Cumulative
		Shares		Shares
1 (lowest)	.0261	.0261	.0266	.0266
2	.0404	.0665	.0401	.0668
3	.0522	.1187	.0484	.1152
4	.0639	.1826	.0573	.1726
5	.0752	.2579	.0667	.2393
6	.0876	.3454	.0804	.3197
7	.1016	.4470	.0934	.4132
8	.1225	.5695	.1158	.5289
9	.1487	.7182	.1534	.6823
10 (highest)	.2818	1.0000	.3177	1.0000
	G=.3619		G=.3964	

Note: deciles are either household or individual

level expenditure distribution is .3619 while that for individual level expenditure distribution is .3964.

Conclusion

The Gini coefficients show that there is a great amount of inequality in the distribution of expenditures in Zambia. The distribution of expenditures among households is more unequal than among individuals in rural areas due to the effect of household size. Urban households show more inequality among individuals because larger households tend to be poorer in per capita terms. There is a greater degree of inequality in the distribution of expenditures in rural areas than in urban areas.

CHAPTER 6.**MEASURES OF POVERTY**

Before one can begin to describe the characteristics of "poor households", it is necessary to first define exactly which households are "poor". To this end, there must be some assertion of a measure of welfare by which households can be rated. A cut-off point value of the measure of welfare can then be established that signifies that those households below the cut-off are deficient in the measure of welfare and those households above the cut-off are sufficient. This cut-off point is referred to as the poverty datum line (PDL).

The primary objective of this study is to describe the characteristics of food deficit households. Therefore, the measure to be used to compare the welfare status of different households will be food consumption as indicated by food expenditures. This chapter deals with how the PDL was established and its implications for identifying food poor households.

After a discussion of the concept of a poverty datum line, the reader is carried through the steps and the rationale of the process used to create the PDL used for this study. First, a set of weights was constructed that was used to standardize food expenditures to make them directly comparable between households. Then, two PDLs were established by

defining the 20% of the population with the lowest standardized food expenditures as the "extreme poverty group" and the 50% of the population with the lowest standardized food expenditures as the "poverty group". Finally, the poverty definitions, as established for the use of this study, are compared with alternative poverty definitions to examine the usefulness of other measures of welfare in identifying food deficit households.

Poverty Datum Line

A meaningful poverty level, or poverty datum line (PDL), provides a criterion for defining members of the population that are living in poverty, and can be used to monitor fluctuations in the incidence, prevalence, and depth of poverty. Those households or individuals defined to be in poverty have incomes less than this reference amount. In practice, the choice of a PDL is a subject of considerable debate. Using an absolute measure, such as a minimum food consumption level or market basket of goods to ensure survival, is one approach. This requires some agreement about the physical requirements for the selected living standard, and good information about household access to goods and services that meet the basic needs. Since the HEIS was undertaken in a one month period, it likely does not fully represent the true consumption pattern over the entire year,

and therefore does not lend itself to define an absolute poverty line.

One could also employ a relative measure of poverty that defines "poor" relative to the general living standard of the country. Relative measures are typically defined in terms of some proportion of the population that receives the lowest incomes. While such a PDL is useful for describing the characteristics of the poorer segment of a population, it is based on strictly subjective criteria and does not allow for any change in the incidence of poverty over time.

The PDL defined for this study is a relative measure. Since the objective of this study is to describe the characteristics of poor households, a relative measure will suffice. This may present a problem should future researchers wish to compare changes in poverty over time. In that case, the value of the food expenditure below which households have been defined to be poor in this study could be adjusted for inflation and used to define poverty in a future study.

The PDL presented here was established by first determining a set of scales for adjusting for household size and composition that expresses each household member as a fraction of an adult. These were estimated based on the food expenditures data. Next, deciles were constructed based on per adult equivalent food expenditures (the standardized food expenditure measure). Those households that fell in the first

two deciles were defined to be in the "extreme poverty" group and those households that fell into the bottom five deciles were defined to be in the "poverty " group.

Per adult equivalent food expenditures were used as the measure of welfare of households because food provides for a basic need and represents a major share of the budgets of poor Zambian households. This use of per adult equivalent food expenditures means that the definition of poverty presented here should be thought of as "food poverty", that is a shortfall in food consumption (expenditure), and not necessarily a shortfall in income.

Adjusting for Household Size and Composition

The 1991 HEIS expenditure data are aggregated by households. Before a meaningful comparison of nutritional welfare can be made across households, food expenditures must be converted to standard units. The most direct method for standardizing food expenditures is to simply divide the expenditure of a household by the number of persons in that household. This approach is limited though, for comparisons of household welfare because it does not allow for the differing needs of adults and children. The level of food expenditure necessary to properly nourish a child is less than that necessary for an adult, but a per capita standardization gives each the same weight. To address this issue a set of

weights was calculated that expresses each member as a fraction of an adult. The sum of the weights represents the number of equivalent adults in the household. Household food expenditure divided by the number of equivalent adults in the household (per adult equivalent food expenditure) provides a measure of nutritional welfare that is more readily comparable across households.

There are several methods of calculating adult equivalence scales, each with its own strengths and weaknesses. The method used here closely follows that outlined by Goungetas and Johnson (1992) in their work on U.S. food stamp program parameters (the reader is referred to Goungetas and Johnson for a more thorough and formal presentation of the method used here). This method is rooted in the estimation of Engel relationships with commodity specific and income scales as first put forward by Prais and Houthakker (1955). The advantage of this method is that it allows for commodity specific equivalence scales. Since the variable of interest in this study is food expenditures, the specific commodity on which the equivalence scales are based is food.

Estimation of the Equivalence Scales

Engel functions were estimated for total food expenditure using the composition of the household, in terms of age distribution and sex and age distribution. No consideration

was given to economies of scale in larger households. Five different age groups were defined:

1. Children less than six years old.
2. Children from six to less than thirteen years of age.
3. Teenagers from thirteen to less than eighteen years of age.
4. Adults from eighteen to less than 56 years of age.
5. Adults fifty six years of age or older.

The following Engel functions were estimated:

$$\text{Linear: } C_i = \sum_{i=1.5} \pi_g [n_{gi} \{ v + (y_i/n_i) \}] \quad (1)$$

$$\text{Semilogarithmic: } C_i = \sum_{i=1.5} \pi_g [n_{gi} \{ v + \ln(y_i/n_i) \}] \quad (2)$$

$$\text{Double-Logarithmic: } C_i = \sum_{i=1.5} \pi_g [n_{gi} (y_i/n_i)^b] \quad (3)$$

Before the Engel functions could be estimated, per capita food expenditure was regressed on per capita income to generate starting values:

$$x_i/n_i = a + b (y_i/n_i) \text{ for the linear model,}$$

$$x_i/n_i = a + b \ln(y_i/n_i) \text{ for the semilog model,}$$

$$\ln(x_i/n_i) = a + b \ln(y_i/n_i) \text{ for the double_log model,}$$

where

x_i is the food expenditure for the i^{th} household,

n_i is the number of members of the i^{th} household,

a is the intercept term,

b is the slope coefficient,

y_i is the income of the i^{th} household,

and \ln is the natural logarithmic operator.

v was calculated as the ratio of a/b .

Next, each of the five π_g are estimated by regressing food expenditure on

$n_{gi}[v+(y_i/n_i)]$ for the linear model,

$n_{gi}[v+\ln(y_i/n_i)]$ for the semilog model

$n_{gi}[(y_i/n_i)^b]$ for the double-log model

where n_{gi} is the age specific or age/sex specific number of members in the i^{th} household, π_g is the age group or age/sex group specific parameter to be estimated, and v , y_i , b , and n_i are as defined above. Each estimation is performed using ordinary least squares (OLS) regression.

The estimation method used in estimating equations (1), (2) and (3) is a nonlinear algorithm available in SAS (Statistical Analysis System). Equations (1) through (3) were estimated using PROC NLIN in SAS using the Gauss-Marquardt convergence method. The OLS estimates of π_g were used as initial values for respective coefficients in the PROC NLIN procedure.

The adult equivalence scales were calculated as the parameter estimate for each of the π_g 's divided by the parameter estimate for π_4 (the 18-56 year old, adult group) in the case of the age specific scales, and π_{44} (18-56 year old males) in the case of the age/sex specific scales. This

assigned an adult equivalence of 1.00 to an adult (18-56 years old) in the case of the age specific scales, and an adult equivalence of 1.00 to an adult male in the case of the age/sex specific scales.

Results All equations converged automatically. The adult equivalence scales are presented in Table 12. The set of equivalence scales used for this paper were from the linear model.

The linear set of scales was chosen because it appeared to be the most "reasonable" of all of the sets of weights. The linear scales show an unusually low weight for the 56+

Table 12 Adult equivalence scales for each of the five age groups and age/sex groups

Age Group	Linear Model	Semilog Model	Double-Log Model
0-5 years	0.4681	0.3650	0.4259
6-12 years	0.6627	0.4344	0.6189
13-17 years	0.7349	0.3766	0.6118
18-55 years	1.0000	1.0000	1.0000
56+ years	0.4247	0.8582	0.7519
<u>Age/Sex Group</u>			
males 0-5	0.5742	0.2916	0.5667
males 6-12	0.5790	0.3179	0.5937
males 13-17	0.9502	0.4147	0.9401
males 18-55	1.0000	1.0000	1.0000
males 56+	1.7215	0.8417	1.6358
females 0-5	0.2556	0.3930	0.0260
females 6-12	0.7538	0.4743	0.0725
females 13-17	0.4995	0.2710	0.4786
females 18-55	0.9595	0.6896	0.9320
females 56+	0.0248	0.6959	0.0194

years age group but, the semilogarithmic and double-logarithmic scales contain the unusual feature that 13-17 year olds are weighted less than the 6-12 year olds. Considering that there is a larger proportion of the population that is in the 6-17 year age range (38%) than the 56+ age range (4%), it was felt that the linear scales would more accurately represent the needs of the population.

