A new methodology for estimating internationally comparable poverty lines and living wage rates

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Preface

Poverty reduction is at the centre of the current debate on development. The most important United Nations' Millenium Development goal is to reduce poverty by half in 2015. Despite the importance of this topic, little advance has been made in improving the measurement of poverty. There has been an important debate on the problems of national poverty line estimates, but few improvements have been made in suggesting ways of making the estimates more comparable across countries.

This paper proposes a methodology for measuring national poverty lines that are more comparable, internationally, than any of the existing approaches. The methodology is normatively based, using a nutritious low cost diet, and it is relevant to all countries in the world. It can be used for calculating national poverty lines and for making regional and global estimates. The method is easy to understand, and to use.

The second part of the paper proposes a method for calculating living wage rates. Based on the poverty line estimates developed here, it suggests a living wage rate expressed in terms of an hourly wage rate a full-time worker would need to earn so that her or his family is above the poverty line.

As the author points out, this paper represents work in progress. More discussion is needed on the assumptions made for calculating poverty lines and living wages. There is also a need for more debate on what constitutes a living wage, particularly in countries where incomes from self employment and migrant remittances are important.

It is hoped that this paper will stimulate further debate how the measurement of poverty and living wages can be improved so that policy makers are better informed.

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July 2005

Executive Summary

This paper develops and tests a new methodology for measuring two closely related concepts that are at the top of national and international policy agendas - - poverty lines and living (decent) wage rates. Poverty line represents a minimum acceptable living standard. Living wage rate represents the hourly pay rate a full-time worker needs to earn to be able to support a small family at the poverty line. Indeed, poverty reduction is generally considered to be the most important United Nations' Millennium Development Goal, and the ILO Constitution notes that peace and harmony in the world requires "the provision of an adequate living wage rate".

Despite the importance of these concepts, cross-nationally comparable estimates of national living wage rates do not exist. And while the World Bank provides national, regional and global estimates of poverty and is to be commended for its increased attention to poverty, their estimates have widely recognized problems especially estimates of national poverty lines.

There are a number of advantages of the methodology developed in this paper for making internationally comparable estimates of national poverty lines compared to current methods. And as noted above there is no methodology currently available for estimating cross-nationally comparable living wage rates.

- Methodology has a normative basis. It starts with the establishment of a nutritious low cost diet. This contrasts with the World Bank methodology which is based on an average of national poverty line estimates of some lower income countries.

- Methodology uses the same approach for measuring the poverty line that most countries have found appropriate for estimating their own poverty line. This contrasts with the World Bank methodology, which even the World Bank recognizes as inappropriate for estimating national poverty lines and only appropriate for making regional and world estimates.

- Methodology is relevant for all countries in the world and not just lower income countries as is the World Bank's methodology. This is important both because poverty is found everywhere as well as because it allows a living wage rate to be estimated for all countries. Using the new methodology and currently available data, estimates of poverty lines and living wage rates can be made for over 100 countries.

- Methodology is transparent. The assumptions used to calculate national poverty lines and national living wage rates are clearly stated. This contrasts with the World Bank methodology where it is quite difficult to understand what $1 in PPP means in terms of living standard, or what it means to use PPP for different years such as 1985, 1993, or 2005.

- Estimates are easy to understand in a common sense way. Poverty lines are presented in terms of model diets, food costs and non-food costs. Living wage rates are expressed in terms of the hourly wage rate a full-time worker would need to earn so his or her family is above the poverty line. Being poor in India according to our new methodology means that people can only afford a diet that includes only 1 cup of milk every three days, 1 egg every four days, and 1 serving of meat every three weeks, in addition to having only about $US9 a month at the official exchange rate left over for all non-food needs of the family.

- Assumptions in the methodology can be easily modified, because estimates are made using EXCEL spreadsheets. This contrasts with the World Bank methodology where the poverty line is fixed in terms of PPP. Flexibility is especially important when a living wage rate estimate is to be used as an input to setting a statutory minimum wage rate, since it is best if a minimum wage rate is set through dialogue and debate.

- Methodology is relatively inexpensive to apply, since the required national data are available online for free. Estimates can be updated regularly at minimal cost, because the necessary data are updated annually. This contrasts with the World Bank methodology that relies on PPP estimates that are expensive to make and as a result are unavailable for many countries; in addition, PPP estimates are benchmarked only every several years when values sometimes change substantially.

The first step in the methodology for measuring a national poverty line establishes a model diet with 10 major food groups that provides sufficient calories and has acceptable amounts of proteins, fats and carbohydrates. Recommendations of international agencies WHO, UNHCR, and FAO are used to decide what constitutes an acceptable diet. Variation by development level is introduced to account for known changes in food consumption that accompany rising income levels. The specific food items included in each food group are selected based partly on actual food preferences according to FAO national food consumption data (to ensure that selected foods are culturally acceptable), and partly on relative food prices according to ILO national food price data (to ensure that food costs are kept low). The cost of a country's model diet is estimated using the ILO food price database that contains unit food prices that countries use to calculate their consumer price index. To this is added other food costs such as for miscellaneous foods, wastage and additional variety. Non-food costs are determined by using the share of expenditures typically spent for food, as this is the approach generally used by countries to estimate non-food costs for their own poverty line. These percentages increase with development level in keeping with known patterns. Estimated food and non-food costs for an individual are, then, scaled up to obtain an estimated poverty line for a household by taking into consideration typical economies of scale in family expenditures. Finally, the living wage rate is estimated by dividing our normatively based poverty line estimate for a country by typical full-time working hours according to ILO data.

To test the methodology developed in this paper, national poverty rates and national living wage rates are estimated using conservative assumptions for 12 countries from all development levels and regions, including large countries such as China, India and United States. It is found that:

- Estimated poverty lines increase, as expected, with development level from on average around $2.6 PPP for low income study countries, to around $2.9 PPP, $4.5 PPP and $12.8 PPP for lower middle income, upper middle income and high income study countries. The small difference between poverty lines for low income and lower middle income study countries is due in large part to relatively high food costs compared to the cost of other goods and services in low income study countries.

- Estimated poverty lines are similar to the poverty lines used by study countries. Excluding China (which uses an unrealistically low poverty line), our poverty line estimates are on average approximately the same as those used by study countries, ranging from 19 percent less to 32 percent more.

- At the same time, estimated poverty lines are much higher than those of the World Bank for low income study countries. Whereas the World Bank poverty line for low income countries is $1.08 a day in 1993 PPP, our estimated poverty line is

roughly twice this at about $2.2 a day in 1993 PPP for our three low income study countries. This result implies that poverty rates in low income countries are considerably higher than currently believed. Comparisons with World Bank poverty lines for lower middle income study countries are mixed as our poverty line estimate is around 10 percent lower for one study countries, roughly the same for two study countries, and higher by 58 and 132 percent for two middle income study countries. Although no comparisons are made for upper middle income and high income study countries because the World Bank does not have standard poverty lines for such countries, our estimates display a reasonable progression from the World Bank $2.15 a day poverty line for lower middle income countries with average values of $3.8 and $11.1 in 1993 PPP for upper middle income and high income study countries respectively.

- Model diets established using the new methodology are acceptable nutritionally with the percent of calories coming from carbohydrates falling and the percent of calories coming from proteins increasing with development level, in keeping with knowledge about how diets change with rising income levels whereby people increase consumption of more expensive foods. Model diets also tend to be similar to the model diets that the countries themselves use. Both use the same major food groups, and the quantity in each food group tends to be similar on average.

- Estimated living wage rates increase, as expected, with development level from approximately $1.6 PPP per hour for low income study countries to approximately $2.0 PPP, $3.1 PPP and $9.3 PPP per hour for study countries at the other three development levels. Living wage rates are around 2-3 times the median wage rate in low income study countries and around 2/3rds the median wage rate in high income study countries. These results indicate that many workers in low income countries do not receive a wage rate sufficient to support a family of four at a poverty line (even when they can find work full time, which is often not the case), and so are working poor. Families of low wage workers, especially in low income countries, have to employ an array of strategies, such as engaging in own production of food and fuel, and making most family members work including often children.

- Because the methodology developed in this paper is new, considerable attention is given to transparency, honest evaluation, and discussion of possible limitations. The paper concludes on a note of optimism about the feasibility and potential value of the normatively based methodology developed in this paper to improve measurement of cross-nationally comparable national poverty lines and living wage rates.

Part 1: Introduction and background on poverty and living wage rate

1. Introduction

Poverty rates and adequate living wage rates are at the center of public attention and policy debates at both the national and international levels. People and governments are concerned about the situation of the less fortunate and reducing the number of persons needing assistance. This is expressed at the international level, as arguably the most important United Nations' Millennium Development Goal is that the global poverty rate should be reduced in half by 2015. For living wage rates, this is expressed at the international level as part of the social clause for international trade. Public disquiet has been expressed by street demonstrations during international forums. The need for an adequate wage was recognized by the international community in the Preamble to the ILO Constitution which notes that peace and harmony in the world requires "the provision of an adequate living wage", as well as in the Declaration Concerning the Aims and Purposes of the ILO which stresses the "solemn obligation of the ILO to further among nations programmes that will … ensure … a living minimum wage to all employed" (underlining added). A recent ILO working paper developing indicators to measure decent work (Anker, Chernyshev, Egger, Mehran, and Ritter, 2003) included adequate pay rate in its core set of decent work indicators.

These aspects of work (living wage rate) and life (poverty) are so important that even technical aspects of how they are measured receive public attention. For example, two recent issues of The Economist (Economist 2004, and Ravallion 2004) discuss at length methodologies to measure poverty at the international level and how this affects the observed level of poverty in the world. The World Bank spends considerable money and attention to measure poverty in the world, and a recent issue of the World Bank Research Observer (2001) is concerned with the measurement of poverty. The United States Government has undertaken investigations to help it to define and monitor core labour standards that include adequate wages (U.S. Government Department of Labor, 2000). A recent special issue of UNDP's online bulletin In Focus is devoted to the measurement of poverty at the international level (UNDP, 2004). The ILO (2005) World Employment Trends is concerned with the number of working poor in the world and several recent ILO working paper are concerned with measurement of the working poor (e.g., Majid, 2001).

The present paper takes up the challenge of developing a methodology for measuring national poverty lines and living wage rates that are internationally comparable. [1, 2] The goal is to develop a methodology that is normatively based, easy to understand by laypersons, and inexpensive to use and update regularly for a majority of countries in the world while taking into consideration differences in national conditions. To develop a methodology that meets these needs, it is necessary to draw on a number of different

[1] The term "wage rate" is used in this paper even though the term "earnings rate" or "pay rate" would be more appropriate as the concern is with earnings derived from all work activities and not just the wage or salary received by employees. "Wage rate" is used, because it is much more widely used and understood.

[2] The term "living wage rate" is used in this paper, even though something like "adequate minimum living standard wage rate" or "decent wage rate" provides a more accurate description of what we is being measured in this paper. The reason is that "living wage rate" is more commonly used and better understood.

disciplines and data sources, such as on poverty, nutrition, labour, development economics, food consumption habits, and demography. At present, there is no accepted way to measure national living wage rates that are comparable internationally. And the commonly accepted way to measure poverty at the international level (the World Bank's $1 a day and $2 a day definitions) has a number of serious problems, including acknowledgment by the World Bank that it is not supposed to be used to measure the poverty line at the national level. Readers are referred to Section 8.1 for a discussion of problems with the World Bank national estimates and methodology for measuring national poverty lines.

There are a number of advantages of the methodology developed in this paper, especially compared to currently available methods for making internationally comparable estimates of national poverty lines. And there is no methodology currently available for making internationally comparable living wage rates.

1. *Methodology has a normative basis*, as it starts with establishment of a nutritious low cost diet. This contrasts with the World Bank methodology which is based on an average of national poverty lines of lower income countries.

2. Methodology uses the same approach for measuring the poverty line that most countries have found appropriate for estimating their own poverty line. This contrasts with the World Bank methodology, which even the World Bank recognizes as inappropriate for making national poverty line estimates and only appropriate for making regional and world estimates.

3. *Methodology is relevant for all countries* in the world and not just low income and lower income countries as is the World Bank's methodology. This is important both because poverty is found everywhere, as well as because this allows living wage rates to be estimated for all countries.

4. *Basis for estimates is transparent.* Assumptions used to calculate national poverty lines and national living wage rates in our methodology are clearly stated.

5. *Estimates are easy to understand.* Poverty lines are presented in terms of model diets, food costs and non-food costs. Living wage rates are expressed in terms of the hourly wage rate a full-time worker would need to earn so his or her family is above the poverty line. This means that laypersons can understand what poverty and a low wage rate really mean in terms of living standard.[3] This contrasts with the World Bank methodology where it is almost impossible for people to know what $1 PPP means, or what it means to express PPP for a different year such as for 1985, 1993 or 2005.

6. *Decisions and assumption used in the methodology, and therefore national estimates, can be easily modified*, because estimates are made in EXCEL spreadsheets. This also makes it possible to observe how sensitive estimates are to changes in decisions and assumptions. This point as well as the previous two points above contrast with the World Bank methodology for estimating poverty lines. Flexibility is especially important when a living wage rate estimate is to be used as an input to setting a statutory minimum wage rate, since it is best if the minimum wage rate is set through dialogue and debate.

[3] For example, it is estimated in Section 7.1 that an Indian worker earning a living wage rate who is always able to find full-time work would only be able to afford for a family of four a diet that includes 1 cup of milk every three days, 1 egg every four days, and 1 serving of meat every three weeks, and with only about 425 Rupees (about US$9 at the official exchange rate, or about US$50 in World Bank PPP) per month left over for all non-food needs for his or her family.

7. *National estimates can be made using the methodology for around 100 countries using currently available data.*

8. *Methodology is relatively inexpensive to apply*, since the required national data are available online for free. This contrasts with the World Bank methodology that relies on PPP estimates that are very expensive to make. Consequently, PPP estimates have not been made for a number of countries; PPP estimates are benchmarked only every several years with values for other years updated annually using national CPI which adds imprecision; and PPP values sometimes change substantially with new benchmarks.

9. *Estimates made using the methodology can be updated regularly, perhaps annually, at minimal cost*, because the necessary data are updated annually.

To test the methodology developed in this paper, national poverty rates and national living wage rates are estimated in Part III for 12 study countries from different development levels and regions of the world. Poverty line estimates are then compared to both the poverty lines estimated by the World Bank based on their purchasing power parity methodology and the poverty lines which countries themselves use. Similarly, our living wage rate estimates are compared to prevailing median (i.e., average) wage rates in these countries. These comparisons allow conclusions about strengths and weaknesses of our methodology to be drawn as well as to suggest ways to improve this methodology in the future. They also provide insights into poverty, working poor, and labour markets around the world.

The main objectives of this paper are, thus, to:

- develop a methodology to measure national poverty lines and national living wage rates that are internationally comparable using available data; and

- test the methodology by estimating national poverty rates and national living wage rates for twelve study countries.

Secondary objectives of this paper are to:

- contribute to the policy debate on poverty, living wage rates and statutory minimum wage rates by stimulating open discussion that help to ensure that policy-makers make informed, understandable and transparent decisions; and

- contribute to the measurement of the ILO decent work indicator of an adequate wage rate.[4]

Two potentially valuable future spin-offs of our methodology include:

- new food basket PPP estimates that are especially relevant for poor persons; and

[4] Adequate wage rate was defined as one-half of median hourly earnings in Anker, Chernyshev, Eger, Mehran and Ritter (2003), and measured for a number of countries in Bescond, Chataignier, and Mehran, (2003). This is approximately the statutory minimum wage rate in developed countries at the time when enacted (OECD, 1997; Ehrenberg and Smith, 1994). One possible problem with this indicator noted in Anker et al (2003) is that the estimated adequate pay rate in a country using this definition might not be sufficient to ensure that a worker and his or her family can live at an acceptable minimum living standard. With this in mind, Anker et al (2003) recommended that the ILO adequate pay rate indicator meet an additional condition - - that it not fall below a rate that provides sufficient income for workers and their families to have an acceptable minimum living standard.

- improved measurement of the number of working poor in the world;

The remainder of this paper is divided into four parts. There are also a number of appendices. The remainder of Part I contains background discussion on poverty and living wage rates. Part II describes the methodology developed in this paper to measure internationally comparable national poverty lines and living wage rates. Part III tests out this methodology by estimating national poverty lines and living wage rates for 12 countries from around the world. Part IV provides a summary and conclusions.

It needs to be clear at the beginning that this paper represents in some sense a work in progress. It has been necessary to make subjective decisions in the process of estimating national living wage rates and poverty lines. While this is always necessary whenever national poverty lines or living wage rates are estimated and I have made every effort to be transparent and conservative when making national estimates and to base decisions on available data and knowledge, judgment has been necessary because of ever-present conceptual ambiguity and/or data available, quality and comparability problems. **This caveat not withstanding, the methodology developed and approach developed in this paper appears to have potential for estimating normatively based national poverty lines and living wage rates around the world on an internationally comparable basis and so appears to represent an improvement on currently available methods.**

2. Poverty and its relationship to living wage rate

The concept and measurement of living wage rates and poverty lines are closely linked. Living wage rate is concerned with whether or not a worker is able to earn sufficient income to be able to afford for his or her family a minimum acceptable living standard. The poverty line is typically used to represent this minimum living standard.