The semilogarithmic function has the theoretical advantage of allowing for a decreasing propensity to consume food at higher income levels. Whereas, the food budget share does decrease among households, the HEIS data still show large food budget shares among the top income groups. This may be a feature of the survey design of the HEIS or it may be true that food continues to be the most important expenditure for Zambian households at all levels of income. In either case, the additional feature of decreasing propensity to consume food at higher income levels allowed by the semilogarithmic function does not provide an improved description of food expenditure over the linear function.

Deciles

The measure of welfare used in this analysis is per adult equivalent food expenditure (as defined in the above section). Deciles were created in the same manner as described in chapter 5 except that households have been ranked by per adult

equivalent food expenditure. Again, the first decile is composed of households with the lowest values of per adult equivalent food expenditure and the tenth decile is composed of those households with the highest values of per adult equivalent food expenditure. The deciles will be referred to in tables as "Per Adult Deciles".

Determining the PDL

Two poverty lines were drawn, defining the poorest 20% of households as the "extreme poverty" group, and the poorest 50% of households as the "poverty" group (Table 13). The extreme poverty group is then a subset of the poverty group. This use of a relative poverty line is justifiable in the absence of data upon which to derive an absolute measure of poverty (which, in the case of the 1991 HEIS is the lack of standardized measures for foods).

Two poverty lines were drawn to examine the characteristics of the extreme poor, or destitute, and the poor. This use of two poverty definitions allows comparison of the depth of poverty among groups. The use of two poverty definitions may also be useful in determining the administrative feasibility of a poverty reduction program. A poverty definition that includes a very large percentage of the population may be of little use if the government is unable, financially or administratively, to provide services and transfers to that

many households. The government may choose, instead, to concentrate on the poorest of the poor. An extreme poverty group also provides a "bulls-eye" for targeted programs, whereby any leakage of benefits to wealthier households still go to relatively poorer households.

The per adult equivalent food expenditure cut points for defining the extreme poverty group and the poverty group were set at the highest value of per adult equivalent food expenditure for the second and fifth deciles, respectively. Based on these measures the extreme poverty group had per adult equivalent annual food expenditures no greater than

Table 13 Maximum and mean per adult food expenditures (Kwacha) by per adult food expenditure deciles

Per Adult Decile	Maximum Per Adult Food Expenditure	Mean Per Adult Food Expenditure	
1 (lowest)	3471.16	2619.06	
2	4581.78	4022.25	↑ extreme poverty
3	5579.52	5084.56	
4	6487.06	6053.94	
5	7848.14	7138.65	↑ poverty
6	9302.41	8485.03	
7	11050.02	10102.96	
8	14270.06	12477.55	
9	19877.15	16673.79	
10 (highest)	162500.65	34064.62	

K4582, and the poverty group had per adult equivalent annual food expenditures no greater than K7848. These poverty groups should be thought of as defining the "food poor" instead of those households that are poor in terms of income. As used here poverty is synonymous with food deficit.

Comparison of Alternative Poverty Measures

Poverty is defined here in terms of per adult equivalent food expenditures in order to identify those households suffering from food deficits. An advantage of this approach, over that of using food shares or some measure that includes non-food expenditures as well (such as total expenditures), is that it includes in the extreme poverty and poverty groups households that are in a position where they are obliged to meet large non-food expenditures and households that happened to report a large non-food expenditure during the survey period. These households would have lower per adult equivalent food expenditures but also lower food shares and higher total expenditures. It may be assumed from the low per adult equivalent food expenditures that these households are food deficit. All such households will be included in the poverty groups defined here but may not be included if households were ranked by total expenditure or food share.

The nature of the poverty lines established here invite comparison with rankings based on other criteria. The reader will recall that two poverty lines based on per adult equivalent food expenditure have been set to define the extreme poverty group and poverty group at 20% and 50% of the population, respectively. Would ranking households by other criteria misidentify some of these food insecure households? Alternative ranking schemes included ranking by per capita

expenditure, household expenditure, and per capita food expenditure. Poverty lines for these alternative rankings were also set at the poorest 20% and the poorest 50% of households, for the "extreme poverty" and the "poverty" groups respectively, thereby allowing for direct comparisons of all poverty definitions. The poverty lines based on per adult equivalent food expenditures are assumed to define "truly" poor households. A cross tabulation of the alternative poverty lines indicates what percentage of truly poor households would be defined as poor by the alternative definition and what percentage of truly not poor households would be defined as not poor by the alternative definition.

Measures of Misclassification

Misclassification tables, such as Table 14 below, are useful in interpreting the accuracy of targeting indicators. The targeting indicator plays the role of the "alternative indicator" and the poverty line criterion defines "true poverty".

There are a number of useful measures that can be calculated from a misclassification table. Sensitivity and specificity are two measures of the validity of targeting indicators. Sensitivity is defined as the probability of a household being categorized as poor by the targeting indicator given the household is truly poor. Specificity is defined as

Table 14 A typical 2x2 misclassification table

Poverty as Classified by Alternative Indicator		True Poverty	
		Yes	No
Yes	a	b	
No	c	d	

Source: Hennekens and Buring (1987)

Note: cell values are expressed in numbers of households

Sensitivity = $a/(a+c)$

Error of Exclusion = $c/(a+c)$

Specificity = $d/(b+d)$

Error of Inclusion = $b/(b+d)$

Positive Predictive Value = $a/(a+b)$

Negative Predictive Value = $d/(c+d)$

the probability of a household being categorized as not poor by the targeting indicator given that the household is truly not poor.

Ideally, a targeting indicator should be highly sensitive and highly specific but in practice there is often a trade off between the two measures. The relative effectiveness of two targeting indicators may be assessed by adding the sensitivity and specificity, preferring the indicator with the larger sum. A highly sensitive test will usually result in a large number of households that are not truly poor being categorized as poor. A highly specific test will usually result in a large number of households that are truly poor being categorized as not poor.

Error of exclusion and error of inclusion are useful for designing a set of criteria by which to judge the eligibility of a household for participation in a poverty reduction

program. A targeting indicator that has low error of exclusion but not necessarily a low error of inclusion should be used for the initial screening. The point here is to err on the side of caution and include any households that may qualify for the program while excluding households that almost certainly do not qualify. In subsequent screenings a low error of inclusion is important to reduce the number of households who are not truly poor from remaining in the program.

Positive predictive value is defined as the probability that a household is truly poor given it has been categorized as poor by the targeting indicator. Negative predictive value is defined as the probability that a household is truly not poor given that it has been categorized as not poor by the targeting indicator. Highly sensitive targeting indicators reduce the likelihood that a truly not poor household will be categorized as poor and therefore will have a greater negative predictive value. Likewise, a highly specific targeting indicator reduces the likelihood that a truly poor household will be categorized as not poor and therefore will have a greater positive predictive value.

Results

Tables 15 and 16 present misclassification tables for the alternative poverty measures. The cells in Tables 15 and 16

report percentages of all households rather than numbers of households to facilitate the reader's understanding of the results.

A cross-tabulation of alternative definitions of the extreme poverty group (lowest 20%) indicates that the rankings by household expenditure misclassifies more households than a ranking by per capita expenditure or per capita food expenditure. Table 15 compares the per adult equivalent food expenditure defined extreme poverty group with the household expenditure defined extreme poverty group. Ranking by household expenditure misclassifies 45.55% of truly extremely poor households as not extremely poor, and 11.40% of truly not extremely poor households as extremely poor. Table 15 also compares the per adult equivalent food expenditure defined extreme poverty group with the per capita expenditure defined extreme poverty group. Ranking by per capita expenditure misclassifies 19.48% of truly extremely poor households as not extremely poor and 4.90% of truly not extremely poor households as extremely poor. Table 15 also shows the results of comparing the per adult equivalent food expenditure defined extreme poverty group with the per capita food expenditure defined extreme poverty group. Ranking by per capita food expenditure misclassifies 8.10% of truly extremely poor households as not extremely poor and 2.03% of truly not extremely poor households as extremely poor.

Table 16 compares the per adult equivalent food expenditure defined poverty group with the household expenditure defined poverty group. Ranking by household expenditure misclassifies 26.68% of truly poor households as not poor and 26.62% of truly not poor households as poor. Table 16 also compares the per adult equivalent food expenditure defined poverty group with the per capita expenditure defined poverty group. Ranking by per capita expenditure misclassifies 19.48% of truly poor households as not poor and 4.90% of truly not poor households as poor. Table 16 compares the per adult equivalent food expenditure defined poverty group with the per capita food expenditure defined poverty group. This ranking misclassifies 5.89% of truly poor households as not poor and

Table 15 Misclassification of extreme poverty by alternative poverty definitions

Extreme Poverty as Classified by Household Expenditure		True Extreme Poverty	
		Yes	No
	Yes	10.86%	9.13%
	No	9.09%	70.92%
sensitivity=.5445			
specificity=.8860			
Extreme Poverty as Classified by Per Capita Expenditure			
	Yes	16.06%	3.92%
	No	3.89%	76.12%
sensitivity=.8052			
specificity=.9510			
Extreme Poverty as Classified by Per Capita Food Expenditure			
	Yes	18.34%	1.63%
	No	1.62%	78.42%
sensitivity=.9190			
specificity=.9797			

5.85% of truly not poor households as poor.

These comparisons show that household expenditure is a poor indicator of the food insecurity of a household. Household expenditure as a defining variable demonstrates low sensitivity and specificity. Per capita expenditure is remarkably accurate in terms of specificity but sensitivity for the extreme poverty group is low. Per capita food expenditure as a defining variable most closely approximates poverty groups defined by per adult equivalent food expenditure of the three alternative measures. All three alternative measures show lower sensitivity for the extreme poverty groups than the poverty groups and higher specificity for the poverty groups than for the extreme poverty groups.

Table 16 Misclassification of poverty by alternative definitions

Poverty as Classified by Household Expenditure		True Poverty	
		Yes	No
	Yes	36.65%	13.31%
	No	13.34%	36.70%
		sensitivity=.7332	
		specificity=.7338	
Poverty as Classified by Per Capita Expenditure			
	Yes	44.10%	5.88%
	No	5.89%	44.13%
		sensitivity=.8821	
		specificity=.8825	
Poverty as Classified by Per Capita Food Expenditure			
	Yes	47.05%	2.95%
	No	2.95%	47.08%
		sensitivity=.9411	
		specificity=.9415	

CHAPTER 7.

THE DISTRIBUTION OF POVERTY AND CHARACTERISTICS OF THE POOR

The 1991 HEIS contained much information about the demographic composition, geographic location, and income sources of households. Many of these variables have been shown to be highly associated with poverty in developing countries (Kennedy, 1992). This chapter presents a variable by variable analysis of each variable's association with the poverty groups defined in the previous chapter.

Each of these variables is a potential candidate for use as a targeting indicator. To assess the appropriateness of each of the variables as a targeting indicator, three different types of analyses are used. A set of decomposable poverty indices were calculated that indicate which groups within the variables have higher incidence of poverty, and which groups contain the most poor households. A decile analysis describes the distribution of characteristics at different levels of per adult equivalent food expenditure. A misclassification analysis, conducted with respect to targeting to particular groups within variables, gauges the effectiveness of particular targeting indicators in terms of reaching the poor and eliminating the nonpoor. The results from the misclassification analysis has implications for the cost effectiveness of targeting by a particular indicator.

Variables

The set of variables examined in this chapter are as follows:

Rural/Urban Location: This designation is based on the administrative definitions of Census Supervisory Areas (CSAs) established for the 1990 Census of Population, Housing and Agriculture. The rural/urban status of each household is based on the designation of the CSA in which it is located.

Provinces: This indicates the province of Zambia in which the household is located. There are nine provinces: Eastern, Central, Copperbelt, Luapula, Lusaka, Northern, North-Western, Southern, and Western.

Household Size: This is the number of members in the household at the time of the HEIS. The household size in equivalent adults is the number of members in a household at the time of the HEIS after each member has been weighted by his/her age specific adult equivalence scale.

Dependency Ratio: This was calculated as the number of children (less than 18 years of age) in a household divided by the number of adults (18 years old or older) in that household. This is a measure of the burden of the household in providing for children.

Percentage of Preschoolers Per Household: This was calculated as the ratio of the number of children less than six years old in a household to the total number of people in

the household.

Gender of the household head: This is whether the person who is identified as the head of the household is a man or a woman.

Age Class of the Household Head: This may be either 18-55 years old or 56+ years old. Younger household heads describes household heads in the 18-55 years age range, and older household head describes heads in the 56+ years age range. All HEIS households had a head in one of these two age groups.

Educational Level of the Household Head: This includes five designations: 1) no schooling (never attended any sort of formal schooling), 2) primary only (left school before entering secondary school), 3) secondary only (completed some or all secondary schooling but did not go on to attend any higher education), 4) higher education (completed some higher education or graduated from an institution of higher education), 5) not applicable (a bit of a mystery, but it probably means not available).

Marital Status of the Household Head: This includes four designations: 1) Single (never married at the time of the HEIS), 2) Married (in a conjugal relationship, however informal, at the time of the HEIS), 3) Widowed (former spouse had died by the time of the HEIS), 4) Divorced (no longer living with former spouse at the time of the HEIS).

Employment Status of the Household Head: This includes four designations: 1) self-employed (employed in an enterprise that is owned by the same individual at the time of the HEIS), 2) employee (employed in an enterprise which is owned by another individual at the time of the HEIS), 3) unemployed (not employed at the time of the HEIS), 4) not applicable (e.g. retired or disabled at the time of the HEIS).

Sources of Income: This is the number of different sectors from which the members of a household receive income. The different sectors are salaried or wage employment, agriculture, manufacturing and repairs, trading and marketing, food and catering, informal sundry services, other sources, and mining and quarrying.

Poverty Indices

Poverty indices measure the incidence and severity of poverty for a population. These measures are useful in comparing poverty among two or more populations. The aggregate poverty measures presented in this study were calculated using the method first proposed by Foster, Greer, and Thorbecke (1984) and known as FGT poverty measures. The advantage of FGT poverty measures is that the measure of poverty for the entire population may be decomposed by subpopulations, so that the sum of the subpopulation poverty measures is the poverty measure for the population as a whole.

Using this technique it is possible to compare the incidence and severity of poverty between subpopulations as well as examine which subpopulations contribute the most to total poverty. Subpopulations are referred to in this paper as groups.

All poverty measures are calculated with respect to the two poverty datum lines defined in the previous chapter and the results for each poverty group are reported.

The FGT poverty measure, P_α , is calculated as follows:

$$P_\alpha = 1/n_j z^\alpha \sum_{i=1}^{q_j} (z - f_i)^\alpha$$

Where

z is the poverty line,

α is a parameter that determines the type of index to be calculated,

f_i is the per adult food expenditure of the i^{th} household whose per adult equivalent food expenditure is below the poverty line,

n_j is the number of households in the j^{th} group,

and the summation takes place over those households whose per adult equivalent expenditure is below the poverty line ($i=1, \dots, q$).

The parameter α is a measure of poverty aversion with different α values weighting the depth of poverty of each household differently. A value of 0 weights all poor households equally, yielding the proportion of households with

income below the poverty level in a given group. An α value of 1 gives the income gap; a measure of the depth of poverty but with no greater emphasis placed on poorer households. An α value greater than one puts more weight on poorer households by increasing exponentially the summed value of the distance between z and f_i . For this analysis an α value of 2 was used which is a common practice in the analysis of poverty in developing countries.

This index can be readily decomposed in order to compare the incidence of poverty among different groups. The proportion of poor in each group was simply calculated as n_q^j/n_j , where n_q^j is the number of poor households in the j^{th} group and n_j is the number of households in the j^{th} group. The percentage contribution to total poverty was calculated as follows:

$$100 (n_j/n) (P_\alpha^j/P_\alpha)$$

Where

n_j is the number of households in the j^{th} group;

n is the number of households in the entire sample;

P_α^j is the P_α measure for the j^{th} group;

P_α is the P_α measure for the entire sample;

Rural and Urban Populations

Zambia's economy is highly dualistic with a modern/urban sector and a traditional/rural sector. The urban sector tends

to have much higher wages and access to subsidized commodities and government provided services.

As Table 17 shows, the food poverty level is relatively high in rural areas regardless of which poverty datum line is used. The upper PDL indicates that 59% of rural households are in poverty compared to 28% of urban households. Using the extreme poverty datum line the difference is even more remarkable with 25% of rural households in poverty but only 6% of urban households. The rural population of Zambia has the vast majority of food deficit households, and a higher incidence and level of food poverty than do urban areas.

Table 17 Poverty levels by rural, urban and all of Zambia

Location	Level of Poverty	Contribution to Total Poverty (percent)	Average Per Adult Expenditure by Poor (Kwacha)	Poor in Each Group (percent)
Extreme Poverty				
Rural	0.8269	95.78	3271.22	25.45
Urban	0.0920	4.22	3827.31	6.08
All Zambia	0.6185	100.00	3319.28	19.95
Poverty				
Rural	3.0684	88.39	4855.82	58.80
Urban	1.0175	11.61	5680.63	27.60
All Zambia	2.4867	100.00	4985.07	49.95

Table 18 shows the percent of households by rural and urban location, both within decile (first two columns) and within location among deciles (last two columns). It can be seen that the lower deciles are made up of mostly rural households while the upper deciles are predominantly urban.

Table 18 Percent of households by rural/urban location

Per Adult Deciles	Deciles Distributed by Rural and Urban Location		Rural and Urban Location Distributed by Deciles	
	Rural	Urban	Rural	Urban
1	96.11	3.89	13.41	1.37
2	86.59	13.41	12.03	4.71
3	82.54	17.46	11.51	6.15
4	78.74	21.26	10.96	7.48
5	77.78	22.22	10.94	7.89
6	67.75	32.25	9.45	11.36
7	73.25	26.75	10.20	9.41
8	57.39	42.61	8.04	15.07
9	56.09	43.91	7.79	15.40
10	40.34	59.66	5.66	21.16

A misclassification analysis was performed using rural location of the household as the alternative poverty definition. Targeting extremely poor households by rural location is highly sensitive (sensitivity=.91) and has a low error of exclusion (error of exclusion=.09). The error of inclusion is fairly high though (error of inclusion=.67), so targeting to all rural households would result in many not poor households being included in the target group.