2.1 Definition of poverty

Measurement of poverty dates back at least to the famous 1899 study of York England by S. Seebhom Rowntree. Definitions of poverty generally refer to the need for a minimum living standard, and are generally measured by the resources or earnings required to achieve this. These are money or consumption based definitions of poverty. Some typical definitions of poverty include:

> "Earnings insufficient to obtain the minimum necessaries for the maintenance of merely physical efficiency." (Rowntree, 1908)
>
> "The inability to obtain a minimum standard of living." (World Bank, 1990)
>
> "Poverty denotes the inability of an individual or a family to command sufficient resources to satisfy basic needs." (Fields, 1994)

2.2 Congruity of poverty and living wage concepts

As noted above, the Preamble to the ILO Constitution mentions an "adequate living wage" and the Declaration of the Aims the ILO Constitution mentions the need for a "minimum living wage". ILO Convention 131 and Recommendation 135 of 1972 on minimum wage fixing spell out what this means: "minimum wage fixing should constitute one element in a policy designed to overcome poverty and to ensure the needs of all workers and their

families." (ILO, 1996, p.439, underlining added for emphasis). Thus, the need for a living wage in international law derives from the need to eliminate poverty.

A similar link between minimum wage and living wage with the need to eliminate poverty exists in United States' legislation. Minimum wage is part of one of the most important pieces of labour legislation in the United States, the Fair Labor Standards Act of 1938, that was "to provide for the establishment of fair labor standards in employment" to avoid "labor conditions detrimental to the maintenance of the minimum standard of living necessary for health efficiency, and general well-being of workers" (U.S. Government, 1938).[5, 6] In addressing the opponents of a minimum wage, President Roosevelt remarked in one of his fireside radio chats on the night before signing the Act, "Do not let any calamity-howling executive with an income of $1000 a day … tell you … that a wage of $11 a week is going to have a disastrous effect on all American industry." (F. D. Roosevelt Public papers and Addresses cited in Grossman, 2003).

There is currently a major movement in the United States to help ensure that workers receive a "living wage". One reason is the belief that statutory minimum wage rates in the United States are below what constitutes a living wage. According to ACORN (Association of Community Organizations for Reform Now), there are 122 living wage ordinances in the United Sates, and EPI (Economic Policy Institute) notes that 70 municipalities have passed living wage ordinances. Although these ordinances apply in practice to less than 1 percent of the local workforce in these municipalities (ACORN, 2004; EPI, 2004), they include major American cities such as New York, Los Angeles, San Francisco, St. Louis, Detroit, Boston, Minneapolis, Baltimore, and Cleveland. Their stated aim is that public money should not subsidize poverty-level work, and therefore that city and county governments should not do business with employers who pay poverty-level wages. Although the pay rate specified in city and county ordinances varies, they are generally designed to at least meet at least the federal poverty line for a family of four. ACORN recommends exceeding the poverty line by 10 to 30 percent.

We build on previous approaches and concepts by defining living wage rates in terms of the need for a full-time worker to earn sufficient income so that a family can have a nutritious diet and other minimum basic needs that lifts them out of poverty.

[5] In light of the world's current concern for free and fair international trade and recommendations of ILO's 2004 International Commission on the Social Dimensions of Globalisation, it is worth noting that the main justification for the United States Fair Labor Standards Act was that interstate commerce within the United States (which is in many ways similar to international trade across countries today) would impoverish workers through a downward push on wages unless social protections are in place.

[6] In addition to minimum wages, the Fair Labour Standards Act prohibits "oppressive child labor" and excessive work hours. It is interesting to note that President Roosevelt decided to include a section on child labour in the Fair Labor Standards Act in order to increase the Act's chance of getting approval in Congress. It is also interesting to note that the 1938 United States Fair Labor Standards Act uses the term "oppressive child labor" (these quotation marks are included in the Act), which is similar to ILO's current emphasis on hazardous child labour.

2.3 Use of one poverty line

Stretching back to Rowntree is a tradition in the poverty literature of often using two poverty lines - - a lower poverty line that allows for only minimal food, clothing and housing, and a higher poverty line that allows for inefficiencies and waste in satisfying food needs in additional to consumption of what society feels are non-food necessities such as for transport, medical care, recreation, etc. Rowntree called these primary poverty and secondary poverty. World Bank (2000/2001) calls these poverty typical of the poorest countries and poverty typical of lower-middle income countries. Economic Commission for Latin America (ECLA) calls these indigence and poverty.

> "Primary poverty is earnings sufficient to obtain the minimum necessities for the maintenance of merely physical efficiency. … Secondary poverty is earnings sufficient for the maintenance of merely physical efficiency were it not that some portion of it is absorbed by other expenses either useful or wasteful." (Rowntree, 1908)

> "In 1990 national poverty lines for 33 countries were converted into 1985 PPP prices, and the most typical line among low income countries for which poverty lines were available was selected. In 1999 the same lines were converted into 1993 PPP prices, and the new line was obtained as the median of the 10 lowest poverty lines. That line is equal to $1.08 a day in 1993 PPP terms (referred to as "$1 a day" in the text). … The upper poverty line (referred to as "$2 a day") was calculated by doubling the amount of the lower poverty line, as in 1990 [publication], reflecting poverty lines more commonly used in lower-middle income countries." (World Bank, 2000/2001)

> "Households with incomes below the poverty line [that allows a household to satisfy its members' basic needs] are considered poor. … Households are considered extremely poor, or in ECLA's [Economic Commission for Latin America] terminology in a position of indigence, when their incomes are insufficient to purchase enough food to satisfy the nutritional requirements of all its members." (Sainz, 1994)

We do not follow this tradition of using two national poverty lines, in part for simplicity and in part because we are interested in a methodology where estimated national poverty lines are meaningful for each country. Estimates of the income needed for a very basic diet and little else that would be acceptable in low income countries would not be possible to live on in higher income countries. While people in higher income countries could theoretically live on the diet of a poor person in India who lives on a very basic diet (which includes very little meat, and considerable amounts of rice, wheat and dhal), it would not be possible for people in higher income countries to live on the approximately US$50 per month allotted in India for all non-food needs of the family as more money is required for non-food costs such as for housing, utilities, transport, clothing, etc. Thus, a methodology is developed in this paper for measuring national poverty lines and living wage rates where:

- **Poverty line** in our methodology measures the income level that is necessary for a family of four to be able to afford a low cost nutritious diet and non-food necessities at levels that are considered acceptable for the country.

- **Living wage rate** in our methodology measures the hourly pay rate a full-time worker would need to earn to support a family of four at the poverty line (i.e., an acceptable minimum living standard) for the country.

2.4 Quasi-relative nature of poverty lines and therefore living wage rates

It is important to note that *estimating a national poverty line* (whether or not comparable internationally) *always involves assumptions and judgment.* Subjectivity has to be present, because each society has a different view on what it considers to be necessary for an acceptable minimum standard of living. At the same time, national consensus is always open to debate and is forever changing. For example, television, recreation, and high quality medical care may be seen as necessary in high income countries in the 21st century but not in these countries in the mid 20th century or in low income countries today. Second, many expenses rise with development and urbanization. For example, housing and transport costs rise with development and urbanization, as it becomes more difficult to live in makeshift housing with little or no rent (as well as less acceptable). Third, even what is considered to be an acceptable diet changes with per capita income, as people come to feel that they require greater quantities of higher cost foods such as milk and meat as well as a greater variety of foods.

The need for judgment obviously also plays out when establishing internationally comparable poverty lines. The World Bank's $1 a day and $2 a day poverty lines, although often referred to as absolute poverty lines, required considerable judgment to establish. First of all, its $1 a day definition of poverty embodies whatever subjectivity and judgment that are included in national poverty lines, since the World Bank 1985 original definition is based on "typical" official national poverty lines of "poor" countries, and its 1993 and current definition is based on official national poverty lines for 10 countries with low poverty lines (World Bank, 1990; Chen and Ravallion, 2004). Secondly, there is subjective judgment involved in deciding to use $1 PPP for 1985, as national values for the poor countries the World Bank had at its disposal ranged from $0.61 to $1.14 per day in 1985 PPP (see Reddy and Pogge 2002 which contains the official poverty line data used by the World Bank). Indeed both $1.01 and the $0.75 were used in the 1990 World Development Report where the $1 a day definition of poverty was introduced. Although there is some justification for the decision to use $1 a day in 1985PPP since there was a cluster of six poor countries in 1985 with a PPP between $1.02 and $1.08, it was none-the-less subjective to do this rather than use say the average of national values. Indeed, the 1993 revision does not look for a cluster of countries. Instead, the median of the ten lowest official national poverty lines the World Bank had at its disposal was used. However, it was clearly subjective to use the lowest ten poverty lines rather than the lowest x poverty lines, as values were available for 33 countries; or the World Bank could have used the median of poverty lines for low income countries only (e.g., ignoring official poverty lines of middle income countries Thailand and Tunisia which are included among the ten lowest); and countries where the official poverty line was known to be wrong (e.g., China) could have been excluded. Third, the 1993 current standard is actually $1.08. Yet, only $1 a day definition is used for the public - - probably because it is a round number and therefore has "communication value". Fourth, the World Bank's almost equally famous $2 a day poverty line (actually $2.15) was obtained in an ad hoc manner simply by multiplying $1 per day by 2 (World Bank, 2000/2001).

It is also important to note that poverty lines cannot be absolute forever in the sense that what is acceptable as a basic minimum in a country and society changes over time, both with economic development and rising income levels as well as with technical change and the introduction of new goods. For example, private telephones and televisions are now considered as required in higher income countries. And as income levels rise in poorer countries, people come to feel that higher cost foods such as milk and meat need to be a more frequent part of a minimum acceptable diet. This means that if one wants to measure the current level of poverty in a country, it is necessary to update the poverty line so that it reflects current norms about basic needs. This also means that fixing a so-called absolute

poverty line for a country and leaving it unchanged for a long period of time will not provide a reasonable measure of the number of poor after some time.

Frequently updating a poverty line, however, makes it difficult to monitor how well a country is doing in reducing poverty. The reason is that the observed change over time in the number of poor persons is affected by changes in the level of the poverty line. It is for this reason that many analysts (e.g. Deaton, 2001) feel strongly that a fixed poverty line is essential.

Analysts and policy-makers are faced by a dilemma. On the one hand, they want a poverty line that allows them to measure the number of poor persons at present. This requires an up-to-date poverty line that reflects current social norms. On the other hand, analysts and policy-makers want a poverty line that allows them to measure how well the country is doing in reducing poverty. This requires a poverty line that remains fixed over time. In short, the need to accurately measure the level of poverty conflicts with the need to monitor progress in reducing poverty.

Countries have faced this inherent dilemma in different ways. The United States and India have set a poverty line and left it unchanged in real terms (updating it only for inflation). The official poverty line in the United States was first accepted in 1969,[7] and the official poverty line in India was first accepted in 1979 (based on information from 1955 and 1961 for the United States and from 1972/73 in India[8]). Indonesia, in contrast, follows the approach of continuously updating its poverty line. There are technical reasons (desire to monitor changes in poverty as discussed above) and political reasons (no government

[7] The poverty line food basket originally used in the United States was based on a food plan developed in 1961 by the U.S. Department of Agriculture for emergency purposes and the ratio between food and non-food needs was based on a 1955 expenditure survey. "The economy food plan was designed as a nutritionally adequate diet for use when the cost of food must be lower than the average food expenditures of low-income families. It is essentially for emergency use. It deviates further from average food habits than other plans and relies heavily on …. foods that are inexpensive. It assumes as well that major selections within each food group will be less expensive foods" (Cofer et al, 1962).

To account for changing norms and expenditure patterns in the United States, the US National Academy of Science recently recommended that the United States use a relative approach to measuring poverty, and move away from the current method (where the original poverty line was estimated using the same methodology used in this paper, of costing a model diet and increasing this cost by the ratio of non-food to food costs). They recommended that the poverty line be calculated each year as a percentage of observed median expenditures (Citro and Michael, 1995) - - thereby ensuring that the real value of the U.S. poverty line increases along with increases in national income per capita as is know to occur around the world (Fischer, 1996). This would make the US poverty line a relative poverty line that is similar to those used unofficially in Europe (EUROSTAT, 2001; Atkinson, 1991). The U.S. National Academy of Science wanted to avoid the situation where the United States official poverty line has remained unchanged in real terms for 35 years despite the considerable changes in diets, non-food expenditures, and social norms since 1969 (Citro and Michael, 1995).

[8] The poverty line in India in 1972/73 was set at the income level of households which consumed the number of calories per capita that was felt to be required (2400 calories per day for rural areas and 2100 calories per day for urban areas). Interestingly, this definition of poverty, where consuming too few calories defines the income poverty line, is not necessarily the same thing as having low income. According to 1999/2000 NSS data, 38 (44) percent of households in the top income quintile in West Bengal (Gujarat) do not have sufficient calories. "While low incomes are clearly associated with low calorie intakes, high income by themselves do not imply sufficient calories. In fact, these high magnitudes of calorie deprivation among the richest quintiles are not really credible" (Meenakshi and Vishwanathan, 2003).

wants the observed poverty rate to increase dramatically on its watch) why governments are reluctant to change their official poverty line.

Data from the United States and India demonstrate what a large impact changing the poverty line to reflect current behaviour and norms would have on the observed poverty line and poverty rate and by implication the living wage rate.[9] According to the US National Academy of Science, the United States poverty line should have been between 14 and 33 percent higher in 1995 than the official poverty line (Fischer, 1999). Indian NSS data from 1973/74 and 1993/94 reported in Joshi (1997) show that letting the diet and food/non-food expenditures vary according to observed behaviour would have raised poverty lines in India by approximately 49 percent in rural areas and by approximately 23 percent in urban areas. In turn, the poverty rate in India would have been 75 percent rather than the official 42 percent in urban areas and 58 percent rather than the official 42 percent in rural areas.[10, 11]

One possible way to address the dilemma of needing a fixed poverty line to measure change over time and a varying poverty line to measure the current level of poverty would be to use the same poverty line for a period of time so that progress in reducing poverty can be monitored. Then to re-estimate the poverty line before the original poverty line has lost too much meaning, and provide a link between estimates of the poverty rate from the two time series (i.e., between estimates based on the new poverty line and the old poverty line). Updating a national poverty line every ten years would seem like a reasonable compromise. For an international exercise such as in this paper, one possibility to mimic this approach might be to estimate a country's poverty line using fixed principles and assumptions over time (with changing actual food prices) as long as the country remains at the same development level, and to change the assumptions for estimating the poverty line (as well as calculate a link between poverty rate estimates based on the old and new poverty lines) when the country moves to another development level according to the World Bank.[12] This is the approach used in this paper.

[9] Another way of illustrating how it is inappropriate to use observed behaviour from the 1960s or 1970s to set a 2004 poverty line would be to imagine that a new commission is set up to estimate a national poverty line. Also imagine that this commission knows nothing about a poverty line having been established in the 1960s or 1970s. It is obvious that this commission would use recent data and behaviour and would not even imagine using data from the 1960s or 1970s.

[10] The income level of rural households which consumed the number of calories per capita that defines the rural poverty line (2400) went from Rs45 in 1972/73 to Rs324 in 1993/94 based on observed behaviour in 1993/94, but only to Rs218 in 1993/94 when the 1972/73 commodity basket was updated by inflation. In urban areas, the increase in the income of households that consumed the number of calories per capita that defines the urban poverty line (2100) went from Rs56 in 1972/73 to Rs400 in 1993/94 based on observed behaviour, but only to Rs324 when the 1972/73 commodity basket was updated by inflation.

[11] These results for India are consistent with expenditure data that show a shift over time in India toward more expensive foods and an increase in the ratio of non-food to food costs. According to NSS data for 1977/78 and 1987/88 reported in Government of India (1993), non-food expenditures as a percent of total expenditures of persons below the poverty line rose over this relatively short time period from 20 to 24 percent in rural areas and from 25 to 26 percent in urban areas; percent spent on cereals fell from 47 to 38 percent in rural areas and from 35 to 30 percent in urban areas.

[12] The World Bank divides countries into four development levels: low income, lower middle income, upper middle income, and high income.

Part 2: Methodology for measuring internationally comparable national poverty lines and living wage rates

The methodology developed in this paper to estimate internationally comparable national poverty lines and living wage rates is described in this Part of the paper. Section 3 provides a general description and flow chart of the methodology. Section 4 describes how food costs are estimated by starting with nutritional needs and the establishment of a low-cost nutritious diet. Section 5 discusses how non-food costs are estimated, household economies of scale, and what constitutes full-time working hours. Section 6 discusses some limitations of our methodology. Appendix C provides the EXCEL tables we use to estimate national poverty lines and living wage rates. Readers should note that Section 4 on model diets, food costs and nutritional needs - - which is a key aspect of our methodology - - is relatively long and complicated, and many readers may prefer to skim this part of the paper.