Targeting poor households by rural location, again, is highly sensitive (sensitivity=.84) and has a low error of exclusion (error of exclusion=.16). The error of inclusion is also fairly high (error of inclusion=.59), so targeting to all rural households would result in many not poor households being included in the target group. Targeting to rural locations though, would exclude those 28% of urban households that are poor from being included in the target group.

Provinces

Households in the Eastern, Luapula, and Southern provinces contribute the most to the number of households nationally that fall below the extreme poverty datum line (Table 19). Eastern, Luapula, North-Western and Southern provinces all have disproportionately large percentages of extremely poor households. The depth of poverty is greatest in households in Eastern, Luapula and Southern provinces for those households falling below the extreme PDL.

Table 19 Poverty levels by province

Province	Level of Poverty	Contribution to Total Poverty (percent)	Average Per Adult Expenditure by Poor (Kwacha)	Poor in Each Group (percent)
Extreme Poverty				
Central	0.6574	12.15	3601.72	20.10
Copperbelt	0.1644	2.68	3864.66	10.51
Eastern	1.4567	33.44	2944.75	38.43
Luapula	0.7007	17.41	3299.32	24.41
Lusaka	0.0405	0.72	3905.69	3.30
Northern	0.2437	1.48	3684.66	12.50
North-Western	0.6560	4.87	3406.53	22.35
Southern	0.7447	25.88	3418.52	22.20
Western	0.1047	1.36	3243.68	9.38
Poverty				
Central	3.6885	16.95	5188.89	53.30
Copperbelt	1.7526	7.12	5497.82	36.51
Eastern	3.8632	22.06	4292.74	68.77
Luapula	2.4632	15.23	4901.14	58.37
Lusaka	0.5694	2.52	5834.67	19.49
Northern	1.3707	2.07	5892.09	52.48
North-Western	2.9200	5.39	4912.46	58.89
Southern	2.9531	25.53	4822.70	51.13
Western	0.9697	3.14	5743.95	45.07

Households in the Central, Eastern, Luapula, and Southern provinces contribute the most to the number of households nationally that fall below the poverty datum line. Eastern, Luapula, North-Western and Southern provinces all have

disproportionately large percentages of poor households. The depth of poverty is greatest in the households of the Central, Eastern, North-Western and Southern provinces for those households falling below the poverty datum line.

Size Distribution of Households

The impact of household size and composition on food poverty has been referred to previously in this report. A closer look at the distribution of household size across food expenditure deciles and the relation of household size to food poverty is presented here.

Table 20 shows that the average household size of rural households decreases at higher per adult deciles. Urban household sizes tend to increase up to the fourth decile and then begin to decrease. These trends are still evident after household size has been expressed in adult equivalents. Nationally there is a clear trend for household size, both actual and expressed in adult equivalents, to decrease with higher deciles. Rural households are slightly smaller than urban households with 5.37 and 5.69 average number of members, respectively. Households of four or fewer members have the greatest percentage of female heads of households and larger households had lesser percentages of female heads (Stampley, Jensen and Johnson, 1992).

Larger households, those with six or more members,

Table 20 Distribution of household size by deciles

Per Adult Decile	Mean Household Size			Mean Household Size in Equivalent Adults		
	Rural	Urban	All Zambia	Rural	Urban	All Zambia
1	6.43	6.82	6.44	4.95	5.43	4.97
2	6.22	6.95	6.32	4.79	5.45	4.88
3	6.15	7.32	6.35	4.69	5.61	4.85
4	5.72	7.68	6.13	4.42	6.09	4.77
5	5.17	7.36	5.65	3.95	5.85	4.37
6	5.12	7.14	5.77	3.96	5.64	4.50
7	5.00	6.07	5.29	3.83	4.80	4.09
8	4.37	5.65	4.92	3.39	4.47	3.85
9	4.66	4.63	4.65	3.55	3.79	3.66
10	2.74	3.39	3.13	2.06	2.81	2.51

contribute the most to the extreme poverty group (Table 21). Households with more than five members contribute the most to the poverty group. Both the extreme poverty and poverty groups show increasing percentages of households falling below the PDL in each household size group as the size of the

Table 21 Levels of poverty by household size

Household Size	Level of Poverty	Contribution to Total Poverty (percent)	Average Per Adult Expenditure by Poor (Kwacha)	Poor in Each Group (percent)
Extreme Poverty				
1	0.0009	0.01	3766.67	1.84
2	0.0240	0.33	3267.05	6.73
3	0.0728	1.47	3484.57	12.61
4	0.2664	5.65	3185.89	19.16
5	0.3545	7.74	3349.05	21.68
6	0.5259	10.50	3389.82	25.17
7	0.9725	17.53	3302.74	28.12
8	1.0635	17.08	3317.27	28.18
9	1.1575	7.62	3375.51	27.28
10 or more	2.4248	32.07	3194.78	25.52
Poverty				
1	0.0078	0.02	5936.20	8.25
2	0.1200	0.41	5450.58	28.65
3	0.3587	1.80	5373.39	38.99
4	0.8808	4.65	5021.30	48.95
5	1.4309	7.77	5087.81	56.32
6	2.2781	11.31	4854.71	59.32
7	3.5438	15.89	4698.12	61.39
8	4.2741	17.08	4786.24	58.95
9	4.9808	8.15	4956.75	62.64
10 or more	10.0077	32.93	4910.24	67.08

household increases.

A misclassification analysis on household size concluded that the best cutoff points for household size is five members for both the extreme poverty and poverty groups. Targeting extremely poor households by household size greater than or equal to five is fairly sensitive (sensitivity=.76) with a relatively low error of exclusion (error of exclusion=.24). The high error of inclusion for targeting extremely poor households by size greater than or equal to five would result in many not extremely poor households being included in the target group (error of inclusion=.55). Therefore, some additional set of indicators or means testing would be necessary to weed out ineligible households.

Targeting poor households by household size greater than or equal to five is also fairly sensitive (sensitivity=.71) with a fairly high error of exclusion (error of exclusion=.29). The error of inclusion for targeting poor households by size greater than or equal to five is also fairly high and would result in many not poor households being included in the target group (error of inclusion=.47).

Gender of the Household Head

Female headship is a more complicated issue than it may at first appear. Table 22 shows that the incidence of poverty and extreme poverty are not very different for female headed

households than for male headed households. What makes the issue of female headship complicated is that female headed households have higher average food shares at almost every decile than male headed households (table 23). This result is consistent with the findings of Kumar (1979) that the propensity to consume food is higher for women's incomes than men's incomes.

If female headed households spend a greater share of their income on food than do male headed households then a definition of poverty based on food expenditure will

Table 22 Poverty levels by gender of household head

Gender	Level of Poverty	Contribution to Total Poverty (percent)	Average Per Adult Expenditure by Poor (Kwacha)	Poor in Each Group (percent)
Extreme Poverty				
Male	0.6311	81.09	3332.58	19.49
Female	0.5696	18.91	3273.10	21.73
Poverty				
Male	2.6042	83.22	5038.93	50.72
Female	2.0319	16.78	4760.20	47.00

Table 23 Food shares of all households and female headed households by deciles

Per Adult Decile	Male Headed Households Mean Food Share	Female Headed Households Mean Food Shares
1 (lowest)	.8052	.8391
2	.8060	.8399
3	.7830	.8431
4	.7911	.8281
5	.7873	.8657
6	.7703	.7946
7	.7643	.8461
8	.7487	.7396
9	.7285	.7668
10 (highest)	.7216	.7504

discriminate against female headed households. This is because they may be spending more on food but have lower actual incomes. Further, a higher propensity to consume food by female headed households makes food subsidies more effective in meeting the nutritional needs of the recipients.

Age Distribution of Households

Table 24 shows a tendency for the dependency ratio (number of children/number of adults) to decrease at higher deciles. This trend holds for the rural and urban areas as well as all of Zambia.

Table 24 Mean dependency ratios by deciles

Per Adult Decile	Mean Dependency Ratio		
	Rural	Urban	All Zambia
1	1.63	1.11	1.61
2	1.49	1.42	1.48
3	1.53	1.85	1.58
4	1.52	1.50	1.52
5	1.41	1.39	1.40
6	1.30	1.38	1.32
7	1.24	1.28	1.25
8	1.01	1.36	1.16
9	1.08	0.98	1.03
10	0.52	0.67	0.60

Table 25 shows that the percentage of preschoolers in a household does not show much of a trend, except at the highest deciles where it begins to fall.

Although households headed by older persons (56+ years) have a higher incidence of poverty than households headed by

Table 25 Percent of household members less than six years old (preschoolers) by per adult deciles

Per Adult Decile	Percent of Household Members Less Than 6		
	Rural	Urban	All Zambia
1	15.40	13.69	15.34
2	17.34	12.54	16.70
3	15.81	14.82	15.64
4	14.22	10.63	13.45
5	15.46	18.21	16.07
6	14.29	15.31	14.62
7	13.06	16.59	14.01
8	12.55	14.61	13.43
9	11.66	11.18	11.45
10	9.85	10.41	10.18

younger persons (18-55 years), the vast majority of the poor are in households headed by younger persons. For the national population, the differences in percent of poor in each group for both poverty lines are not especially dramatic (Table 26). This indicates that targeting households with older heads at the national level would be ineffective because it would exclude most poor households while not reaching a particularly poverty-prone group.

For urban households only, households headed by older persons are much more likely to be in poverty (Table 27).

Table 26 Level of poverty by age class of household head-All Zambia

Age Class	Level of Poverty	Contribution to Total Poverty (percent)	Average Per Adult Expenditure by Poor (Kwacha)	Poor in Each Group (percent)
Extreme Poverty				
18-55	0.6400	88.95	3319.57	20.13
56+	0.4869	11.05	3317.37	18.88
Poverty				
18-55	2.5360	87.67	4964.59	49.70
56+	2.1847	12.33	5106.15	51.49

Table 27 Level of poverty by age class of household head-Urban

	Level of Poverty	Contribution to Total Poverty (percent)	Average Per Adult Expenditure by Poor (Kwacha)	Poor in Each Group (percent)
Extreme Poverty				
18-55	0.0914	94.18	3817.07	5.53
56+	0.1034	5.82	3891.85	16.09
Poverty				
18-55	0.9645	89.89	5697.05	25.94
56+	1.9880	10.11	5545.90	57.96

While it is still the case that the majority of urban poor households are headed by a younger person, the large proportion of urban households that are headed by an older person that are in poverty, suggests that age of the household head is a useful indicator for urban poverty.

Educational Level of the Household Head

Table 28 shows that the greatest incidence of extreme poverty is among the no education group while the primary only group contributes the most to total extreme poverty. The same is true for the poverty group.

Misclassification analysis showed that the most effective targeting indicator by educational level is for the combined groups, no education and primary schooling only. For rural areas and all of Zambia the sensitivity of this indicator was high while the error of exclusion was low (Table 29). This held for both the extreme poverty and poverty groups. This indicator was much less effective for urban areas though, with fairly low sensitivity and fairly high errors of exclusion, regardless of which poverty line was used.

Table 28 Level of poverty by educational status of head of household

Education	Level of Poverty	Contribution to Total Poverty (percent)	Average Per Adult Expenditure by Poor (Kwacha)	Poor in Each Group (percent)
Rural				
Extreme Poverty				
No Education	0.9541	28.48	3234.41	30.69
Primary Only	0.8950	61.44	3257.17	26.82
Secondary Only	0.5740	9.91	3415.55	16.51
Higher Ed	0.0016	0.01	3859.74	0.84
Not Applicable	0.1127	0.17	3798.35	20.50
Poverty				
No Education	3.4207	27.52	4753.91	63.72
Primary Only	3.3096	61.23	4796.40	61.59
Secondary Only	2.1976	10.22	5125.81	43.89
Higher Ed	0.5019	0.49	6426.64	39.98
Not Applicable	1.3044	0.54	5014.46	50.74
Urban				
Extreme Poverty				
No Education	0.1489	9.90	3954.45	19.95
Primary Only	0.1481	58.39	3728.50	7.65
Secondary Only	0.0451	21.05	3925.05	4.05
Higher Ed	0.0695	10.66	3680.93	2.46
Not Applicable	0.0000	0.00	0.00	0.00
Poverty				
No Education	1.9169	11.52	4753.91	63.72
Primary Only	1.3264	47.30	4796.40	61.59
Secondary Only	0.7791	32.88	5125.81	43.89
Higher Ed	0.5516	7.65	6426.64	39.98
Not Applicable	1.2222	0.65	5014.46	50.74

Table 29 Misclassification measures for targeting to households headed by a person with no or primary schooling only. By rural, urban and all Zambia

Poverty Group	Measure	Rural	Urban	All Zambia
Extreme Poverty				
	sensitivity	.8961	.6570	.8755
	specificity	.2134	.5911	.3391
	error of exclusion	.1039	.3430	.1245
	error of inclusion	.7866	.4089	.6609
Poverty				
	sensitivity	.8622	.5734	.8170
	specificity	.2537	.6330	.4095
	error of exclusion	.1378	.4266	.1830
	error of inclusion	.7463	.3670	.5905

Marital Status of Household Head

Households in which the household head has never been married tend to fall into the upper deciles. This reflects the same finding that households in which only one person resides tend to fall into the higher deciles.

Households with married, widowed and divorced heads show no particular trend across deciles (Table 30). Households with a married head contribute the most to total poverty and extreme poverty (Table 31). None of the marital status groups show an exceptionally disproportionate number of poor households.

Table 30 Percent distribution of marital status of household heads by deciles

Per Adult				
Decile	Single	Married	Widowed	Divorced
1	4.55	80.24	7.37	7.84
2	4.04	80.76	8.17	7.03
3	4.00	81.29	8.45	6.27
4	6.57	75.48	4.84	13.11
5	2.35	80.00	7.66	9.99
6	3.51	81.92	6.03	8.54
7	7.24	76.60	6.42	9.74
8	8.92	77.26	7.16	6.66
9	13.32	66.79	9.12	10.76
10	24.18	59.31	6.01	10.49

Table 31 Levels of poverty by marital status of household head

Marital Status	Level of Poverty	Contribution to Total Poverty (percent)	Average Per Adult Expenditure by Poor (Kwacha)	Poor in Each Group (percent)
Extreme Poverty				
Single	0.3267	4.16	3013.41	10.89
Married	0.6831	83.89	3322.19	21.14
Widowed	0.6085	7.01	3313.52	21.77
Divorced	0.3379	4.94	3470.44	16.41
Poverty				
Single	1.1677	3.70	4815.50	27.29
Married	2.7535	84.11	4972.13	52.31
Widowed	2.0685	5.92	4909.71	51.23
Divorced	1.7238	6.27	5245.84	48.92

Employment and Sources of Income

Rural households show a pattern of increased wage employment by the household head as deciles increase, but no particular trend for any other employment status (Table 32).

Table 32 Percent of deciles by employment status of household head - all of Zambia

Per Adult Decile	Self- Employed	Wage Employee	Unemployed	Not Applicable
1	79.75	12.43	2.92	4.90
2	76.91	17.95	3.47	1.66
3	75.00	19.86	4.09	1.06
4	75.08	19.94	3.16	1.81
5	64.91	28.26	5.41	1.41
6	60.82	33.32	4.23	1.64
7	62.90	31.56	3.22	2.23
8	58.31	36.61	3.06	2.03
9	48.44	47.85	2.88	0.84
10	44.39	50.72	3.31	1.16

Self-employed household heads are more common in rural areas than in urban areas. Urban household heads are more likely to be wage and salaried workers than are rural households.

Households with self-employed heads contribute the most to total poverty and total extreme poverty (Table 33).

Households headed by wage earners show a lower incidence of poverty and extreme poverty than other employment groups.

Table 34 shows the average number of different income sources for households by decile. Sources of income are by sector, e.g. wages and salaries, informal sector earnings, agriculture, etc. This variable is important in examining the

Table 33 Levels of poverty by employment status of household head

Employment Status	Level of Poverty	Contribution to Total Poverty (percent)	Average Per Adult Expenditure by Poor (Kwacha)	Poor in Each Group (percent)
Extreme Poverty				
Self-Employed	0.7547	78.88	3286.31	24.18
Employee	0.3124	15.08	3514.60	10.15
Unemployed	0.4057	2.33	3532.36	17.91
Not Applicable	1.1806	3.71	2994.83	33.70
Poverty				
Self-Employed	2.9480	76.63	4876.06	57.42
Employee	1.4540	17.46	5414.14	32.99
Unemployed	2.3432	3.35	5303.52	53.59
Not Applicable	3.2775	2.56	4261.52	55.81

Table 34 Average number of different income sources

Decile	All Zambia	Rural	Urban
1	0.8862	0.8709	1.2637
2	1.0798	0.9750	1.7559
3	1.1674	1.0868	1.5481
4	1.3198	1.2161	1.7039
5	1.2093	1.0725	1.6881
6	1.3103	1.1293	1.6905
7	1.4014	1.3086	1.6558
8	1.4280	1.2964	1.6054
9	1.4200	1.3493	1.5102
10	1.3130	1.1527	1.4213

role of diversity in the economic base of a household and its welfare. The number of different sources of income increases as deciles increase up to about the eighth decile and then begin to fall. Urban households show more different sources of income than do rural households at all deciles.

Conclusions

The preceding analysis identified a number of demographic, geographic and income source variables that would be useful as

targeting indicators. There are differences in per adult equivalent food expenditures among provinces, and within provinces there are much lower per adult equivalent food expenditures in rural areas than in urban areas. Households with more members tend to have lower per adult equivalent food expenditures than households with fewer members, especially those households with larger numbers of children. Urban households with an older head (56+ years) are more likely to be food-poor than are households with younger heads (18-55 years). Households that are headed by a person with little or no education are much more likely to be food-poor than households headed by a person with some secondary or higher education. Among rural households, a variety of income sources is associated with an improvement in per adult equivalent food expenditures.

The preceding analysis presented some results on the inclusivity and exclusivity of households in the truly extreme poverty and truly poverty groups when defined by alternative targeting indicators. These are important results because they suggest the cost effectiveness and targeting effectiveness of various targeting indicators.

CHAPTER 8.**FOOD CONSUMPTION WELFARE**

The objective of this chapter is to identify which potential targeting indicators are statistically significant in predicting per adult equivalent food expenditure and in predicting which households fall into the extreme poverty group and the poverty group. Two regression techniques were employed in this analysis. Ordinary least squares regression was used to analyze predictors for per adult equivalent food expenditure. Probit analysis was used to analyze which variables were significant predictors for the inclusion of households in the extreme poverty and poverty groups. A discussion of those predictors found to be statistically significant at the 95% confidence level follows a description of the variables and regression techniques. Tables of the regression results are found at the end of the chapter.