3. General description of methodology for estimating national poverty lines and living wage rates

There is general agreement in the poverty and the living wage rate literatures as well as a tradition in national practices on how to measure and estimate national poverty lines and living wage rates. [13] **This traditional approach is used in this paper.**[14] Figure 1 illustrates schematically the methodology used in this paper for measuring national poverty line and national living wage rates. Notice that the determination of model diets, miscellaneous food costs, non-food costs and number of full time working hours vary by development level.

- A national model diet is established that is: (i) acceptable nutritionally; (ii) low cost in nature; (iii) includes 10 major food groups; and (iv) includes specific foods that are consistent with local food preferences and relative food prices.[15] In the

[13] Some readers may need reminding that the national living wage rate is estimated by dividing the national poverty line by full-time working hours.

[14] Some countries use a different approach. Some developing countries (especially in Asia such as India, Bangladesh and Indonesia) establish their national poverty line by using the income level of households that consume just above the required number of calories per capita, without considering whether other nutritional requirements or non-food needs are met (Ravallion, 1992; Asra and Santos-Francisco, 2001). They implicitly assume that people are efficient in allocating calories so receive sufficient proteins, fats, vitamins and minerals as well as in meeting non-food needs. It is generally thought that this approach is not as good as the approach used in this paper and by most national authorities (see for example Ravallion, 1992, and Ravallion and Sen, 1996). In any case, the approach used in these countries would not be practical for an international methodology such as in this paper, because the required data sets are not available on a regular basis for a sufficient number of countries. European Union countries use a relative poverty line usually set at 50 percent of national median disposable income equalized for equivalent consumers (Everaers, 1998). A major problem with this approach is that there is disagreement about the percent of median income to use and for this reason it is common to report several poverty lines using different percentages; also use of a relative poverty line makes it very difficult to reduce poverty.

[15] Some countries (especially in Asia such as India, Bangladesh and Indonesia) use a different approach (Ravallion, 1992; Asra and Santos-Francisco, 2001). They establish their national poverty

words of Rowntree (1908), one wants "a standard diet that gives adequate nutrition at the lowest practical cost". This is done in this paper in an internationally comparable way using WHO recommendations on acceptable ranges for proteins, fats and carbohydrates, FAO data on national per capita calorie requirements and food consumption preferences, and ILO data on relative food prices in each country. At the same time, model diets differ by development level in that the percentage of calories from proteins increases with development level and the percentage from carbohydrates decreases with development level. The number of calories required per capita is determined by average body size and the age distribution of the population. The specific food items included in each major food group are selected based on relative food prices except for cereals that are selected based on observed national food consumption patterns. FAO data are also used to help decide on the quantity of cereals, roots and tubers, and pulses/nuts to include in a country's model diet to ensure that national food habits for these food groups reflect national preferences, since their consumption varies so greatly across countries.

- The *national model diet is costed using official food price data from the country* as reported in the ILO food price data set. Miscellaneous food costs (that increase with development level in keeping with empirical evidence on this) are then added to get total food cost.

- *Non-food costs* for a country are estimated by assuming that essential non-food costs *are a certain percentage of food costs*, which uses in essence Engels curves. Thus, non-food costs are estimated by multiplying food costs by a non-food "multiplier" that increases with development level to represent the known relationship between non-food expenditures relative to food expenditures.[16]

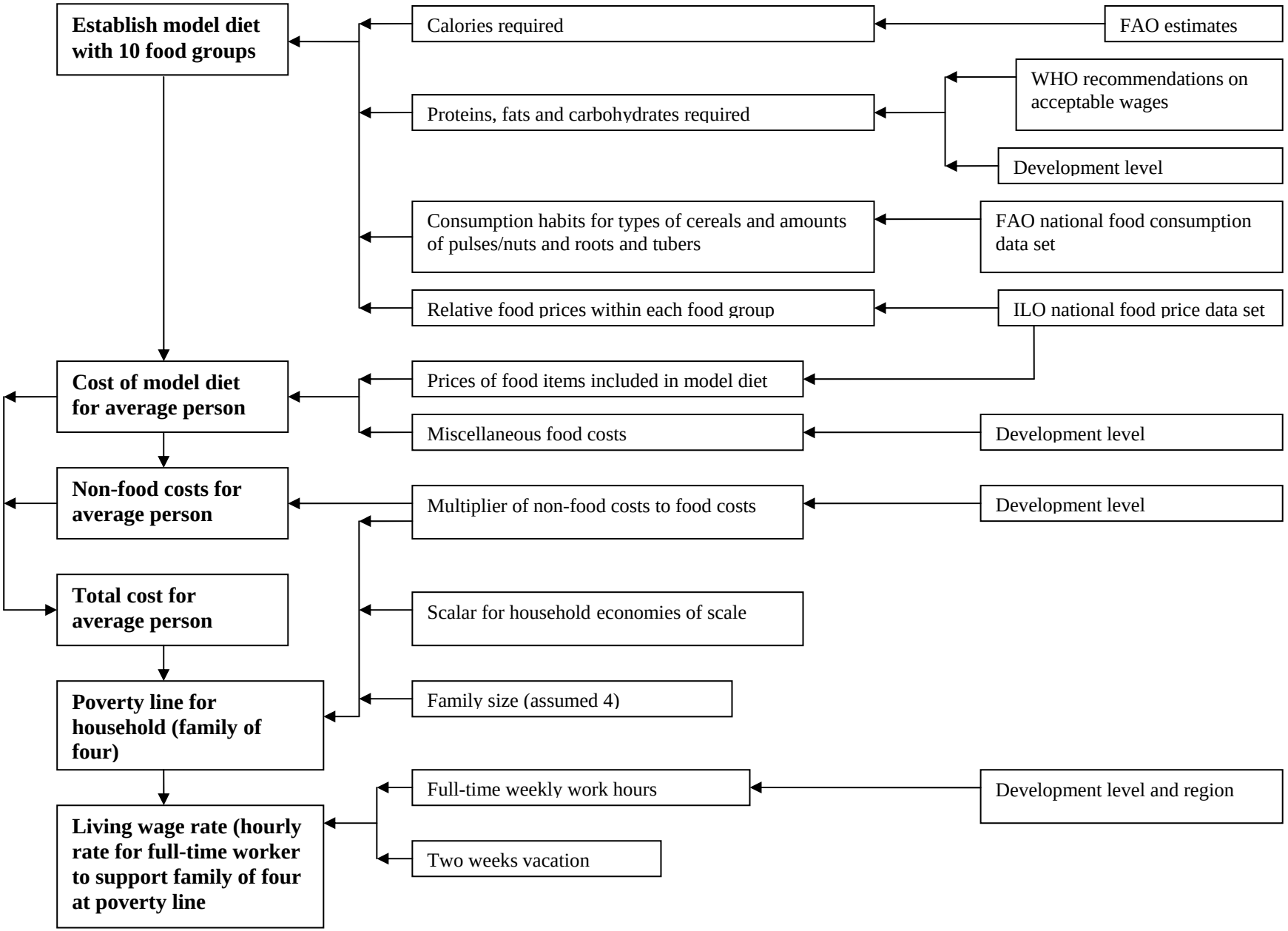
- National poverty line for a family (family of four here, but any family size could be used) is estimated by multiplying the sum of estimated per capita food and non-food costs by a family size "scalar". This is necessary, because poverty is a household concept and food and non-food costs up to this point are estimated per person. Scalars are less than 4, our family size, as they take into account economies of scale in household expenditures. Scalars decrease with development level, because household economies of scale increase with development and the relative importance of non-food expenses such as housing.

- National living wage rate is estimated by dividing the estimated national poverty line for a family of four by work hours of a full-time worker.

line by looking at the income level of households that consume just above the required number of calories per capita, without considering whether other nutritional requirements or non-food needs are met. An implicit assumption is that people are efficient in allocating calories so that they receive sufficient proteins, fats, vitamins and minerals as well as in meeting non-food needs. It is generally thought that this approach is not as good as the approach used in this paper and by most national authorities (see for example Ravallion, 1992, and Ravallion and Sen, 1996). In any case, the approach used in these countries would not be practical for an international methodology such as in this paper, because the required data sets are not available on a regular basis for a sufficient number of countries.

[16] An obvious alterative approach would be to list and cost essential non-food needs. This approach is not often used at the country level, because of the many difficulties involved such as agreeing on what should be in the list and the quality level of each item on the list.

Figure 1: Flow chart of methodology used to estimate national poverty line and national living wage rate



4. Establishing national model diet and estimating food cost for our poverty line

Section 4 is a long and detailed section. The reason is that nutrition is a complex subject, especially at the international level, yet establishing and costing a national model diet is essential to estimating a normatively based poverty line and living wage rate. Readers who are not interested in the details of how this is done may want to skim or skip this section and get a flavour and summary of what is done by reading the present introduction and Section 4.7.

A national poverty line is the sum of food and non-food costs.

Poverty line = Food costs + Non-food costs

To estimate food costs in a country, it is necessary to establish a model diet and to calculate the cost of that diet. A general description of the methodology used in this paper to establish and cost a country's model diet is provided below.

1. Estimate total number of calories required per day for an average person in each country. How this is done is described in Section 4.1.

2. Establish general principles for developing national model diets. This consists of two steps:

    a. Decide on the major food groups to include in model diets. This is described in Section 4.2.

    b. Decide on the percentage of total calories that should come from proteins, fats and carbohydrates. Percentages are based on international recommendations, and are allowed to vary by development level. This is discussed in Section 4.4.

3. Establish general principles for selecting the specific foods to include in each major food group in a country's model diet. These principles, which are discussed in Section 4.3, take into consideration observed actual national consumption habits and relative prices. How this is done is described in Section 4.5.

4. Cost of each selected food is estimated by multiplying its quantity by its unit price. The reported "as purchased" price has to be adjusted to take into consideration inedible parts of foods and food lost in cooking.

5. The total cost of a country's model food basket is obtained by summing the cost for each food item in the country's model diet and then adding a miscellaneous food cost category to allow for a minimal level of wastage, miscellaneous foods (such as coffee/tea, spices, condiments, sauces, salt), and additional variation in diet. The relative importance of miscellaneous food costs increases with development level; how this is done is described in Section 4.6.

A summary of the main aspects of our methodology for estimating national food costs is provided in Section 4.7.

4.1 Total calorie requirements

The total number of calories required per day is known to vary with age, body size, basic metabolic rate, sex, health, climate, pregnancy, lactation, and level of physical activity (Latham, 1997). Countries generally simplify this to indicate calorie requirements by age, sex and weight for someone who is doing light to moderate activities. A multiplier is, then, applied to take into account the level of physical activity during the day (such as light activity, moderate activity, or heavy activity). Finally, an average calorie requirement per capita per day is typically calculated for a reference family size or for the population as a whole that takes into consideration body size, and the age and sex distribution of the population. This means that it is not advisable to use the same per capita calorie requirements for all countries.

To help decide on the number of calories per capita to use for our national model diets, Table 1 indicates the number of calories per capita that 21 countries have used in model diets to estimate national poverty lines. Values are from compendiums on poverty by Tabatabai (1996) and World Bank (1997) in addition to values for some of our 12 study countries. National model diets for developing countries used for estimating poverty lines contain around 2200 calories per capita per day on average, with values for Asian countries generally lower (at around 2140 calories) than those for other parts of the world (around 2250 calories).

Table 1: Average number of calories per capita per day used by countries to estimate their national poverty line

Country	Calories required per day	Year	Sources and notes
Bangladesh	2122	1973-1989	Ravallion and Sen 1996; Bangladesh Bureau of Statistics 1988-1991; Hossain and Sen 1992; Khan 1990
China	2100	1998-present	2400 was used 1973-1997
Vietnam	2100	1993	World Bank, 1997
India	2400 rural 2100 urban	1973/4-present	Govt of India 1993. 2400 generally recognized as too high[b]
Philippines	2016	1985	World Bank, 1988
Indonesia	2100	1976-1990	Central Bureau of Statistics, 1992
Nepal	2250	1984/1985	NRB, 1989
Pakistan	2250	1984/1985-1987/88	Malik, 1993
Korea, Republic of	2100	1965-1984	Suh and Yeon, 1986
Thailand	1978	1962-1989	Hutaserani and Tapwong, 1990
Brazil	2242	1960-1977	Romao, 1992
Nicaragua	2226	1978-1983	World Bank, 1995
Ecuador	2370	2004	ILO, 2004. Also used for Bolivia, Columbia, Peru and Venezuela
South Africa	2327	2001-2002	Martins and Maritz, 2002
Senegal	2400	1991/92	World Bank, 1997
Mauritania	2300	1987-90	World Bank, 1997
Uganda	2200	1993	World Bank, 1993
Zimbabwe	2100	1995-1998 at least	Zimbabwe Government, 1998
Egypt	2336	1999/2000	World Bank, June 2002
Tunisia	2200	1966-1985	Radwan, Jamal and Ghose, 1991
Armenia	2100	1996-present	World Bank, Dec 2002. Ministry of Health recommends 2400
Average for Asia	2139[a]		
Average for other countries	2254[b]		

Notes: [a] Value for India used to calculate this average is 2316. It uses 28 percent urban and 72 percent rural as reported in World Bank World Development Indicators online database. [b] Note that the 2400 value for rural India is widely recognized as being too high (Meenakshi and Vishwanathan, 2003).

Sources: All sources cited in Tabatabai (1996) except for: China (from Sangui, 2004), India (from Government of India, 1993), Ecuador (from ILO, 2004), Zimbabwe (from Zimbabwe Government, 1998), Egypt (from World Bank, June 2002), Armenia (from World Bank, December 2002), South Africa (from Martins and Maritz, 2002), Senegal and Mauritania and Viet Nam (from World Bank, 1997).

National values in Table 1 are similar to, but somewhat above, recommendations of organizations concerned with humanitarian relief. World Food Program and United Nations High Commission for Human Rights (WFP/UNHCR) recommend 1900-2100 calories for refugees (UN ACC/SCN, 2000). United States Defense Department includes

1900-2200 calories in its humanitarian rations (UN ACC/SCN, 2000). The UN Subcommittee on Nutrition (ACC/SCN) recommends 2080 calories (unpublished).

What we need for our methodology are national values for calorie requirements per person per day that reflect variation in national values such as those shown in Table 1 (that take into consideration factors that are known to determine calorie requirements such as body size and age and sex distribution of the population), that are round 2200 calories per capita outside of high income countries (approximately the unweighted average of national values in Table 1), and that are lower for Asian countries. It is possible to approximate these needs by using: (i) unpublished FAO data on national calorie requirements (which take into consideration national differences in body size, age and sex distribution of the population, etc.) to account for cross-national differences in calorie requirements; together with (ii) an assumption of calorie requirements for a base country. We decided to use Bangladesh for the base country with a per capita calorie requirement of 2100 calories, as 2100 calories is approximately the value used by national authorities and the World Bank. This approach yields reasonable estimates of calorie requirements for our 12 study countries (see column 3, Table 2). The unweighted average for our 10 non-high income study developing countries is 2244 which is similar to the average in Table 1 of around 2200; values tend to be lower in Asia than in other non-high income countries (about 2180 compared to 2270 on average); and increase with development level (from about …. In low income countries to about …. In high income countries). Also notice that estimated calorie requirements in column 3 in Table 2 are generally similar to those used in national poverty line estimates for study countries or there is a good explanation for the difference (see column 4 in Table 2).

Table 2: Average number of calories required per person per day used to estimate our national poverty lines, study countries

Development level/Country	FAO ratio of recommended calories to calories for Bangladesh (base country)[a]	Calories per day used in this paper (2100 for Bangladesh times col 2)[b]	Calories used by country for its national poverty line (see Table 1)[c]
Bangladesh	1.00	2100	2122
India	1.02	2152	2100 urban 2400 rural (approx 2316 as India 28% urban)[d]
Zimbabwe	1.03	2170	2100
Low income ave	1.02	2141	
Armenia	1.12	2346	2100 (Ministry of Health recommends 2400)
Ecuador	1.02	2151	2370 (recommended for 4 L. Am countries)
Egypt	1.08	2263	2336
China	1.09	2290	2100 (2400 before 1998)
South Africa	1.11	2340	2327
Lower middle income average	1.08	2278	
Lithuania	1.12	2348	
Costa Rica	1.08	2277	
Upper middle income average	1.10	2313	
Switzerland	1.16	2437	
USA	1.16	2439	
High income ave	1.16	2438	
Non-high income average	1.07	2244	

Notes: Average is unweighted average of national values.

[a] Estimates are an average for the entire population and take into consideration typical body size (height and weight) as well as age and sex distribu population.