Independent Variables

The set of independent variables for the welfare regression and each of the probit regressions are the same. These variables reflect many of the potential targeting indicators that were revealed in the previous chapter. Definitions for each of the independent variables included in the regressions are presented below.

Intercept: is the constant term.

Household Size: is the number of members of the household.

Percent Preschoolers is as defined in the previous chapter.

Dependency Ratio: is as defined in the previous chapter.

Female Headship: is a dummy variable that =1 if the household head is a woman, and =0 if the household head is a man.

Single Head: is a dummy variable that =1 if the household head has never been married, and =0 otherwise.

Widowed/Divorced: is a dummy variable that =1 if the household head is either widowed or divorced, and =0 otherwise.

Older Head: is a dummy variable that =1 if the household head is 56 years of age or older, and =0 otherwise.

No Education: is a dummy variable that =1 if the household head has no formal schooling, and =0 otherwise.

Primary Education Only: is a dummy variable that =1 if the household head has at least some primary education but no education at any higher level, and =0 otherwise.

Higher Education: is a dummy variable that =1 if the household head has some higher education, and =0 otherwise.

Self-Employed: is a dummy variable that =1 if the household head is self-employed, and =0 otherwise.

Unemployed: is a dummy variable that =1 if the household head is unemployed, and =0 otherwise.

Sources of Income: is as defined in the previous chapter.

Rural Location: is a dummy variable that =1 if the household is located in a rural area, and =0 if it is located in an urban area.

% Food Purchased: is the ratio of the household's expenditure on purchased foods to the household's total food expenditure (purchased and home produced foods).

Welfare Analysis

The measure of welfare used here is the natural log of per adult equivalent food expenditure. Due to some fundamental differences between rural and urban Zambia in terms of access to food, education and employment, separate analyses were conducted for rural and urban households in addition to a combined data set. The results of the three regression runs are presented in Table 35.

An ordinary least squares regression was performed on the set of demographic, geographic and food consumption variables listed above in order to identify which variables were significant in estimating the level of a household's food expenditure. Variables to be included on the right hand side of the equation were chosen because of their relevance to identifying potential targeting indicators.

Probit Analyses

Probit analyses were conducted to identify significant predictors for inclusion of households into each of the poverty groups. The probit regressions were conducted using the statistical software package SHAZAM. Again, separate analyses were conducted for rural and urban areas, and all of Zambia. Table 36 presents the results of the probit regression for the "extreme poverty group". Table 37 presents the results of the probit regression for the "poverty group".

Results

Household size was found to be a statistically significant predictor for food expenditure in the welfare regression. The coefficient has a negative sign reflecting the finding that larger households tend to have lower per adult equivalent food expenditures. Household size was also significant in predicting extreme poverty and poverty in the probit regressions.

For rural areas and all of Zambia the percentage of preschoolers in a household decreases at higher deciles (Table 25). This is borne out by the welfare regression and the probit regressions as well. Percent of preschoolers is negatively associated with per adult equivalent food expenditure, although not significantly. The probit analysis revealed that percent of preschoolers is positively associated with both the extreme poverty and poverty groups, but again, not significantly so.

The dependency ratio variable was found to be a statistically significant predictor for per adult equivalent food expenditure in the welfare regression for rural and all Zambia with a negative coefficient. The dependency ratio was significant in predicting poverty for the rural areas and all of Zambia but not for urban areas. It was not a significant predictor of extreme poverty.

Female headship was not an important predictor for per

adult equivalent food expenditure, nor was it important in predicting inclusion in the extreme poverty group. Female headship was important in predicting inclusion in the poverty group for rural households.

Urban households headed by a person that has never been married are associated with higher per adult equivalent food expenditure while this factor has no effect in rural areas.

Urban households headed by a person who is either widowed or divorced tend to have higher per adult equivalent food expenditures although this appears to have no impact on inclusion in the poverty groups.

Rural households headed by an older person (56+ years of age) are associated with higher per adult equivalent food expenditures and are less likely to be included in the extreme poverty and poverty groups. This is not true, however, for urban areas where older headed households are more likely to be included in the poverty group.

The various educational levels of the household head had significant coefficients in the welfare analysis and the probit analyses. No education and primary education only were associated with lower per adult equivalent food expenditure as well as inclusion in the extreme poverty and poverty groups. Higher education was associated with higher per adult equivalent food expenditures and not being included in the extreme poverty and poverty groups. Primary only and higher

education were not significant predictors for inclusion in the extreme poverty group for urban areas, although no education was significant and had a large coefficient. Rural household heads tend to have lower levels of education than do urban household heads. However, it may be seen from the separate urban and rural analyses that educational level remains significant in predicting per adult equivalent food expenditure, and therefore, is not simply a confounder of the rural/urban dichotomy. The difference in levels of educational attainment may be a factor in the rural/urban split in welfare.

Being self-employed is positively associated with per adult equivalent food expenditures in rural areas only. Being an employee is not significantly associated with inclusion in the extreme poverty or poverty group, nor with per adult equivalent food expenditures.

The welfare and probit analyses show that the number of different sources of income is positively associated with per adult equivalent food expenditure and exclusion from the extreme poverty and poverty groups for all of Zambia and, especially, rural areas. This points out that off-farm income is an important factor in alleviating rural poverty.

Rural location is a significant, and negative, predictor of per adult food expenditure. Rural location is also a significant predictor of inclusion in the poverty group and,

especially, the extreme poverty group. This again confirms that Zambia's food deficit problem is overwhelmingly a rural phenomenon.

The welfare analysis shows that as the percentage of the total food budget made up by purchased foods increases, per adult food expenditure increases. This may, in part, reflect the under-valuation of home produced foods as discussed in chapter 4, but it, most likely, reflects a greater dependence on home produced foods among poorer households. The probit analyses bear this out. Percent of food purchased is significantly associated with exclusion from the extreme poverty and poverty groups. The coefficients are largest for the urban only analyses, indicating a greater reliance on the commercial food market for wealthier urban households.

Table 35 Ordinary least squares food expenditure estimation

Variable	Estimated Coefficient		
	All Zambia	Rural	Urban
Dependent Variable:			
Natural Log of Per Adult Equivalent Food Expenditure			
Independent Variables:			
Intercept	9.2050 (119.49)	8.9213 (109.32)	9.2395 (48.10)
Household Size	-0.0633 (-14.04)	-0.0536 (-10.10)	-0.0962 (-11.42)
Percent Preschoolers	-0.0447 (-0.56)	-0.0620 (-0.66)	-0.0048 (-0.04)
Dependency Ratio	-0.0524 (-4.33)	-0.0583 (-4.09)	-0.0237 (-1.04)
Female Headship	0.0061 (0.15)	0.0405 (0.79)	-0.0956 (-1.40)
Single Head	0.1808 (3.75)	0.0122 (0.19)	0.3066 (4.39)
Widowed/Divorced	0.0902 (2.01)	0.0707 (1.32)	0.1572 (1.99)
Older Head	0.2423 (6.68)	0.2754 (6.85)	-0.0604 (-0.66)
No Education	-0.2953 (-7.05)	-0.2708 (-5.30)	-0.3353 (-3.79)
Primary Education Only	-0.2188 (-6.95)	-0.2005 (-4.73)	-0.2056 (-4.65)
Higher Education	0.3300 (6.17)	0.2185 (2.38)	0.3828 (6.50)
Self-Employed	0.1005 (1.92)	0.1378 (2.16)	0.0244 (0.27)
Employee	-0.0420 (-0.73)	0.0065 (0.08)	-0.1177 (-1.42)
Sources of Income	0.0789 (5.14)	0.1255 (6.29)	0.0131 (0.57)
Rural Location	-0.1482 (-3.82)	-	-
% Food Purchased	0.5150 (9.94)	0.4891 (8.08)	0.8192 (4.92)
F value	81.948	34.55	35.44
R squared	0.3366	0.2249	0.4007
Adjusted R squared	0.3325	0.2184	0.3894
Observations	2439	1682	757

note: t-statistics are reported in parentheses

Table 36 Probit estimation for the extreme poverty measure

Variable	Estimated Coefficient		
	All Zambia	Rural	Urban
Dependent Variable:			
Dummy Variable:			
=1 if below extreme poverty line			
=0 if not below extreme poverty line			
Independent Variables:			
Intercept	-1.3092 (-6.12)	-0.8080 (-4.04)	-0.6838 (-1.03)
Household Size	0.0843 (7.84)	0.0874 (7.52)	0.0656 (1.95)
Percent Preschoolers	0.2315 (1.11)	0.3005 (1.32)	-0.2389 (-0.39)
Dependency Ratio	0.0242 (0.78)	0.0275 (0.82)	0.0357 (0.39)
Female Headship	0.1913 (1.63)	0.1877 (1.47)	0.3846 (1.00)
Single Head	-0.1590 (-1.06)	-0.0224 (-0.13)	-1.3085 (-1.72)
Widowed/Divorced	-0.2938 (-2.33)	-0.2573 (-1.89)	-0.7315 (-1.69)
Older Head	-0.3299 (-3.43)	-0.3834 (-3.73)	0.2137 (0.68)
No Education	0.5721 (5.07)	0.4771 (3.74)	0.9464 (3.09)
Primary Only	0.3395 (3.70)	0.2756 (2.54)	0.3595 (1.92)
Higher Education	-0.7303 (-2.78)	-1.4621 (-2.51)	-0.2279 (-0.74)
Self-Employed	-0.1486 (-1.06)	-0.1645 (-1.07)	-0.2459 (-0.58)
Employee	0.2472 (1.48)	0.1243 (0.62)	0.4237 (1.08)
Sources of Income	-0.2486 (-5.52)	-0.3183 (-6.08)	-0.0467 (-0.48)
Rural Location	0.4160 (3.46)	-	-
% Food Purchased	-0.7575 (-5.39)	-0.5907 (-3.82)	-1.7985 (-3.49)
Log Likelihood	-1218.90	-953.99	-173.47
Observations	2439	1682	757