[b] Base value of 2100 is based on approximate observed national values for Bangladesh in Table 1 and discussion in text.

[c] There are generally reasonable explanations when there is a large difference between our estimate of calorie requirements in column 3 and the valu country to estimate its own poverty line (see explanation in column 4).

[d] There was considerable disagreement about how many calories were required in India when the official figures were being set. This is illustrated by t of nine studies in India between 1960 and 1972 cited in Cutler (1984), three used 2100 calories as the minimum required, three used 2250, two used two used 2700. According to Meenakshi and Vishwanathan (2003), "There is an informal – albeit unwritten - understanding that the 2400 norm [for rur 'too high'."

Sources: FAO unpublished data for column 2. Table 1 for column 4.

Model diets for our 12 study countries use the calorie requirements shown in column 3 in Table 2. Four aspects of these estimates make them especially useful for our purposes. First, they take into consideration differences between countries in body sizes as well as in age and sex distributions of the population. Second, estimated calorie requirements per capita are around 2260 calories on average for developing countries, which is reasonably consistent with national practices (see Table 1). Third, calorie requirements are lower in Asia and higher in high income countries. Fourth, calorie requirements are expressed in terms of average calories per capita per day for the entire population (for men and women, adults and children), and this facilitates our ability to estimate the cost of a minimal acceptable nutritious diet for poor families.[17]

Note that national calorie requirement estimates in column 3 in Table 2 have not been specifically adjusted to take into consideration different levels of physical activity. It is assumed that FAO values reported in Table 2 as well as those used by countries reported in Table 1 are based on moderate activity during the day. To get an idea of how much activity level affects the number of calories required, Table 3 indicates the multipliers used by India and World Health Organization to go from calorie requirements for light activity to moderate activity and from light activity to heavy activity. Thus if a person does heavy work for 8 hours a day at a workplace and heavy activity requires 17 percent more calories than light activity as noted in Table 3, total daily calorie requirements would increase by about 12 percent (i.e. 8/24*35). It is clear that when estimating living wage rates for physically taxing work, the additional calories required for heavy work should be taken into account.

Table 3: Ratio of calories required for different work activity levels compared to requirement for sleep/complete rest, various estimates

Activity level comparisons	India	WHO
Moderate/light	1.19	1.15
Heavy/light	1.32	1.35

Notes: Ratios for men.

Sources: Latham (1997) citing a WHO source. UNFPA (2003) for India.

4.2 Typical major food groups in model diets

Table 4 indicates the major food groupings necessary for a healthy diet according to the United States Department of Agriculture (USDA) for Americans, and World Food Program (WFP) and United Nations High Commission for Refugees (UNHCR) for refugees. These are almost the same broadly speaking. In both model diets, cereals (i.e., grains) provide the bulk of the calories required. Protein-rich foods, which provide the bulk of the remaining proteins necessary, are typically divided into three subgroups: (i) vegetal-based protein-rich foods such as lentils, beans and peas, and nuts; (ii) dairy such as milk and cheese; and (iii) other animal-based foods such as beef, poultry, fish, pork and eggs. Vegetables and fruits provide the bulk of the remaining necessary micronutrients, minerals and fiber. Oils provide remaining fats that are necessary. Sugar is included in both diets in recognition of the universal demand for them.

Despite their generally similar structures, there are important differences between the food groups used by WFP and UNHCR for refugees and by USDA for Americans. These reflect

[17] It should be noted that these FAO data are preliminary and therefore subject to change in the future.

the major differences in situations and incomes in these populations. The WFP/UNHCR diet allows for vegetables or fruits; and for pulses/ beans/peas/nuts or fish/ meat. In contrast, the USDA diet allows for vegetables and fruits; and for dairy and beans/nuts and meat/eggs.

Table 4: Major food groups included in recommended diets for United States and for refugees

WFP and UNHCR for refugees[a]	U.S. Dept of Agriculture for USA
Cereals	Grains (bread, breakfast cereal, rice, flour, pasta)
Protein-rich food (pulses, beans, peas, nuts OR fish or meat)	Milk products (milk, yogurt, cheese) AND
	Meat (beef, poultry, fish, pork), eggs AND
	Meat alternatives (dry beans, nuts)
Vegetables OR fruits	Vegetables[c] AND
	Fruits
Oil	Fats, oils (use sparingly)[b]
Sugar	Sweets (use sparingly)[b]
Fortified blended cereals[a]	----
Condiments (e.g., soy sauce, tomato paste)	Gravies, sauces, condiments[d]
Salt[a] and spices	Salt, spices

Notes:

[a] Because specific micronutrients are often lacking for refugees, fortified foods are distributed such as iodized salt, vitamin fortified dried skimmed milk, and blended flours fortified with a variety of vitamins and minerals.

[b] Because of obesity and over-consumption of fats and sugars in the United States, USDA recommends that they be used sparingly.

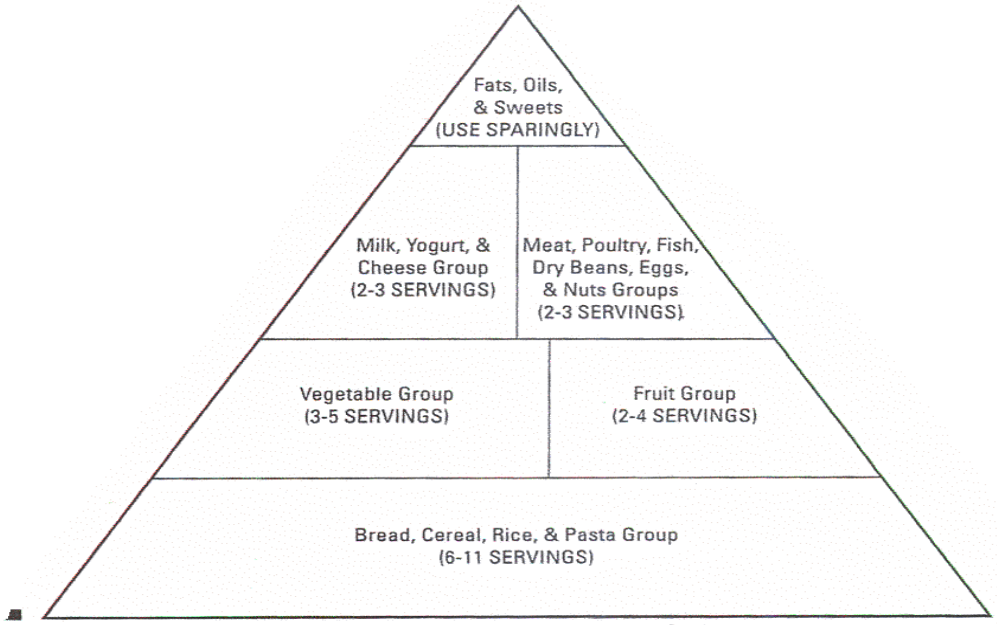
[c] Potatoes are considered a vegetable in USDA diet, and they contribute approximately 50% of the calories and 30% of the weight of vegetables in the 1999 USDA recommended Thrifty Diet.

[d] Also included is approximately ¼ liter per day per person of soft drinks.

Sources: USDA website and United States (2003) for United States. Katona-Apte (1993) for refugees.

The need to eat foods from different food groups is typically presented in a pyramid shape in order to convey to the public in pictorial form the relative importance of each food group in the recommended diet (see Figures 2 and 3 for USA and Canada). Thus, it is recommended for moderate activity in the United States and Canada that a person has per day approximately 8.5 servings of cereals (e.g., 1 slice bread, ½ cup cooked rice for a serving), 4 servings of vegetables (e.g., ½ cup chopped raw vegetables for a serving), 3 servings of fruits (e.g., 1 medium fresh fruit for a serving), 2.5 servings of dairy (e.g., 1 cup milk for a serving), 2.5 servings of meats (e.g., 85 grams of lean cooked meat for a serving), and sparing use of fats and sweets.

Figure 2: Recommended food pyramid for USA



Source: U.S. Department of Agriculture/U.S. Department of Health and Human Services

Figure 3: Recommended food pyramid for Canada

Grain Products	Vegetables and Fruit	Milk Products	Meat and Alternatives
Choose whole grain and enriched products more often.	Choose dark green and orange vegetables and orange fruit more often.	Choose lower-fat milk products more often.	Choose leaner meats, poultry and fish, as well as dried peas, beans and lentils more often.

The similarity of recommended major food groups for these quite different populations implies that there is a good basis for establishing general principles for model diets. Also as will be shown in Section 7.4, these are also the same food groups used by countries to estimate food costs and national poverty line. With this in mind, the same major food groups as in Table 4 and Figures 2 and 3 are used in the national model diets developed for this paper. The only adjustment we make is to specify roots and tubers (mainly potatoes) as a separate food group. This helps take account of the importance of potatoes in some country but not in others. Thus, the following food groups are used in our model diets:

1. Cereals and starches
    a. Cereals (2 most important among rice, wheat, maize, etc.)
    b. Potatoes (and other roots and tubers)
2. Protein-rich foods
    a. Vegetables (pulses, beans, nuts)
    b. Dairy
    c. Eggs
    d. Other animal-based (beef, poultry, pork, fish)
3. Vegetables
4. Fruits
5. Oils and fats
6. Sugar
7. Miscellaneous (spices, condiments, salt, etc.)

The following general rules are used to establish our national model diets. Notice that they allow for variation by development level.

First, the percentage of total calories from cereals and starches in our model diets decreases with development level, from 70 percent for low income countries to 50 percent for high income countries. This is consistent with observed consumption of these foods across countries and income levels.

Second, the amount of pulses/nuts and potatoes/roots and tubers included in a national model diet is set at the same percentage of total calories at which they are actually consumed on average in a country according to FAO food consumption data. This is done, because consumption of pulses/nuts and potatoes vary greatly across countries along with differences in food habits.

Third, the amount of protein in our model diets increases with development level, as does the distribution of proteins between different animal-based foods. Meat is favoured more than milk and egg in higher income countries as compared to lower income countries. This is consistent with WFP/UNHCR and USDA recommendations as the United States recommends more protein and especially animal-based foods such as milk, eggs and meats in its model diet, whereas WFP/UNHCR emphasizes protein-rich vegetal products such as lentils, beans and peas. This difference is consistent with differences in costs and standards of living, as animal-based foods are expensive**.** Thus, we assume that protein contributes

10 percent of total calories in low income country model diets, and that this percentage increases by 2 percent for each development level up to 16 percent in high income country model diets. We also assume that among animal-based foods, milk (which provides important nutrients and is a relatively inexpensive form of calories for an animal-based food) provides one-half of the required protein in low and lower middle income countries after taking into consideration protein provided by cereals, starches, pulses, vegetables, and fruits (oil and sugar contain no protein); eggs and meats each are assumed to provide one-quarter of remaining protein required in low income countries. In high income countries, percentage of remaining protein required is reduced to one-quarter from milk and one-eighth from eggs, and increased to five-eights from meats.

Fourth, vegetables or fruits are included in low income country model diets depending on relative costs per kg (similar to what is done by WFP/UNHCR for refugees), while fruits and vegetables are included in model diets for other countries (similar to the approach used by the United States). The amount of vegetables and fruits increases with development level in keeping with observed consumption of these foods across countries and the fact that these are relatively expensive sources of calories.

Fifth, the need for some fat and the universal demand for sugar is taken into consideration by including small amounts of oil and sugar in our model diets - - enough oil for cooking and to meet minimum needs for fats (23-38 grams per day depending on development level), and a small quantity of sugar for cooking and for non-alcoholic beverages such as coffee and tea (from 18-42 grams per day depending on development level). Notice that WFP/UNHCR specifically includes oil to ensure sufficient fats and sugar to ensure an acceptable diet, while the United States recommends that oils and sugar be used sparingly because Americans often over-consume these foods.

Sixth, we include a miscellaneous food category in our model diet to allow for the purchase of spices, condiments, salt, non-alcoholic beverages, etc. This is consistent with the need for these items so that meals are palatable and contain sufficient micronutrients and minerals. Notice that WFP/UNHCR specifically mentions the need for fortified and blended foods, as well as condiments, salt and spices. The United States, in contrast, does not mention this, because many foods in the United States are fortified by law. The miscellaneous expense category also takes into consideration some wastage and the need for some variety of food items within major food groups.

4.3 Taking into consideration local food preferences

Nutritionists (Latham, 1997), international agencies (WHO/FAO, 2003) and virtually all concerned with measuring poverty (see Ravallion, 1992) recommend that model diets take into consideration cultural context and local food consumption patterns and preferences. This recognizes the important role food preferences and traditions play in determining acceptable diets. It also implicitly recognizes the important role played by relative food prices in determining consumption patterns. Indeed, this practice is followed in all model food diets for study countries we found (see Section 7.4 for these model diets). Some countries (e.g., India, Bangladesh and Indonesia) go further, in essence using the actual diet observed of households with just the required number of calories per capita, without regard to nutritional content except for number of calories.[18]

[18] For example if 2200 calories per capita were felt to be required, the poverty line would be set at the income level of households that consume 2200 calories per capita. This implicitly means in a sense that the diet of families that consume 2200 calories is used.

National data are available online from FAO on the consumption of many vegetal foods in terms of average number of calories, proteins and fats per capita.[19, 20] **These FAO food consumption data are used in several ways to help us take into consideration local food preferences and habits.** First, the specific cereals to include in a country's model diet are identified. The two most consumed cereals according to FAO food consumption data (e.g., rice and wheat; or wheat and maize) are included in a country's model diet. Second the amount of each selected cereal included in a country's model diet is set at the same ratio as actual consumption for the population as a whole of these two cereals according to FAO food consumption data. Third, FAO food consumption data are used to determine the amount of pulses/nuts to include in a country's model diet; this is set at the same percentage of total calories as actual national consumption of pulses/nuts according to FAO food consumption data. Fourth, the amount of roots and tubers, such as potatoes, included in a country's model diet is set at the same percentage as actual national consumption of roots and tubers according to FAO food consumption data. Although these FAO data measure average consumption rather than consumption of the poor, food habits are country specific.

4.4 Acceptable amounts of carbohydrates, proteins, and fats

This section describes the general principles used to establish national model diets. It is based on earlier discussions in this paper and recommendations in Table 5 of international and national agencies regarding the distribution of total required calories between carbohydrates, proteins, fats, vegetables/fruits, and free sugar.

Before beginning, it is important to remind readers that national model diets are established in our methodology to enable us to estimate how much money people would need to purchase a nutritious low cost diet. The foods that are actually purchased and eaten each day would obviously change depending on availability and season.

Nutrition is a complex subject. With the exception of a few foods such as sugar that is almost exclusively carbohydrate and oil that is almost exclusively fat, all foods contain carbohydrates, proteins, fats, vitamins and minerals. In addition, different types of proteins are provided by vegetal and animal-based foods; and there are different types of fats such as saturated and unsaturated fats. This means that nutritious diets should take into consideration the complex array of the types of proteins, fats, minerals, vitamins, and fibers included in each food. Also, combinations of foods consumed affect absorption by the body. A well-designed diet for a country would take all of this into account.[21] This is not possible in a cross-country comparable methodology such as developed in this paper.

[19] Although these FAO data are not strictly speaking food consumption data, it is reasonable to use them in this way as indeed FAO does after providing caveats. FAO notes that these data indicate "national average apparent food consumption" or "average food available for consumption" (WHO/FAO, 2003). They are calculated by subtracting exports from estimated domestic food production and then adding imports. Despite the limitation that wastage at the household level and animal feed are included, a background chapter by FAO in WHO/FAO (2003) says "in the remainder of this chapter, 'food consumption' or 'food intake' should be read as 'food available for consumption'." In other words, FAO uses these data to describe food consumption and food intake even though they are strictly speaking data on food available for consumption.

[20] FAO data do not include information on consumption of specific non-vegetal foods, although they do indicate the grand total consumption per capita for foods (vegetal and non-vegetal together).

[21] To establish recommended diets for the United States for example, a complex linear programming approach is used that takes some of this into consideration (USDA, 2003).

Instead, relatively simple national model diets are constructed. Thus, cereals along with root and tubers are included as the main source of carbohydrates. Oil is included to ensure a minimal amount of fat and to facilitate preparation of palatable food. Vegetables and fruits are included to help provide needed vitamins and minerals. Four groups of protein-rich foods (pulses/nuts, dairy, eggs, meats) are included to provide the required protein after taking into account protein contained in cereals, roots and tubers, vegetables and fruits. Although our approach is not a very complicated approach, it should be sufficiently complex to establish nutritious and acceptable national model diets. Indeed, our model diets are as complex as those used by many national authorities and governments in low and middle income countries to estimate the poverty line in their country (see country model diets in Section 7.4).

Table 5: Distribution of nutritional needs by proteins, fats and food groups, international and national recommendations

Source	Cereals (and carbohydrate-rich foods)	Proteins	Fats	Vegetables and fruits	Sugar	Comments
WHO/FAO	55-75% of calories. 60% from carbohydrates best	10-15% of calories	15-30% of calories Approx 20% best	400g	<10%	Recommended amount of vegetables and fruits rarely reached in countries in practice.
WFP/ UNHCR (for refugees, 1992)		8%	10%			
WFP/ UNHCR (for refugees, 2000)		12%	17%			
India	55-75%					
USA	60% (8-9 servings per day) 55% also recommended[a]	5 servings per day of dairy/ meats	<30%	6 servings per day	Use sparingly	Consumption of sugar and fats too high in USA.
Latham (for FAO)	55-75%		<15%		10% typical. Higher in higher income countries.	70% from carbohydrates often in developing countries. 8-10% from fats often in developing countries.

Notes: [a] USDA (2003).

Sources: WHO/FAO (2003) for WHO/FAO. Katona-Apte (1993) for WFP/UNHCR 1992. United Nations ACC/SCN (2000) for WFP/UNHCR 2000. Indian Council of Medical Research as reported in UNFPA (2003). National Research Council reported in Rinzler (1997) for USA.

FAO/WHO recommends that carbohydrates provide between 55 and 75 percent of calories (Table 5). Approximately 60 percent is considered best (Latham, 1997 for FAO; National Research Council, 1997for USA), although USDA recently recommended 55 percent for the United States (USDA, 2003).[22] These recommended percentages for carbohydrates are somewhat higher than the observed contribution of cereals to world dietary energy supply (i.e., calories). Cereals provide approximately 50 percent of calories worldwide, with this percent remaining basically constant between 1969 and 1999 (WHO/FAO, 2003). Cereals provide a higher percentage of calories in developing countries (54 percent in 1997-1999), although this percentage fell in the 1990s from 60 percent mainly because of a move away from wheat and rice in China and Brazil (WHO/FAO, 2003). On the other hand, cereals provide approximately 80 percent of calories in Bangladesh according to FAO food consumption data

Taking into account these recommendations and cost considerations (as cereals and starches are relatively inexpensive sources of calories), we decided that cereals and starches would provide 50 percent of total calories in the model diets of high income, countries, 70 percent of total calories in low income countries, and in-between percentages

[22] Three food groups are comprised largely of carbohydrates: cereals and roots and tubers (approximately 90 percent) and sugar (100 percent).

of 60 percent for upper middle income countries and 65 percent for lower middle income countries. These percentages are consistent with the 55 to 75 percent range recommended by WHO when one takes into consideration that there are carbohydrates in sugar (which is 100 percent carbohydrate) as well as vegetables and fruits.

WHO recommends that protein should provide 10-15 percent of required calories. The low end of 10 percent is similar to WFP/UNHCR recommendations for refugees. Based on these recommendations and the fact that proteins are an expensive source of calories, we decided to use 10 percent (low end) for low income countries and to gradually increase this percentage by 2 percent with development level: to 12 percent for lower middle income countries, 14 percent for upper middle income countries, and 16 percent for high income countries.

There are four protein-rich types of food: vegetal-based foods that contain high percentages of protein (such as lentils, beans, peas, and nuts), dairy, eggs, and other animal-based foods (beef, poultry, fish, and pork). When pulses are eaten with cereals, they provide a good protein mixture containing good quantities of amino acids which improves the protein value of diet. Foods of animal origin provide a good complement to plant foods and are important for the absorption of iron. This means that a combination of different sources of protein is required for a nutritious diet. In addition, people generally prefer animal-based foods to pulses but cannot always afford them as they are much more expensive than pulses. This is reflected in international data that show that the per capita consumption of animal-based protein is three times higher in developed countries compared to developing countries (WHO/FAO, 2003). We take these various aspects related to the source of protein into consideration in establishing national model diets in two ways. First, we include pulses/nuts in our national model diets in the same proportion as observed in the FAO food consumption data. This helps to help keep down food costs in a way that is consistent with national food habits. Second, milk, eggs and meat are included in our national model diets with the percentage from meats increasing with development level.

Recommendations for fats in Table 5 display a wide range, going from 10 percent up to 30 percent. This reflects to some extent the high and increasing consumption of fats all around the world (WHO/FAO, 2003) that often contributes to obesity and other health problems. Taking these recommendations and facts into account, we decided to include a small amount of cooking/salad oil (approximately two tablespoons) in our model diets in order to ensure that diets are palatable as well as contain a minimum level of fat.[23]

WHO recommends 400 grams of fruits and vegetables per day, but few countries achieve this level as noted in the Table 5. On average, developing and developed countries had a daily supply of 271 and 309 grams of vegetables and fruits per capita in 2000 (Fresco and Baudoin, 2002 cited in WHO/FAO, 2003). These figures, which probably overstate vegetable consumption since they include horticultural produce consumed on the farm (but exclude wild vegetables and fruits), indicate how far the world is from WHO's recommendation of 400 grams of vegetables and fruits. For this reason, we include what we feel is a more realistic 250 grams for low income countries, 300 grams per day for middle income countries, and 350 grams per day for high income countries. Two varieties of vegetables and one fruit are included in our model diets in recognition of the need for some variety of fruits and vegetables to help provide the range of vitamins and minerals needed by the body.

[23] The total amount of fat in our model diets will be of course greater than the amount of cooking/salad oil, because fat is contained in almost all foods. For example: rice, chicken, lentils, egg, and carrot contain respectively 0.5, 7.5, 1.9, 12.5 and 0.3 grams of fat per 100 grams.

Recommendations for sugar in Table 5 range from "use sparingly" to "less than 10 percent." One reason for such a large range is that people in high income countries consume too much sugar (e.g., sugar and sweeteners comprise approximately 18 percent of calories in the United States according to FAO food consumption data), and government authorities such as in the United States want to discourage over consumption of sugar. To account for the universal demand for sugar, we decided to include a small amount in our model diets with the amount a positive function of development level and ability to afford sugar. Thus, 18 grams of sugar (approximately 3 teaspoons) are included in model diets of low income countries, 30 grams (5 teaspoons) for lower middle income countries, 36 grams (6 teaspoons) for upper middle income countries, and 42 grams (7 teaspoons) for high income countries.

Table 6 presents the structure of our model diet. Notice that the **amount or percentage for most food groups varies by development level.** Choice of the specific food items included in a country's model diet is determined by local food habits and relative costs; this is discussed below in Section 4.5.

Table 6: Distribution of calories by food group and development level in our national model diets

Food group	Percent of calories by development level				Comments
	Low income	Lower middle income	Upper middle income	High income	
Cereals and starches	70%	65%	60%	50%	WHO recommends 55-75% of calories from carbohydrates. 60% recommended as best.[e] Cereals -Cereals are main carbohydrate-rich food and main source of calories in all countries. -Two most important cereals in country (in same proportion as actual consumption according to FAO data) included in model diet. Roots and tubers -Roots and tubers consumption varies greatly across countries. -Amount included in model diet is set at same percent of calories as actual consumption according to FAO data. -Roots and tubers (potato, cassava, and yam) have fewer proteins per gram than cereals.
Protein rich foods	10%	12%	14%	16%	-WHO recommends proteins represent 10-15% of calories. Consumption higher in high income countries. -Cereals contain 8-12g of protein per 100g, depending on the cereal and milling. Provide majority of required protein in low income countries. -Vegetables and fruits contain approx 1g of protein per 100g. -Remainder of protein required provided by protein-rich foods. Pulses and nuts -Main protein-rich vegetal foods are pulses (lentils, beans, and peas) and nuts. Less expensive per gram of protein than animal-based foods. -Amount of pulses/nuts included in model diet set at actual percent of calories consumed in country according to FAO data. Dairy -Main non-vegetal foods are dairy; eggs, and beef/fish/ chicken/pork.[b] -Least expensive dairy (always milk) included in model diet of all countries except when lactose intolerance important (e.g. China). Eggs

Food group	Percent of calories by development level				Comments
	Low income	Lower middle income	Upper middle income	High income	
					-Least expensive egg included in model diet of all countries. Always chicken egg. Meats -Least expensive meat iper gram of protein ncluded in model diet of all countries.
Vegetables and/or Fruits	6% (250g.)	7% (300g.)	7% (300g.)	7% (350g.)	-WHO recommends 400g. Rarely achieved in practice by high or low income countries. -Vegetables and fruits contribute to balanced diet. Provide needed micronutrients, minerals and fiber.[c] Vegetables or fruit recommended for refugees by WFP/UNHCR to reduce cost. Least expensive vegetables or fruit included in our low income country model diets. Two least expensive vegetables and least expensive fruit included in our middle income and high income country model diets. -Percent of calories indicated is very approx as depends on specific vegetables and fruits consumed.[d]
Oil	10% (23g.)	10% (30g.)	9% (30g.)	9% (38g.)	-15-30% recommended by WHO. -Additional fat in diet often needed for poor persons in low income countries. -Oil added to provide minimum fat and to improve cooking/palatability of food (30 grams is approx 2 tablespoons). -Fat consumption is too high in high income countries leading to epidemic of obesity. -Cooking/salad oil almost is always used as almost always least expensive oil.
Sugar	3% (18g.)	5% (30g.)	6% (36g.)	7% (42g.)	-<10% recommended by WHO. Actual consumption is often much higher, especially in higher income countries. -Not required but always consumed, so relatively small amount included in diet (18g is approx 3 teaspoons). -Sugar here refers to sugar that is added to foods or beverages by the family (sometimes referred to as free sugar). -Sugar has “empty” calories, without protein, fat or micronutrients.

Food group	Percent of calories by development level				Comments
	Low income	Lower middle income	Upper middle income	High income	
Miscellaneous (total miscellaneous costs. see table 9 for distribution among types of miscellaneous costs.)	8%	17%	29%	43%	Other, miscellaneous foods -Condiments, spices, sauces, etc. required to make food palatable. -Salt needed. -Coffee and tea consumed in almost all countries. -Cost of these other food expenses not calculated separately. -Cost of alcoholic beverages not considered here. Wastage (losses from storage; poor absorption of protein and micronutrients; food discarded) -Cost of poor absorption not considered here. Additional variety of foods within major food groups. -Model diet selects only least expensive food item in each major food group. Cost of additional variety is accounted for here. -Cost of some additional variety included in misc. expense category. Food for guests -Cost of food for guests not considered here.

Notes: Our approach should be seen as establishing a model diet in order to estimate how much money people need to buy a low cost nutritious diet. The foods actually eaten each day would change depending on availability and season and cost that day. Implicit assumption is that people are both efficient and knowledgeable as regards purchase, storage and preparation of foods and diet. [a] A variety of cereals is better than only one cereal, such as only rice or only wheat. To account for this partially and simply, we include in model diets the two most important cereals actually consumed in the country and use their relative actual consumption according to FAO food consumption data to determine amounts to include in a national model diet. Note that there is considerable similarity between cereals in that all contain approximately 350 calories per 100g. [b] Percentage distribution of remaining protein required from animal-based foods (after taking into consideration protein in all vegetal foods in the model diet) is a function of development level. Meat consumption percentage increases with development level while dairy and egg consumption percentages decrease with development level. Specific type of dairy, egg and meat selected is the least expensive per available gram of protein according to the ILO food price data. Note that it is always milk for dairy and chicken egg for eggs. [c] A variety of vegetables and fruits is important, because this helps provide a more complete range of required micronutrients, minerals, and fiber. To help account for this partially, the three least expensive vegetables and fruits according to ILO food price data are included in the model diet of low income countries. The two least expensive vegetables and the least expensive fruit are included in the diet of middle income and high income countries. [d] Vegetables and fruits do not generally contain many calories. Percent of total calories indicated in this table is approximate, since number of calories per gram varies greatly by type of vegetable and fruit. Percentages here are based on the average for carrots, cabbage and banana (three relatively inexpensive and commonly consumed vegetables and fruit); this provides an approximate percent, as bananas contain approximately 2.5 times more calories per edible gram compared to oranges. [e] Percentages used in our model diets roughly mimic this recommended range when one considers that sugar is 100 percent carbohydrate and fruits and vegetables contain some carbohydrate.

4.5 Selecting specific foods to include in major food groups and costing them

Our model diet has a prescribed distribution of consumption across ten food groups (cereals; roots and tubers; pulses/nuts; dairy; eggs; meats; oils; vegetables; fruits; sugar). The specific foods included in a country's model diet (e.g., rice or wheat or maize for cereals; potatoes or yams for roots and tubers; corn oil or sunflower oil or butter for oils; carrot or cabbage for vegetables; banana or orange for fruits; lentils or beans for pulses and nuts; beef, or chicken or fish for meat; cheese or milk for dairy), however, are determined by country-specific factors. Relative food prices in a country are used to select specific food items except for cereals where actual food consumption patterns in a country are used.

The remainder of this section describes how ILO unit food price data are used to cost a country's food basket as well as to determine the specific foods to include in a country's food basket (Section 4.5.1). More detail on how we go about selecting and costing food items in a country's model diet is provided in Section 4.5.2.

4.5.1 Selecting specific foods

Since we need to cost each country's model diet (and be able to update this cost perhaps annually), the methodology and estimates in this paper are necessarily constrained by the availability of food price data. It does no good to include a particular food item in a country's model diet if it is not possible to price it. Thus, it is important that food price data are available for important foods within each of our ten food groups.

Fortunately, food prices for 93 commonly consumed food items are published annually by ILO in its October Inquiry and available online from ILO. **These ILO food price data are used to select specific food items and cost national model diets.** They are the most comprehensive annual international food price data set currently available. As shown below in Table 7, food price data were reported for 110 countries or territories in the 2001 ILO October Inquiry publication, with an excellent distribution of countries by region.

Table 7: Number of countries with food price data for 1999 and/or 2000 in ILO October Inquiry 2001, by region

Region	Number of countries/territories with food price data
Sub-Saharan Africa	15
Latin America	22
Asia	17
Middle East/North Africa	9
Transition Economy	23
Developed Economy	24
Total	110

Notes:
Judgment is used to assign countries to regional grouping.
Countries and territories with very small populations were excluded.
Source: ILO (2001) ILO October Inquiry.

In addition to the wide coverage of countries and foods, there are several additional advantages afforded by these data for our purposes. First, the eleven food groups included in the ILO food price data (shown below) overlap very closely with the food groups included in our model diet.

- Cereals
- Starchy roots and tubers
- Meat, poultry and fish
- Milk and dairy products
- Eggs
- Fats and oils
- Vegetables and fruits
- Sugar
- Non-alcoholic beverages
- Alcoholic beverages
- Miscellaneous

Second, a wide variety of foods are included (see Appendix E for the complete list of food items), and these are foods that are commonly consumed.[24]

Third, according to ILO October Inquiry (2002) "prices reported should be, as far as possible, those used regularly for calculating consumer price indices. They should also

[24] Another advantage of ILO October Inquiry food price data is that the specific variety of some food items (cooking oil, fish, wheat bread and cheese) is country-specific. For example, the cooking/salad oil could be sunflower oil, or corn oil, or palm oil.

refer to the normal retail price paid by the consumer". This means that food prices in the ILO data set should reflect actual retail costs consumers pay.[25]

4.5.2 More detailed discussion on selection, quantity and costing of specific foods included in each major food group

Discussion in this subsection proceeds by major food group, and describes how we select, quantify and cost the specific foods for each major food group included in a country's model diet. Appendix G provides detailed information on the nutritional content and edible proportion of foods.

Cereals

Two cereals are included in national model diets to ensure some variety. FAO food consumption data are used to identify which cereals to include a country's model diet. The two cereals with greatest actual consumption in the country according to FAO data are selected. The relative amount of the two most important cereals is determined by their relative actual consumption according to FAO data. For example, if the two most important cereals consumed in a country are rice (80 percent of total cereal calories) and wheat (15 percent of total cereal calories), then 84 percent (i.e., 80/95) of cereal consumption would come from rice and 16 (15/95) percent would come from wheat in our model diet for this country. The rice and wheat flour prices in the ILO food price database would then be used to calculate the total cost of cereal consumption in this country.[26] The consumption of wheat is assumed to be wheat flour in low income and lower middle income countries, and one-half bread and one-half wheat flour in upper middle income and high income countries. Our assumption regarding the consumption of wheat should perhaps be rethought in the future and perhaps changed to include a combination of flour and bread in lower middle income countries where this is felt to be appropriate and perhaps changed to a combination of pasta, bread and flour in high income countries.

Roots and tubers (usually potatoes)

FAO food consumption data are used to determine the amount of roots and tubers to include in national model diets. The percentage of total calorie from roots and tubers included in a country's model diet is set at the percentage actually consumed according to FAO food consumption data. This was felt to be necessary, because the consumption of roots and tubers various so much across countries along with local food habits. Note that the percentage of total calories supplied by cereals and starches decreases along with development level in our model diets. It is 70 percent for low income countries, 65 percent for lower middle income countries, 60 percent for upper middle income countries, and 50 percent for high income countries.