note: t-statistics are given in parentheses

Table 37 Probit estimation for the poverty measure

Variable	Estimated Coefficient		
	All Zambia	Rural	Urban
Dependent Variable:			
Dummy Variable:			
=1 if below poverty line			
=0 if not below poverty line			
Independent Variables:			
Intercept	-0.3687 (-2.03)	0.0749 (0.40)	-0.3184 (-0.60)
Household Size	0.0981 (9.49)	0.0837 (7.11)	0.1678 (7.15)
Percent Preschoolers	0.0798 (0.43)	0.1690 (0.79)	-0.0603 (-0.15)
Dependency Ratio	0.1230 (4.27)	0.1353 (4.03)	0.0572 (0.95)
Female Headship	-0.3233 (-3.23)	-0.3362 (-2.92)	-0.2009 (-0.90)
Single Head	-0.1200 (-0.98)	0.0475 (0.32)	-0.3850 (-1.47)
Widowed/Divorced	0.1107 (1.05)	0.0997 (0.83)	0.0781 (0.33)
Older Head	-0.3078 (-3.68)	-0.3947 (-4.34)	0.5499 (2.29)
No Education	0.5937 (6.06)	0.5685 (4.90)	0.7120 (3.03)
Primary Only	0.3740 (5.09)	0.3676 (3.86)	0.2946 (2.43)
Higher Education	-0.3916 (-2.78)	-0.0300 (-0.14)	-0.7681 (-3.70)
Self-Employed	-0.1865 (-1.48)	-0.2469 (-1.63)	-0.0944 (-0.37)
Employee	-0.0153 (-0.11)	-0.1645 (-0.88)	0.1827 (0.76)
Sources of Income	-0.1606 (-4.35)	-0.2386 (-5.16)	-0.0356 (-0.54)
Rural Location	0.2616 (2.85)	-	-
% Food Purchased	-0.8090 (-6.72)	-0.7025 (-5.16)	-1.5902 (-3.52)
Log Likelihood	-1690.60	-1139.30	-445.98
Observations	2439	1682	757

note: t-statistics are given in parentheses

CHAPTER 9.**FOOD CONSUMPTION PATTERNS**

An understanding of the diets of target households is essential for creating effective food policy. Targeted food subsidies should be on those foods that the target population consumes most often or on foods that fill a nutritional deficiency in their diets.

This chapter seeks to identify trends in the composition of the diets of households by level of per adult equivalent food expenditure. A decile analysis is presented using the deciles as created in chapter 7 (whereby households have been ranked on per adult equivalent food expenditure). The reader should bear in mind that the extreme poverty group consists of the first and second deciles and that the poverty group consists of the first through fifth deciles.

Food Shares and Food Expenditures

Mean food budget shares were computed as the mean of the ratio of food expenditure to total expenditure (food and nonfood) for each household within a decile. As Table 38 shows, mean food budget shares fall with higher deciles, but even the highest deciles have large food shares. But, the share of total, national expenditure on food for each decile is highly skewed to the upper deciles (Table 39).

Table 38 Mean food budget shares by decile

Per Adult

<u>Decile</u>	<u>Share</u>
1	.8130
2	.8133
3	.7925
4	.7990
5	.7988
6	.7746
7	.7811
8	.7466
9	.7386
10	.7277

Table 39 Share of total, national food expenditure by deciles

Per Adult

<u>Decile</u>	<u>Share of Food Expenditure</u>
1	0.0337
2	0.0505
3	0.0637
4	0.0745
5	0.0813
6	0.0987
7	0.1065
8	0.1244
9	0.1556
10	0.2111

Diet Composition

Shares of food budget for various foods were computed as the ratio of the expenditure for the particular food to the total food expenditure of the household. This measure is useful in examining the importance of particular food items in the diets of households and how the diets of households change by level of per adult equivalent food expenditure.

The composition of the food basket changes by decile, as

the higher deciles purchase relatively more meat and less tubers and cereals than do the lower deciles (Table 40). Particular foods are more important in the diets of some decile classes than others. Bread and rice are more important (larger food budget share) in the diets of the upper deciles while maize meal and cassava flour is more important in the lower deciles. Other foods more important to the diets of the upper deciles are beef, chicken, milk, eggs, cooking oil, tomatoes and sugar. Other foods more important in the diets of the lower deciles are sweet potatoes, beans, and ground nuts.

Households in the lower deciles have relatively larger food budget shares for carbohydrate source foods, while the upper deciles have relatively larger food budget shares for protein source foods (Table 41). Primarily carbohydrate source foods are defined here as the sum of bread, cassava flour, cassava, sweet potatoes, beans, maize products, rice and sugar. Primarily protein source foods are defined here as the sum of beef, chicken, fresh fish, dried fish, dried kapenta, milk, and eggs. Food budget shares for vegetables show a slight trend to become more important in the diets of the upper deciles. This may be due to under-reported (or undervalued) foods acquired outside of market channels.

A large proportion of the food budgets of rural households is home produced, rather than purchased. Table 42 shows the

Table 40 Shares of food budget by foods and per adult deciles

P/A Decile	Bread	Rice	Hammer Meal	Maize Grain	Breakfast Meal	Roller Meal	All Maize Products	Cassava Flour
1	0.01	0.42	23.93	1.72	0.67	3.34	29.66	8.43
2	0.24	0.39	16.45	2.29	0.45	2.37	21.56	9.32
3	0.78	0.74	14.24	2.15	0.87	2.60	19.87	7.47
4	0.57	1.33	12.06	2.13	1.18	2.74	18.10	11.02
5	0.56	1.57	11.09	1.54	1.97	3.66	18.25	6.87
6	1.51	1.21	8.48	1.19	1.53	3.07	14.28	6.36
7	1.43	1.42	8.31	1.86	1.64	2.02	13.83	7.69
8	2.52	2.47	6.44	1.18	2.98	2.44	13.04	2.55
9	3.25	1.54	6.40	1.05	2.84	2.19	12.48	4.32
10	4.62	1.67	3.61	0.96	3.16	1.92	9.64	1.93

P/A Decile	Sweet Potatoes	Beans	Beef	Chicken	Dried Kapenta	Fresh Fish	Dried Fish	Milk	Eggs	Oil
1	5.39	3.16	2.45	2.01	2.36	1.67	3.14	0.13	0.08	0.53
2	6.03	3.17	3.16	2.86	2.31	1.80	4.73	0.11	0.24	1.36
3	6.09	2.64	3.82	2.88	2.22	3.00	4.70	0.45	0.23	1.95
4	5.44	3.46	5.08	2.77	2.29	2.49	5.74	0.58	0.12	2.47
5	6.49	4.07	4.18	2.63	2.13	3.43	4.26	0.20	0.31	2.99
6	5.84	3.55	5.17	3.94	3.73	3.39	4.68	0.58	0.45	3.90
7	5.43	2.98	5.60	4.12	2.99	3.28	4.14	0.93	0.42	3.67
8	4.60	2.79	7.04	4.00	3.25	4.19	4.38	0.96	0.68	4.75
9	3.82	2.50	7.44	5.36	2.91	4.55	5.32	1.43	0.79	4.31
10	2.70	2.31	10.96	5.73	3.31	3.56	3.02	2.27	1.25	4.52

P/A Decile	Cabbage	Onions	Tomatoes	Pumpkin	Okra	Ground Nuts	Rape Seed	Sugar	Salt
1	0.68	0.04	0.77	1.45	1.23	8.81	3.24	1.73	2.19
2	1.03	0.13	1.23	1.21	1.07	10.57	3.69	1.31	1.99
3	1.25	0.19	1.45	1.47	1.04	8.33	3.85	2.09	1.59
4	1.23	0.42	1.62	2.55	1.01	5.80	3.43	2.02	1.79
5	0.78	0.42	1.69	1.88	0.59	7.15	3.07	2.68	1.52
6	1.05	0.51	2.15	1.55	0.66	6.96	4.12	3.17	1.20
7	1.08	0.54	1.89	1.78	0.53	6.40	3.04	3.41	1.44
8	1.14	1.00	2.50	1.40	1.00	5.56	2.97	3.95	1.50
9	0.98	0.73	2.85	1.10	0.50	3.92	3.51	4.58	1.14
10	1.47	1.15	3.03	0.72	0.59	2.44	3.52	3.83	1.19

Table 41 Mean share of the food budget by food groups Per Adult

Decile	Carbohydrates	Protein	Vegetables
1	0.4571	0.1184	0.0417
2	0.4008	0.1520	0.0468
3	0.3718	0.1729	0.0538
4	0.3859	0.1907	0.0684
5	0.3719	0.1714	0.0537
6	0.3363	0.2194	0.0592
7	0.3486	0.2148	0.0581
8	0.2830	0.2451	0.0704
9	0.2816	0.2779	0.0617
10	0.2242	0.3011	0.0695

Table 42 Proportion of food expenditure that is purchased
Per Adult

Decile	Rural	Urban	All Zambia
1	.2353	.7083	.2571
2	.2305	.8882	.2746
3	.2653	.8994	.4059
4	.2824	.9485	.3658
5	.3010	.9143	.4426
6	.3024	.9304	.5049
7	.3261	.9564	.5090
8	.3987	.9549	.6107
9	.4471	.9715	.7146
10	.5269	.9728	.8303

mean share of the food budget that is purchased by deciles. Purchased foods become a greater share of the food budget at higher deciles.