[25] Price data are collected from establishments selling food and so reflect actual retail prices paid. It is possible for these prices to differ from those paid by poor persons for a number of reasons that could cause ILO reported prices to be higher (e.g., prices may be lower in informal sector where poor buy), or lower (e.g., poor may not be able to afford to buy in bulk). See Section 6.5.4 for discussion on this issue.

[26] When the price of a main cereal is not reported in the ILO dataset, which occurs infrequently, a rough estimate is made. For example the maize meal price for Zimbabwe is estimated by multiplying the maize to wheat price ratio in Zambia (a neighboring country) by the known wheat price in Zimbabwe. Appendix D contains details on how all of such estimates are made.

Vegetables and fruits

ILO food price data are used to identify the specific vegetables and fruit to include in a country's model diet. The least expensive vegetables and fruits are selected.

Note that the quantity of vegetables/fruits consumed in national model diets increases with development level, from 250 grams per day for low income countries, to 300 grams per day for middle income countries, and to 350 grams per day for high income countries. Also note that these are quantities "as consumed". To get quantities "as purchased", it is necessary to increase the quantity consumed by the proportion of food that is inedible or lost through cooking (see Appendix G).

Two or three vegetables are included in model diets in order to help ensure some variety. One fruit is always included in model diets in middle income and high income countries. In low income countries, one fruit is included in the model diet only when it is less that 50 percent more expensive than the least expensive vegetable. It is important to have some variety in vegetables and fruits, because an acceptable minimum nutritious diet requires a range of vitamins and minerals. Consuming the same vegetable every day together with cereals and some protein-rich foods would not yield the required daily allowance of most micronutrients.[27] For this reason, the specific vegetables and fruits selected for inclusion in a national model diet should not be seen too literally. People should not be seen as literally consuming every day say 150 grams of cabbage, 75 grams of carrots and 75 grams of banana. Rather, the variety of the specific vegetables and fruits included in a country's model diet should be seen as providing people with income to buy vegetables and fruits. Which vegetables and fruits people purchase would clearly vary across the week and the season depending on costs and availability.

ILO food price data are used to identify the specific vegetables and fruit to include in a country's model diet in the following way. First, the two least expensive vegetables and the least expensive fruit per edible gram in a country are identified for possible inclusion in the country's model food basket. In middle income and high income countries, the least expensive fruit and the least expensive vegetable are included in the model diet. In addition in these countries, the second least expensive vegetable is included when its cost does not exceed 1.5 times the cost of the least expensive vegetable; when this price limit is exceeded, an unspecified second vegetable is included in the country's model diet at this capped price. The quantity of total vegetables/fruits consumed in middle income and high income countries is taken as three-quarters from vegetables (one-half from least expensive vegetable and one-quarter from second least expensive vegetable) and one-quarter from the least expensive fruit. A different approach is followed in low income countries where fruit is included in the model diet only if its cost per edible gram does not exceed 50 percent more than of the cost of the least expensive vegetable. Also in low income countries, the cost per edible gram of the second vegetable is not allowed to exceed 1.5 times the cost of the least expensive vegetable. Readers need to keep in mind that we are interested in establishing a basic nutritious diet for the poor, and it is unlikely that the poor in low income countries would eat much fruit when it is too expensive. It is also worth remembering that the recommended WFP/UNHCR diet for refugees allows for the consumption of vegetables or fruit depending on availability and cost.

[27] This is the reason that governments and aid agencies recommend fortified foods.

Oil

ILO food price data are used to identify and price the least expensive oil in a country for inclusion in the country's model diet. This almost always turns out to be "cooking or salad oil", as the other fats and oils included in the ILO data set (i.e., margarine, ghee, olive oil, lard) are almost always more expensive per kg. It is worth noting that some countries mention which type of "salad or cooking oil" has been priced. Peanut oil is mentioned for Morocco, Chad, India, and Hong Kong; sunflower oil is mentioned for Egypt, Russia, Australia, and Netherlands; corn oil is mentioned for Colombia, Jordan, Republic of Korea, Malaysia, and Italy; soybean oil is mentioned for Mauritius, Norway, Poland, Panama, and Cambodia.

Protein-rich foods

In some ways, the most important decisions in choosing specific foods to include in a country's model diet occur for protein-rich animal-based foods because of their relatively high unit cost. As shown in the sensitivity analysis in Appendix A, the cost of a model diet in our methodology is somewhat sensitive to the amount of protein in the diet. In our model diets, we allow the percentage of total calories that come from protein to increase with development level from 10 percent in low income countries (WHO's lowest recommended level), to 12 percent for lower middle income countries, 14 percent for upper middle income countries, and 16 percent for high income countries (just above WHO's highest recommended level). To keep down the cost of protein-rich foods in our model diets, the following approach is used.

Vegetal protein-rich foods

First, we ensure that pulses/nuts are included in model diets, because they are an inexpensive source of protein. To make sure that the amount of pulse/nuts in a country's model diet is consistent with local food habits, the amount is set at a country's average national consumption of these foods according to FAO food consumption data. This is important, because the consumption of pulses/nuts varies so greatly across countries. If for example, pulses and nuts actually provide 2 percent of total calories in a country on average according to FAO food consumption data, then pulses/nuts would comprise 2 percent of total calories in our model diet for this country. In this way, the cost of providing protein is kept down at the same time that food habits for each country are taken into consideration.

Animal-based foods

All of the remaining protein required (after taking into account the protein provided by all vegetals in a country's model diet) is divided between three animal-based foods: (i) dairy; (ii) eggs, and (iii) meat. The proportion of remaining required protein is assumed to fall with development level for milk (from one-half to one-quarter) and eggs (from one-quarter to one-eight) and to increase with development level for meats (from one-quarter to five-eighths) because of increased preference for meats. The least expensive variety of dairy, eggs and meats per edible gram of protein according to ILO food price data is selected for inclusion in a country's model diet. This is always milk for dairy and chicken eggs for eggs for our 12 study countries. The least expensive meat varies across countries. It is beef in Armenia, Ecuador, Costa Rica, India, Zimbabwe, and Bangladesh; fish in China and Lithuania; and chicken in South Africa, Egypt, USA and Switzerland. The least expensive meat is identified by calculating cost per gram of available protein for all meats using ILO food price data along with nutrition data on the number of grams of protein per gram of edible food and taking into consideration losses from bones, skin and cooking.

Sugar

ILO food price data are used to price sugar. Since there is only one variety of sugar included in the ILO food price data set, this variety and price are used. It is the price for the widely consumed "white refined sugar" (ILO, website).

4.6 Miscellaneous additional food costs

There are many food costs that families have to pay that our model diet does not specifically consider. This includes the following costs:

- Spices, salt, condiments and sauces (such as soy sauce and tomato paste) are necessary to make food palatable. These foods are included in the WFP/UNHCR basic diet for refugees (see Table 5).

- Coffee and tea are universally consumed, including by poor persons, and are often specifically included in national model diets.

- Non-alcoholic beverages such as sodas are widely consumed around the world and are included in the model diets used by some of our study countries such as Costa Rica, Egypt, and United States.

- Wastage and spoilage (for example from storage) can represent an important cost. So can food not eaten and discarded.

- Additional variety of foods within food groups. Our methodology provides for almost no variety within major food groups. While it allows for two cereals and two vegetables, only one food item is included in each of the other eight food groups. National diets often allow for more food items within food groups. For example, the 1998 diet used to estimate the poverty line in China includes 27 food items (Sangui, 2004), and the 1999 recommended Thrifty Food Plan in the United States includes 44 food items (U.S. Government, USDA, 1999). Since the greater the number of food items in a model diet, the higher its cost is generally (because more expensive foods are now included in each food group), adding variety generally increases total food cost. As is shown below, the increase in food cost from greater variety of foods is often substantial, especially in upper middle income and high income countries where recommended model diets are reasonably complex.

- Poor absorption of micronutrients and protein can be important. This is ignored here because it is complex and depends in part on the combinations of foods that are consumed.

- Food is sometimes provided to guests. This occurs in poor households just as it does for better-off households. This cost is ignored here, partly because it is not considered to be absolutely necessary (although it might be in some societies) and partly because poor households could gain as well as lose food in this way.

- Alcoholic beverages are consumed all around the world, and they are included in some national recommended model diets, such as for Armenia and Egypt among our study countries. Consumption of alcohol is ignored here, because it is not necessary.[28]

Since it is difficult to separately price all of the above miscellaneous food costs in every country, a simpler approach is taken. A miscellaneous food cost category is used to account for all miscellaneous food costs.[29] This miscellaneous food cost is then added to the cost of the selected foods in a model diet to arrive at an estimate of total food cost.

To help decide on what percentage of total food costs would be reasonable to represent unaccounted miscellaneous food costs such as those noted above, information for study countries was collected on how miscellaneous food costs are treated in the model diets countries use (Table 8). Three types of miscellaneous food costs were looked at: (i) cost of typical miscellaneous foods such as spices, salt, condiments, sauces, coffee, tea, sodas, etc.; (ii) wastage; and (iii) increased cost due to greater variety of foods within major food groups. We ignored the cost of alcoholic beverages, poor absorption of nutrients, and food given to guests, because they were not felt to be necessary and were difficult to estimate in practice.

The cost of typical miscellaneous foods in national model diets as a percentage of total food costs tended to increase with development level. It was 0-1 percent for the two low income study countries in Table 8, although according to Government of India (1993), households below the official poverty line in India in 1987/88 spent around 5 percent of their food budget on "salt and spices" and around another 5 percent on "beverages and refreshments". Percentages for lower middle income study countries were 0-2 percent for China, Armenia and Ecuador, 4-7 percent for South Africa and Ecuador, and 10 percent for Egypt. The percentage of food costs for miscellaneous foods increased further to 17 percent for upper middle income country Costa Rica (and 10 percent for United States in 1961). These data for study countries indicate that *including the cost of miscellaneous foods (such as spices, salt, condiments, coffee and tea) in model diets is common and that the percentage of food costs for miscellaneous foods increases with development level.* With national practices in mind and wanting to be conservative, the cost of miscellaneous foods for our model diets was set at (see Table 9) 3 percent for low income countries (midway between values in Table 8 for low income study countries and actual expenditures in India), 4 percent for lower middle income countries (value for South Africa, and approximate average for the five lower middle income study countries), 8 percent for upper middle income countries (approximately half of 17 percent value for Costa Rica whose national model diet includes considerable variety of non-essential miscellaneous foods), and 10 percent for high income countries (value for United States in Table 8 is for 1961 which is undoubtedly lower than for today).

[28] It is interesting to note that Rowntree (1908) in his seminal study included the cost of typical but unnecessary expenditures, such as on alcohol and gambling, in what he called secondary poverty to measure necessary available income for a minimal living standard (see discussion in Section 2).

[29] It would be possible to cost salt, coffee and tea using the ILO food price data set, because their prices are included in this data set for many countries. First it would be necessary to decide on amounts to include (for example say 5 grams of salt and 10 grams of tea and/or coffee each day). This could be done in the future if others feel this would represent a significant improvement and acceptable assumptions on amounts (such as those suggested above) could be established. Although it would not be possible to directly cost spices or condiments because their prices are not included in the ILO food price data set, it would be possible to assume that there is a fixed ratio between the cost of spices and condiments and the cost of salt.

Wastage (from spoilage of foods and food discarded) is generally ignored in national model diets. The only example found among study countries was for the United States which assumes 10 percent wastage for its 1999 Low Cost Food Plan, and 30 percent for its 1999 Liberal Food Plan. Back in 1961, the United States used 5 percent for its Economy Food Plan, 8 percent for its Low Cost Food Plan, and 20 percent for its Liberal Food Plan. *My feeling is that it is correct to include a small allowance for spoilage and wastage for all countries* - - even though national authorities generally ignore this. For example, food is lost to rodents, mold, spoilage, etc. in low income countries. On the other hand, the amount of wastage would not be high for poor persons, especially in lower income countries and especially as regards food not eaten and discarded. With these considerations in mind, I decided to include only a small percentage for wastage in our model diets and to have this percentage increase with development level, from a conservative 1 percent in low income countries to a conservative 10 percent in high income countries (see Table 9).

Increased variety of foods within major food groups can have a major impact on total food costs. While the relationship between greater variety and total food costs is complex as it is affected by the number of food items selected, their relative quantities, and their relative costs, there should be a strong tendency for total food costs to increase along with increased variety of foods within food groups compared to total food costs using our methodology, because the least expensive food item(s) is always selected in our methodology. This is indeed the case as shown in Table 8 - - the greater the variety of foods in a country's model diet, the greater the increase in total food costs. This relationship is also found to be positively related to development level, increasing from around 1-2 percent in Bangladesh and one Zimbabwe model diet among low income study countries; to around 6-7 percent in China and Ecuador and to around 14 percent in South Africa among lower middle income countries; and to around 24 percent in Costa Rica in 2000 and the United States in 1961. Keeping in mind that I want to be conservative in assumptions here, I decided to use the following percentage to allow for greater variety of foods than allowed for in our methodology - - 4 percent for low income countries (slightly above value used by Bangladesh and well below one value for Zimbabwe), 8 percent for lower middle income countries (six percent below value for South Africa and slightly above values for China and Ecuador), 16 percent for upper middle income countries (eight percent less than value for Costa Rica and twice value for lower middle income countries), and 23 percent for high income countries (percentage observed for the United States back in 1961).

Table 8: Miscellaneous food costs used by national authorities to estimate their poverty line (percent of total food costs)

Development level/ Country	Miscellaneous foods	Wastage	Additional variety within major food groups[a]
Low income			
Bangladesh	None[b]	None	2% (2 meats, 2 pulses, 2 cereals)
Zimbabwe (Central Statistical Office)	1%[b] (salt)	None	10% (approx as difficult to calculate) (4 cereals, 2 pulses/nuts, 4 vegetables, 3 meats)[c]
Zimbabwe (World Bank)	None[b]	None	1% (approx as difficult to calculate) (3 vegetables, 3 meats, 4 cereals, 4 oils)[c]
Lower middle income			
Armenia	1% (coffee, tea, confectionary products, soft drinks, other)[d]	None	Unknown (unspecified variety for 8 major food groups)
China before 1998[e]	None	None	6% (4 meats, 2 oils)
Ecuador	0.2% (salt)	None	7% (3 meats, 2 cereals, 3 vegetables, 3 fruits, 2 oils)
Egypt	10% (tea, coffee, soft drinks, other)	None	Considerable (variety determined by "how food is actually obtained by the second quartile")
South Africa	4% (spices, salt, coffee, tea)	None	14% (2 meats, 2 cereals, 5 vegetables, 2 sugars, 2 beans/nuts, 2 oils)
Upper middle income			
Costa Rica	17% (salts, condiments, spices, coffee, biscuits, sodas)	None	24% (7 cereals, 2 roots and tubers, 4 dairy, 7 meats, 5 vegetables, 4 fruits, 3 oils)
High income			
USA 1961 Economy Plan	10%[f] (coffee, tea, soft drinks, puddings, catsup, jellies, cookies, cocoa, salt, seasoning, other)	5% (10% in 1999)[g]	23%[f] (7 cereals, 2 roots and tubers, 3 beans/nuts, 10 dairy, 8 meats, 11 fruits, 19 vegetables, 4 oils, 4 sugars)

Notes: Miscellaneous costs here do not include food consumed by guests, or food consumed outside home, or an adjustment for poor absorption of nutrients. Information not available to author on model diet used by study countries India, Lithuania or Switzerland. [a] Percentage for additional variety is approximate and is estimated by author. It is percentage difference between cost of our model diet for a country using our methodology of selecting least costly food item(s) in each major food group and cost of this same model diet with the additional variety within major food groups as specified in the country's own model diet. Percent is calculated relative to total food cost that includes miscellaneous costs. Unit food prices used are from ILO food prices data set except for Costa Rica and United States where prices reported by national authorities are used; in United States, these are the prices actually paid by households with an income in the lowest one-third of the income distribution. [b] In India in 1987/88, households below the official poverty line actually spent approximately 10 percent of their food expenditures on miscellaneous foods - - 5 percent for "salt and spices" and 5 percent for "beverages and refreshments" (Government of India, 1993). [c] Less variation for vegetables than in our own model diet. Rape comprises 91 percent of vegetables in World Bank model diet; own consumed vegetables and rape comprise 80 percent of vegetables in CSO model diet. [d] Excludes 1 percent for alcoholic beverages. [e] Details of model diet used by China after 1997 was not available to the author. [f] Percentage is difficult to calculate for 1999 USA Thrift Food Plan for miscellaneous foods and variety. For example, foods generally considered as a miscellaneous food in other countries are often included in major food groups (e.g., cookies are included with cereals and sweets are included with sugars). In addition, U.S. Government, USDA (1999) notes that the 1999 Thrifty Food Plan is not a realistic diet, especially in terms of variety. It "serves as a valuable framework for providing advice to low income households regarding economical nutritious food selection. This is especially important as the average low income family of four spends about 23 percent more on food than the Thrifty Food Plan market basket". [g] Wastage in 1961 United States' model diets was 5 percent for the Economy Food Plan, 8 percent for the Low Cost Food Plan and 20 percent for the Liberal Food Plan. Wastage in the 1999 United States' model diets was 10 percent for the Low Cost Plan and 30 percent for the Liberal Food Plan.

Sources: Zimbabwe Central Statistical Office (1998) for Zimbabwe CSO. Hamdok, (1999) for Zimbabwe World Bank. Cofer et al (1962) for United States 1961. United States USDA (1999) for United States 1999. Costa Rica Government INEC (2004) for Costa Rica. Ravallion and Sen (1996) for Bangladesh. World Bank (June 2002) for Egypt. Martins and Maritz (2002) for South Africa.

Bringing the above discussion and analysis on miscellaneous food costs together results in the following crude assumptions for miscellaneous food costs in our model diets (see Table 9). Miscellaneous food costs as a percentage of total food costs are assumed to increase with development level from 8 percent for low income countries, to 17 percent for lower middle income countries, to 29 percent for upper middle income countries, and to 43 percent for high income countries. These percentages are obviously only rough approximations, and some readers will disagree and want to change them**. My feeling, however, is that these assumptions for miscellaneous food costs are conservative.**

Table 9: Miscellaneous food costs used in our model diets, by development level (percent of total food costs)

Development level	Miscellaneous foods (spices, condiments, salt, coffee, tea, etc.)	Wastage (spoilage, food discarded)	Additional variety within major food groups (e.g., several meats, vegetables, etc.)	Total
Low income	3	1	4	8
Lower middle income	4	3	8	17
Upper middle income	8	5	16	29
High income	10	10	23	43

Notes:

Percentages are rough approximations.

Percentages are purposely conservative and on the low side.

Source: Based on national information in Table 8 and discussion in text.

4.7 Summary for establishing and costing national model diets

The following general principles are used to establish a national model diet and to select and cost the specific foods included in the model diet. They use international recommendations on nutrition, FAO national food consumption data, and ILO national food price data to ensure that national diets: (i) are nutritious, (ii) reflect national food habits, and (iii) are relatively inexpensive.

Establishing a national model diet

- *Ten major food groups are included in a model diet* (cereals, roots and tubers, pulses, dairy, eggs, meats, vegetables, fruits, oils, sugar). These are the same food groups used by countries and international agencies in their model diets. Two varieties of cereals and two different vegetables are selected; one food item is selected for the other eight major food groups.

- Selection of specific food item(s) included in a major food group is based on a combination of actual national consumption patterns (to make sure that selected foods are acceptable to people), and relative costs (to make sure that the model diet is low in cost). The former is used to select the two cereals to include, and the latter is used to select specific food items() for the other nine major food groups.

- *Recommendations and practices of international and national agencies and nutritionists are used* to decide on total calories per capita required as well as how these required calories are distributed between proteins, fats and carbohydrates.

- *Quantity of food included in each major food group is partly determined by development level* to reflect differences in ability to pay for different types of

foods. For example, the amount of vegetable, fruit, sugar, milk, meat and egg increase with development level, while the quantity of cereals decreases with development level. However, the quantity for two major food groups (roots and tubers and pulse/nuts) is determined by actual food habits observed in a country according to FAO food consumption data, because consumption of these foods varies so greatly across countries.

- Model diets should be seen as providing a basis for estimating the cost of a low-cost nutritious diet. They should not be seen literally as fixed diets that poor families consume each and every day.

Selecting and costing the specific foods included in a country's model diet

- Two cereals are included in model diets to allow for variation in the most important food group as regards calories, both because a variety of cereals is important for nutrition as well as because many countries consume a variety of cereals. The cereals selected are those with the greatest actual consumption in the country according to FAO food consumption data.

- Relative amounts of the selected cereals in a country's model diet are determined by the extent to which they are actually consumed in the country according to FAO food consumption data. For example if four times as much rice were actually consumed as compared to wheat according to FAO food consumption data, then four times as much rice as compared to wheat would be included in a country's model diet.

- *Amount of roots and tubers included in a country's model diet is determined by its actual consumption* according to FAO food consumption data. The least expensive root and tuber according to ILO food price data (almost always potato) is selected.

- *Amount of protein-rich pulses and nuts in a country's diet is determined by the actual consumption* in the country of these foods according to FAO food consumption data. The least expensive pulse per edible gram according to ILO food price data is selected.

- *The least expensive dairy, the least expensive egg, and the least expensive meat per gram of available protein* according to ILO food price data are included in a country's model diet. The relative consumption of these three types of animal-based foods changes with development level; meats increase in relative importance with development level while milk and eggs decrease in relative importance.

- The three least expensive vegetables/fruits per edible gram according to ILO food price data are included in model diets of low income countries. The unit cost of the second and third vegetable and fruit is capped at 1.5 times that of the least expensive vegetable to keep down food costs.

- In middle income and high income countries, model diets include the two least expensive vegetables and the least expensive fruit. The price of the second vegetable is not allowed to exceed 1.5 times the price of the least expensive vegetable.

- *A miscellaneous food category is added* to arrive at total food costs. This allows for minimal levels of wastage; condiments, spices, salt, non-alcoholic beverages; and additional variety of foods. Miscellaneous costs as a percentage of total costs increase with development level in keeping with observed national practices and ability of the poor to afford miscellaneous food costs.

5. Non-food costs, taking into consideration family size, and full-time working hours

This section of the paper moves beyond food costs to discuss other aspects which are necessary to estimate national poverty lines and national living wage rates. This includes non-food costs, number of full-time work hours, and how to go from a minimum living standard cost for one person to a minimum living standard cost for a family. Appendix A contains a sensitivity analysis of the various assumptions made in this section.

5.1 Estimating non-food costs to include in poverty line

This paper follows the traditional and most common approach used in the poverty literature and by national authorities to estimate non-food costs to include in a poverty line estimate. The cost of non-food needs is estimated using the ratio of non-food costs to food cost. For example if the poor spend 75 percent of all expenditures on food, then it would be assumed that non-food costs are one-third of food costs, and so the poverty line would equal 1.33 times food costs.

Non-food costs = Food cost *(% spent on nonfood/% spent on food)

thus

Poverty line = Food costs * (100/% spent on food)

Since the percentage of consumption devoted to essential non-food items is known to increase with income, the non-food multiplier we use increases with national income per capita level (see discussion and data on this later in this section). This relationship tends to be so regular and strong and has been observed for such a long time that it is often referred to as a law (Engel's law); indeed, the proportion of expenditures for food is sometimes used on its own to measure poverty.

> "The poorer is a family, the greater is the proportion of the total outgo [family expenditures] which must be used for food. … The proportion of the outgo used for food, other things being equal is the best measure of the material well-being of the material standard of living of a population" (quote from Ernst Engel in Zimmerman, 1932).

To help decide on what non-food multipliers would be appropriate for countries at different levels of development, we put together information on national practices for a number of countries.[30] Table 10 contains information for 15 countries on the percentage of total expenditures for food that have been used to estimate the national poverty line. Table 11 and Figure 4 indicate the share of total expenditures for food that 75 countries or territories have used to estimate the national consumer price index (CPI).

[30] It is worth noting that there is another quite different approach to measuring non-food costs that is sometimes used in the poverty literature and national poverty line estimates. This other approach starts off by establishing a set of essential non-food needs, and then costing all items on this list. While this basic needs type of approach is superior conceptually to the approach used in this paper as well as in almost all national poverty line estimates (as it costs a normatively established set of goods and services just as is done for food), it is not often used (e.g., Streeten, 1994). The most important reason why this alternative approach is not used much is that it is difficult to use in practice, because it is almost impossible to agree on what items, in what quantities, and at what quality levels are truly necessary for the poor and so should be considered as non-food essentials.

Table 10: Percent of total expenditures for food used by national authorities to estimate poverty line, 15 countries by development level

Development level /country	Year	National	Implied non food multiplier (1.0/col 5)
Low income			
Bangladesh	1991-92	65	1.54
India	1972/73	80	1.25
Nepal	1976-85	65	1.54
Pakistan	1963-79	55	1.82
Mean		66	1.54
Median		65[a]	1.54[a]
Lower middle income			
China	1978-1997	60	1.67
South Africa	2002	58	1.72
Egypt	1977	60	1.67
Tunisia	1968-85	69	1.45
Turkey	1994	67	1.50
Brazil	1960-85	60	1.67
Honduras	1988-91	62	1.61
Mean		62	1.61
Median		60	1.67
Upper middle income			
Venezuela	1982-89	50	2.00
Mexico	1992	50	2.00
Uruguay	1996	32[b]	3.13
Mean		44	2.37
Median		50	2.00
High income			
USA	1964	33.3	3.00

Notes: Latest available value from sources is used except for China where 1997 value is used. 1998 value for China of 87% is not used because it is clearly inappropriately low.

National values reported for earlier years were: 70% and 80% for Bangladesh for 1973-78 and 1963-78; 70%, 67% and 65% for Egypt for 1964-75; 70% for Brazil for 1974/75.

[a] Recent article by Kakwani (2004) provides values in the late 1990s or later using calorie-based poverty lines he estimated for 19 low income countries. Median value for these 19 low income countries was 71% (ranging from approximately 55% in Cameroon to 81% in Burundi). This implies a multiplier of 1.41. Values for Bangladesh and India in 2000 (only two countries that are included in the present table and Kakwani, 2004) were 69 percent and 68 percent respectively.

[b] Uruguay value is for Montevideo. Value for other urban areas in Uruguay is 36%.

Sources: Nepal, Pakistan, Egypt, Honduras, Brazil, Venezuela cited in Tabatabai (1996); Joshi (1997) for India; Erdogan (1997) for Turkey; Cervera (1997) for Mexico; Rama and Fernadez (1997) for Uruguay; Ravallion and Sen (1996) for Bangladesh; Sangui (2004) for China; Martins and Maritz (2002) for South Africa; Orshansky (1965) for United States.

Table 11: Percent of total expenditures for food used to estimate consumer price index (CPI), 75 countries or territories

Development level/Country	% food	Development level/Country	% food
High income		*Upper middle income Cont'd*	
Switzerland	12	Poland	34
United Kingdom	13	Lebanon	35
Netherlands	14	Mauritius	36
Sweden	14	Latvia	37
Netherlands Antilles	15	Czech	38
Iceland	15	Argentina	40
Finland	16	average (mean)	34
Luxembourg	16	Upper middle income median	34
USA	16	Lower middle income	
Isle of Man	16	Honduras	41
Italy	17	Iran	37
France	18	Tunisia	41
Israel	18	Columbia	41
New Zealand	18	Guyana	26
Canada	19	Morocco	45
Australia	20	Bulgaria	46
Greece	21	Jordan	44
Portugal	23	Bolivia	49
Ireland	23	Romania	50
Japan	29	Thailand	35
Spain	29	Fiji	35
Faroe Islands	42	St Vincent and Grenadines	60
Kuwait	36	Armenia	61
Bahrain	25	Sri Lanka (Colombo)	62
Puerto Rico	45	Belarus	65
Hong Kong, China	30	Philippines	55
Korea, Rep of	30	average (mean)	47
Macao, China	31	Lower middle income median	45

Development level/Country	% food	Development level/Country	% food
average (mean)	22	*Low income*	
High income median	19	Kenya	39
Upper middle income		Benin	39
St. Lucia	47	Burkina Faso	34
Botswana	26	Haiti	49
Venezuela	39	Uganda	50
Oman (Muscat)	26	Malawi	56
Lithuania	47	Kyrgyzstan	60
Hungary	27	Azerbaijan	63
Uruguay	28	Georgia	63
Slovakia	29	Nigeria	69
Mexico	29	India (A.W.)	69
Saudi Arabia	33	Tanzania	74
Malaysia	34	average (mean)	55
Estonia	34	Low income median	58

Notes: Countries or territories are excluded when their development level is not classified by the World Bank. These are almost always very small countries or territories.

New Delhi, India is excluded as another value was available for India.

Sources: ILO unpublished data, drawn from official national sources.

Table 12: Summary of percent spent for food used by countries to estimate national CPI and national poverty line and implied non-food multipliers, by development level

Development level	% for food[a]		Implied non-food multiplier[b]	
	CPI weights	Poverty line	CPI weights	Poverty line
Low income	58	65[c]	1.73	1.54[c]
Lower middle income	45	60	2.21	1.67
Upper middle income	34	50	2.94	2.00
High income	19	33.3[d]	5.40	3.00[d]

Notes:

[a] Median values from Tables 10 and 11 are used to represent average.

[b] Implied non-food multiplier calculated as (100) / (% for food).

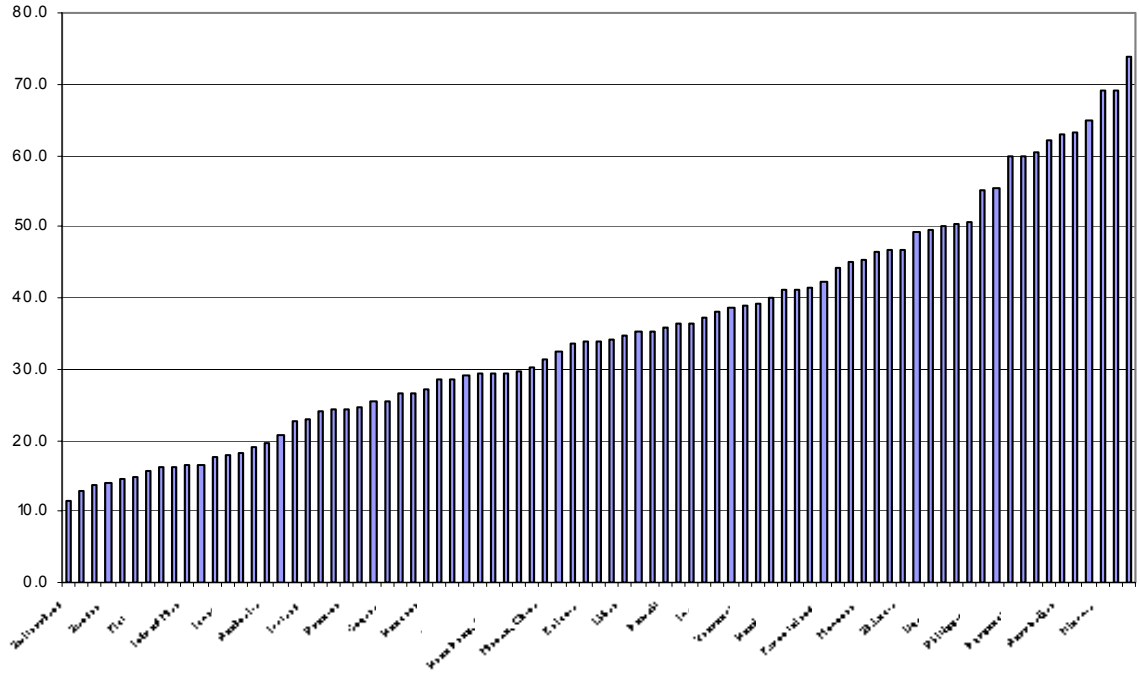
[c] Recent article by Kakwani (2004) finds a median value of 71 percent for 19 low income country calorie-based poverty lines he estimated. This yields an implied multiplier of 1.41.

[d] United States is the only value for high income countries. It is based on outdated household expenditure survey data from 1955, although it remains the underlying assumption for official poverty line estimates in the United States. Other high income countries, such as EU countries, generally estimate their national poverty line relative to their national income per capita.

Sources: Tables 10 and 11.

As expected, values in Tables 10-12 are negatively and strongly related to development level. The percent spent for food used to estimate national poverty lines falls from around 65 percent on average for low income countries to 33 percent for high income countries, and from around 58 percent to around 19 percent according to CPI weights (see summary Table 12). [31] These values are similar and consistent with each other when one considers that CPI weights should be higher, since CPI represents average consumption for the entire population whereas values used for poverty line estimates are for the poor. Average CPI food shares tend to be around 15 percentage points lower for the three higher development levels and around 10 percentage points lower for low income countries.

Figure 4: Percent of consumption for food used to calculate consumer price indices (CPI), 75 countries or territories



Note: Every other country noted on x axis
Source: Table 11.

I decided to use the median non-food multipliers have used to estimate their national poverty line (last column in Table 12) after making two adjustments (see Table 13).[32] First,

[31] It is interesting to note that Rowntree found in his 1899 York study that food comprised approximately 58 percent of his estimate of "minimum necessary expenditure" (Rowntree, 1908). This is not so different from the percentages used to estimate poverty lines in many developing countries today (see Table 10).