Expenditure Elasticities for Foods

Stampley (1993) estimated expenditure elasticities from the 1991 HEIS data. Separate analyses were conducted for rural and urban areas, and all of Zambia. The elasticities for meat, breakfast meal, bread and rice were found to be higher than for the other foods in rural areas. All other foods in rural areas were found to be normal goods. In urban areas, hammer-milled maize, whole maize grain, and cassava flour were found to be inferior goods.

CHAPTER 10.**SUMMARY AND CONCLUSIONS**

This paper has presented an overview of the political environment in which food subsidies have come to play an important role in the Zambian economy. This environment eventually led to a crisis situation in which it was recognized that some adjustment in the country's maize subsidy policies would have to be made. The 1991 HEIS was carried out with the aim of supplying information useful in designing a new set of food subsidy policies that are sensitive to Zambia's, sometimes conflicting, economic and social welfare goals.

The Policy Environment

The impact that policies to provision the mines with a reliable and convenient staple have had on the Zambian economy has been tremendous. Maize subsidies became entrenched, not so much out of a desire to feed the poorest of Zambians, but to effect a number of political objectives. The resultant political environment trapped the Government in an intractable situation. The cost of maize subsidies spiraled out of control leading to a crisis situation of excessive budget deficits. Facing credit restrictions the Government was forced to turn to the IMF who demanded curtailment of the

maize subsidy program. Any reduction of maize subsidies though, would threaten the political power base of the governing party. Thus the administration of President Kaunda was forced to choose between bankruptcy and popular rebellion. The new administration of President Chiluba has been successful in finally shedding the burden of maize subsidies from the government budget, but has the drought relief program maintained public expectations of continued access to low cost maize meal?

The failure of these policies is in that they have created a dependence on maize as the staple food and altered the traditional structure of agricultural production. Dependence on maize as the only acceptable staple among urban consumers who demand ready access to cheap, regular supplies has pitted the interests of the urban sector against those of rural producers.

The Contribution of the 1991 HEIS

The 1991 Household Expenditures and Incomes Survey offers some insight into the nature of the distribution of food expenditures in Zambia. These insights can be put to use in meeting the stated objectives of this study, which were: 1) to identify food deficit households, 2) to identify common characteristics of food deficit households, 3) to examine the consumption patterns of food deficit households and, 4) to

suggest alternative policy recommendations. This chapter will address the objectives of the study and summarize the evidence from the 1991 HEIS.

Identifying Food Deficit Households

An approach for evaluating the food deficit status of households has been presented. This approach begins by standardizing household food expenditures to be able to make direct welfare comparisons between households. The standardized measure of household food welfare was expressed as the per adult equivalent food expenditure and was used as the measure of food consumption welfare rather than some measure of income.

Two relative poverty lines were drawn defining households as poor or extremely poor in terms of per adult equivalent food expenditure for a classification of "food poverty". Poverty defined by alternative measures of welfare was compared by using the food poverty groups to determine if alternative measures of welfare would fail to identify those households that would most benefit from a food subsidy. It was found that total household expenditure was a poor measure of food poverty while per capita household expenditure was somewhat better. Per capita food expenditure was the most accurate alternative measure of food poverty.

Common Characteristics of Food Deficit Households

Using a variety of techniques, including deciles, poverty indices, misclassification tables, and regression analysis, the distribution of particular geographic, demographic and income variables were examined for their association with low levels of food expenditure. Several factors were found to be associated with low levels of per adult equivalent food expenditure.

The vast majority of Zambia's food poor households are found in rural areas. Rural households have per adult equivalent food expenditures almost half that of urban households. Some provinces were found to have greater food poverty rates than others, particularly the Eastern, Luapula and Southern provinces.

Household size proved to be a very significant predictor of food poverty also. Larger households tended to be much more likely to have lower per capita food expenditures than smaller households. The percentage of household members that are less than six years old (preschoolers) was also negatively correlated with food expenditures. The dependency ratio (calculated as the number of adult members in a household divided by the number of children in the household) was not useful in predicting food poverty.

Many characteristics of the head of the household were useful in identifying food poor households. The most

important characteristic was the level of education of the household head. Households where the head has little or no education were the most likely to suffer from low food expenditures. Marital status and employment status of the household head were not important predictors of food poverty.

The association of female headship was unclear due to a difference in the distribution of food shares for female headed households. Food shares in female headed households tended to be greater than male headed households. Since the measure of welfare is food expenditure, the greater propensity to consume food by female headed households means that they are less likely to fall into the food poverty groups even though their incomes may be less than some of the food poor households. If a policy objective of the food subsidy program is income transfer to poor households, then basing the measure of welfare on food expenditure will eliminate many needy female headed households from receiving the benefits.

The number of different sources of income for a household is positively correlated with food expenditures. Multiple sources of income are important in the household's ability to generate revenues from different sectors and take advantage of the most lucrative market. As incomes increase, so do food expenditures. This finding has implications for off-farm income generating opportunities in alleviating rural food poverty.

Consumption Patterns of Food Deficit Households

The composition of the food basket changes as households increase their per adult equivalent food expenditure. Lower per adult equivalent food expenditure households consume more carbohydrate source foods, such as grains and tubers, while higher per adult equivalent food expenditure households consume more meats and fish. In order for a food subsidy program to reach poorer households it must provide subsidies on those products most commonly consumed by poor households.

The dependence of households on commercial food markets increases with higher levels of per adult equivalent food expenditure. Since poor, and especially rural, households produce most of their own food, food subsidies on marketed commodities are not likely to reach them and, therefore, may not be effectively targeted subsidies.

Food Policy Alternatives

The brief history of food subsidies in Zambia points out many of the problems encountered with Zambia's urban maize subsidy. This generalized subsidy went to anyone who chose to purchase either breakfast meal or roller meal, but was confined in operations to urban areas only. Such a program is, arguably, the very least effective, and perhaps the most counterproductive, subsidy scheme if the goal of the subsidy program is to improve the nutritional situation of Zambia's

poorest households.

The generalized maize subsidy only operated in urban areas where, as was shown in chapter 7, there is a much lower incidence of food poverty than in rural areas. This is not necessarily a flaw in the policy because rural households, with their lower proportions of purchased foods, are not in the position to take advantage of the subsidy. But, the generalized subsidy had a distortionary effect on producer maize prices that further impoverished rural households.

Much of the maize subsidy program expenditures went to subsidize breakfast meal, a commodity that is more important in the diets of households with already higher per adult equivalent food expenditures. Therefore, the absolute amount and, perhaps even the relative amount, of the food subsidy benefit was lower for the most food-poor households.

The results from this study suggest that a food stamp program targeted to the poorest urban households may be the best solution to meeting social welfare goals while containing the cost of the subsidy program. The maize coupon program that had been established in Zambia in 1989 and was terminated in 1991 should serve as a guiding experience in formulating a new food subsidy program. The maize coupon program though, suffered from a lack of tight control and too broad of a target population. The targeting indicators revealed by this study would be most useful as a set of initial screening

criteria before a more rigorous means testing for inclusion in the program is conducted. The most useful targeting indicators as revealed by this analysis are rural location, residence in the Eastern or Luapula provinces, large numbers of household members, urban households with an older head, and households headed by a person with little or no education.

Economic theory suggests that people are rational and will, in the absence of price distortions, maximize their utility from any given basket of goods and services. Food coupons that are exchangeable for a variety of foods, and not just maize meal, will give poor consumers the latitude to choose those foods that best fill their particular nutritional needs. Nonspecific food coupons will help to reduce distortions in food prices that result from increased demand for the subsidized product.

Self-targeted commodities had been difficult to identify. Zambia's previous experience with the self-targeting of roller meal in 1986 went badly wrong and the country may be loath to try it again. Many of the poor people's foods identified in chapter 9, such as tubers and cassava flour, do not store well for long periods and would require an extensive domestic marketing system to provide a constant supply; a market that may be inefficient at best. Some suggestions of subsidizing imported yellow maize have been considered in place of the preferred white maize. But, experiences in other East African

countries have shown that there is often leakage of yellow maize to commercial livestock operations to be used as feed.

The emphasis in meeting the food needs of poor rural households have more to do with off-farm employment opportunities, agricultural markets, and extension services. During the drought relief efforts of 1992-93, Zambia was able to develop a very successful food-for-work program that helped to meet the food deficits of many of the poorest rural households. Policy makers should consider the lessons learned from this experience in designing a basic needs welfare program targeted at food-poor rural households.

The most important factor to be considered in creating a food welfare "net" for Zambia is the interaction between the urban and rural sectors. Rural producer households must be protected from any price depressing effects of a food subsidy program and should, if at all possible, be made the indirect benefactors of such a program. Food coupons increase the demand for food and may result in higher producer prices; non-commodity specific coupons will spread the benefits of higher producer prices around to more sub-sectors within agriculture.

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