[32] One possible problem with this approach is that it does not allow the percent spent for non-food items to change smoothly over time as a country's per capita income increases or decreases. This percentage would change in our methodology only when a country changes development level. While there are advantages to this procedure as it better monitors changes in poverty over time, a good case could be made for adjusting percent for non-food smoothly over time. This is an area where further thought and work is warranted in the future. Readers are referred to Section 2.4 for a discussion of the pros and cons of a fixed poverty line compared to a variable poverty line for measuring current levels of poverty versus monitoring changes in poverty over time.

food share for low income countries was increased from 65 percent to 70 percent (implying a decrease in the non-food multiplier from about 1.54 to 1.43) for several reasons. This created a more realistic progression in the food share across development levels - - from 70 percent in low income countries, to 60 percent in lower middle income countries and 50 percent in upper middle income countries. It caused the difference between median values from CPI and national poverty lines to become roughly the same for all development levels. And this is approximately the median value Kakwani (2004) recently found for a larger sample of 19 low income countries. Second, the food share in high income countries was reduced from 33 percent to 25 percent (implying an increase in the non-food multiplier from 3 to 4), because 25 percent is more consistent with the much more complete and up-to-date CPI data for high income countries. It is important to keep in mind that the 33 percent (and its implied non-food multiplier of 3) shown in column 3 in Table 12 for high income countries is based on data from an outdated expenditure survey carried out in the United States in 1955.

Table 13: Multipliers used in this paper to estimate cost of non-food necessities for our poverty line estimates

Development level	Multiplier used in paper for non-food necessities	Implied percent of total consumption for food
Low income	1.43	70%
Lower middle income	1.67	60%
Upper middle income	2.0	50%
High income	4.0	25%

Notes: Multiplier is derived from assumed percent of consumption for food using the formula in the text. For example if 25% were spent on food, the multiplier would be 4 (i.e., 1.0/.25); if 70% were spent on food, the multiplier would be 1.43 (i.e., 1.0/.70).

Poverty line in a country is estimated by multiplying the appropriate multiplier in this table by the cost of a low cost nutritious model diet for the country.

In summary, non-food costs in a country's poverty line are estimated by using the appropriate multiplier in Table 13 together with the cost of a low cost nutritious model diet for the country. Non-food multipliers increase with development level, reflecting the fact that non-food costs and social norms about non-food needs change with per capita income. Although these non-food multipliers appear reasonable and are similar to those actually used by countries, they are obviously rough approximations and some readers might disagree with the choices made in this section and so might want to change them. A sensitivity analysis in Appendix A indicates that a ten percent decrease in the food share of total expenditures is associated with an approximately thirteen percent increase in the poverty line.

5.2 Going from cost per person to cost for a household

The poverty line is a household-level concept, and therefore is measured at the household-level. One is interested in knowing how many households (and people in such households) have a household income below the poverty line, and so should be considered as poor.[33] This means that it is necessary to have some way of going from estimated food and non-food cost per person to cost for a household. Since there are economies of scale whereby

[33] One important problem with this approach is that it ignores differences between household members. Yet in many parts of the world there is a substantial degree of intra-household inequality with female members disadvantaged.

each additional person in a household costs less per capita because some costs are shared (especially housing), it is not correct to estimate a poverty line for a household by multiplying estimated cost for a single person by household size.

What is typically done is to go from the cost for one person to the cost for a household using adult equivalence units or equivalence scales to take into consideration household economies of scale in costs. For example in the modified OECD equivalence scale, additional adults in a household are considered to be one-half as costly as the first adult, and children less than age 14 years are considered to be thirty percent as costly as the first adult. **This typical approach of scalars is used in our methodology to go from the cost of food and non-food needs for a single adult to total cost for a household.** A family of four is used (although any other family size could have been used).

Scalar for family of four compared to single person =

food scalar * proportion of budget for food

+ non-food scalar * proportion of budget for non-food

Unfortunately, there is no generally accepted adult equivalence scale, and indeed there is considerable disagreement about what is appropriate among scholars and practitioners. As noted by Case and Deaton (2003) “There is currently no procedure in the literature that we can recommend as the basis for estimating reasonable child costs or economies of scale.” This should not be too surprising given the wide variety in circumstances, costs for households, and household structures around the world. Indeed, Fields (1994) mentions that some countries use “adjustments that are controversial and to some offensive” where “men are counted with a weight of 1.0, women with a weight of 0.5 and children with a weight of 0.25”.

To get an idea of what adult equivalence scale and implied scalars would be reasonable and appropriate for our purposes, information was put together on equivalence scales that have been used to estimate household costs for families of different sizes and structures. Readers should keep in mind that the lower a household scalar, the greater are the household economies of scale, since a lower scalar indicates that it is possible for a family to live more cheaply than one person. Table 14 contains detailed information on equivalence scales for the United States and Canada. Table 15 contains information for 12 equivalence scales, seven that have been used for developed countries and five that have been used for developing countries.

The equivalence scales in Table 14 for Canada and the United States are similar for all three sources.[34] Cost for a family of four (consisting of two adults and two children) is twice that for a single adult household according to Canadian and official American poverty lines. The ratio recommended by the U.S. National Academy of Science is somewhat higher, between 2.22 and 2.51 (Citro and Michael, 1995). Equivalence scales in Table 15 for other developed countries (with an average scalar of 2.33 for a family of four) are roughly similar to those in Table 14 for USA and Canada.

[34] Equivalence scales are also calculated and reported for other family sizes and family types by Canada and the United States. These are not presented here for reasons of parsimony.

Table 14: Relative costs and implied scalars for different family sizes used in United States and Canada

Family size and type	USA official	Canada	USA National Academy of Science two parameter model for USA[b] p=.75	p=.65
Single adult	0.513	0.50	0.399	0.451
One adult and one child	0.680	0.70	0.595	0.673
Two adults	0.660	0.67	0.672	0.708
Two adults and one child	0.794	0.85	0.841	0.861
Two adults and two children	1.00	1.00	1.00	1.00
Ratio of costs[a]				
One adult and one child to: Single adult	1.33	1.40	1.49	1.49
Two adults to: single adult	1.29	1.34	1.68	1.57
Two adults and two children to: Two adults and one child	1.26	1.18	1.19	1.16
Two adults and two children to: one adult and one child	1.47	1.43	1.68	1.49
Two adults and two children to: single adult	1.95	2.00	2.51	2.22

Notes: Note that a higher value implies a lower economy of scale.

Canadian scale = 1 + .4*(adults-1) +. 4*(first child) + .3*(children-1).

[a] Ratio of costs was calculated by the author from rows 2-6. Slightly different ratios are reported in the source.

[b] Recommended two-parameter model of U.S. National Academy of Science uses the assumptions that the cost of a child under 18 years old is 0.7 times the cost of an adult, and that economies of scale (p) are between .65 and .75. In equation form, scalar = (number of adults + .70 times number of children)^p.

Source: Citro and Michael (1995).

There is a clear and consistent difference in Table 15 between scalars for developed countries as compared to scalars for developing countries. Whereas the average scalar for a family of four for developed countries is 2.29 (with a range of 1.95 to 2.70), the average for developing countries is 3.09 (with a range of 2.50 to 3.32). A higher (lower) multiplier for developing (developed) countries makes sense. One has to keep in mind that adult equivalence units that are used to calculate scalars embody two effects: differences in needs by age (e.g. children eat less than adults) and household economies of scale whereby it is less expensive per capita to live in a larger household as compared to a smaller household. Since food costs in developed countries comprise a relatively low percentage of household expenditures, this implies that scalars from developed countries are more appropriate for our purposes than those from developing countries, since we need scalars for non-food expenses only (remember that food requirements are specified for an average person in our methodology). With this in mind, we decided to use the average of the two United States National Academy of Science multipliers (2.37) reported in Table 14, since this is for a developed country and is based on more up-to-date information than the scalars for other developed countries included in Table 15. [35]

[35] It is uncertain the extent to which the scalar chosen is above or below a scalar for non-food needs only. While on the one hand, children eat less than adults on average (whereas we use average per capita needs for all persons in our methodology), there are on the other hand savings/economies of scale in households when food is purchased and prepared in bulk (see discussion on this in Section 6.5.4).

Thus, it is possible to calculate overall household scalars that allow us to go from cost for one person to cost for a family of four if we use a scalar of 4 for food costs (as we must since model diet and food cost in our methodology is for an average person) together with the scalar of 2.37 for non-food costs (as noted in the last paragraph) and plug these scalars into the above formula in this section. These resulting household scalars are shown in Table 16. Note that of necessity they vary along with development level and the decreasing percent of total expenditures spent on food.

Table 15: Equivalence scales and implied scalars for a family of four compared to single adult used by national authorities to estimate national poverty line

Scale/country	Adult, 1st	Adult, 2nd	Child, younger	Child, older	Implied scalar for family of four[a]	Country or region
Modified OECD scale[b]	1.00	0.50	0.30	0.50	2.30	Europe
Oxford scale	1.00	0.70	0.50	0.50	2.70	France
McClements scale[c]	0.61	0.39	0.21	0.23	2.36	UK
USA official[d]	0.51	0.15	0.13	0.21	1.95	USA
Canada[d]	0.50	0.17	0.18	0.15	2.00	Canada
U.S. National Academy of Science[d]	0.43	0.27	0.16	0.15	2.37	USA
Ireland	1.00	0.66	0.33	0.33	2.33	Ireland
Developed country average					2.29	
Nicaragua[e]	1.00 assumed[i]	1.00 assumed[i]	0.61	0.61	3.22	Caribbean
Egypt[f]					3.32	Egypt
India[g]					3.20	India
Pakistan[g]					3.20	Pakistan
Ghana[h]	1.00 assumed[i]	1.00 assumed[i]	0.20	0.30	2.50	Ghana
Developing country average					3.09	

Notes: Average is unweighted average of national values.

[a] Family of 4 consists of two adults (one male and one female 25-54) and two children (with preferred ages of 4-6 and 10-12 when possible). Implied scalar is calculated by summing values for adults and children and dividing this total by value for 1st adult.

[b] Younger child is < 14 and older child >14 in modified OECD scale.

[c] Values for children in McClements scale are: .09 (ages 0-1), .18 (2-4), .21 (5-7), .23 (8-10), .25 (11-12), .27 (13-15); or .20 (<14) and .30 (>14).

[d] USA official, Canada, and U.S. National Academy of Science values for adults and children represent the additional cost conditional on a prior family size (e.g., 2nd adult conditional on first adult; 1st child conditional on two adults; 2nd child conditional on two adults and one child).

[e] Nicaragua values are .61 for ages 0-9 and .91 for ages 10-17. Value for children ages 0-9 were used for both children to get a rough average for our preferred ages of 4-6 and 10-12.

[f] Egypt is derived from average value of 0.83 per household member (i.e., .83 times family of 4).

[g] India and Pakistan assume that family of 5 is equivalent to cost of 4 persons.

[h] Ghana uses 0.2 for ages 0-2, 0.3 for ages 7-12, and 0.5 for ages 13-17.

[i] No indication provided of the value for an adult. Value of 1.0 is sssumed.

Sources: OECD (1997) for Modified OECD. Atkinson (1991) for Oxford scale. Hilllyard (2003) for McClements scale and Ireland. Citro and Michael (1995) for USA, Canada and U.S. National Academy of Science. Tabatabai (1996) for Nicaragua, Pakistan and Ghana. World Bank (June 2002) for Egypt. Government of India (1993) for India.

Our estimated scalars of the cost for a family of four compared to the cost for a single adult range from 2.8 for high income countries to 3.5 for low income countries. The reason the value of these scalars fall with development level is that there are no economies of scale in our methodology for food costs but there are for non-food costs and the percent of a poor household's budget spent on food decreases with development. Thus, the poverty line for a family of four is estimated in our methodology by multiplying our estimated cost for one person by 3.51 in low income countries, by 3.35 in lower middle income countries, by 3.18 in upper middle income countries, and by 2.77 in high income countries.

Table 16: Cost scalars for family of four (two adults and two children) compared to cost for single adult as a function of percent spent on food/development level

Percent spend on food (development level)[a]	Implied cost multiplier for family of four compared to single adult family
25% (high income countries)	2.77
50% (upper middle income countries)	3.18
60% (lower middle income countries)	3.35
70% (low income countries)	3.51

Notes: Based on formula in text in this section. Assumption is that all family members require the same type and quantity of food on average, because nutritional requirements in our methodology are based on average food requirements for the population as a whole.

[a] Percentages of expenditures spent on food are from Section 5.1 and represent typical percentages for poor persons by development level.

Our choice of scalars for non-food family economies of scale clearly involved judgment and is therefore open to debate and disagreement. This has to be the case, since there is considerable debate and disagreement in the research literature on adult equivalence scales. Assumptions here are, however, reasonably conservative as they are well below those used in developing countries, which in turn implies that our poverty line estimates are conservatively estimated in this regard. Given that adult equivalence scales is a controversial topic, despite having received considerable attention and debate, it is not possible that a "right" answer will emerge in the future. For this reason, a sensitivity analysis of our choice of scalars is provided in Appendix A.

5.3 Number of full-time working hours per week

Living wage rate is defined as the pay rate per hour a full-time worker needs to earn so that a family of four has sufficient income for an acceptable minimum living standard. It is calculated by dividing the cost of a country's estimated poverty line (for the essentials of nutrition, housing, clothing, transport, etc.) by the number of full-time working hours. This means that full-time work hours are required to make these calculations. Thus:

Living wage rate = Poverty line / Full time working hours

What we want are weekly hours of work that are clearly recognized as full-time, since we do not want our estimates of national living wage rates to be subject to the criticism that they are biased upward by an assumption of low working hours. At the same time, we do not want full-time work hours that are so long that they represent a danger to a worker's health and are unsustainable in the long run, since excessive work hours are known to be a threat to physical and mental health (Anker et al, 2003).

Several approaches could be taken to arrive at national full-time working hours. One approach would be to use the same number of hours for all countries. 48 hours per week could be used for this purpose, as it is long enough to be recognized as long all around the

world. It is the maximum number of hours of work allowed in ILO Convention 1 (1919) on hours of work. It was decided not to use 48 hours per week for all countries, because it is well above usual working hours in high income countries and Transition Economy countries, and so would be considered excessively long hours in these countries.

A second approach would be to use national data on usual average working hours to identify country-specific values. I decided not to use this approach in part because I wanted an approach that had greater comparability across countries and in part because these data are not available for many countries in the ILO Yearbook of Labour Statistics.

A third approach and the one used, is to specify a common number for full-time working hours per week for groups of countries in order to increase cross-national comparability. To help decide on the number of work hours to use, data from the ILO Yearbook of Labour Statistics on average working hours in the manufacturing sector were tabulated by region (Table 17). Although there are problems with particular national values in terms of cross-country comparability (and therefore particular national values have to be treated cautiously)[36], there is a reasonable degree of similarity within regions. Average working hours per week are around 40 hours in high income countries; around 35 hours in Transition Economy countries; around 44 hours in Latin America; and around 48 hours in Asia, Sub-Saharan Africa, and Middle East/North Africa.

[36] Reasons for non-comparability across countries include differences in the following: coverage in terms of employment status (e.g., wage earners only, wage and salaried workers, all workers); source of data (e.g., census, establishment survey, establishment census, household survey); coverage in terms of worker's sex (all workers, males or females only); year; hours worked or hours paid for; time reference period (per day, per week, per month); number of jobs (one job, multiple jobs, all jobs). Latest reported value for male wage employees from an establishment census or survey was used whenever possible.

Table 17: Average number of work hours per week in manufacturing sector, by region and development level

Region/Country	Average weekly work hours	Region/Country	Average weekly work hours
Asia		*Transition Economy*	
Bangladesh	51.0	Armenia	37.2
China	40.7	Georgia	39.2
Hong Kong, China	47.1	Ukraine	31.5
India	46.5	Slovenia	35.8
Korea, Rep. of	48.2	Romania	38.5
Macau, China	51.8	Poland	41.6
Miramar	40.0	Moldova	26.6
Philippines	48.6	Latvia	41.5
Singapore	48.6	Lithuania	39.5
Thailand	50.1	Hungary	36.9
Asia average	47.3	Croatia	34.8
Latin America		Czech Rep	40.7
Argentina	47.6	Estonia	33.8
Bolivia	44.7	Russia	33.3
Brazil	44.8	Slovakia	35.8
Costa Rica	51.0	Transition Economy ave	36.5
Chile	43.6	*High income*	
El Salvador	48.0	Canada	46.0
Mexico	45.0	USA	40.7
Nicaragua	48.5	Cyprus	40.7
Peru	49.3	Israel	41.9
Paraguay	34.0	Japan	39.0
Uruguay	39.4	Australia	41.8
Latin America average	45.1	New Zealand	42.3
Sub Saharan Africa		Belgium	36.7
Gambia	53.0	Spain	37.0
Kenya	44.0	Finland	38.5
South Africa	45.5	France	38.6
Sub Sahara Africa ave	47.5	Germany	37.9
Middle East/N. Africa		Greece	41.5
Egypt	57.0	Iceland	47.5
Jordan	62.8	Italy	41.9
Turkey	41.5	Malta	41.0
West Bank and Gaza	43.8	High income ave	40.8
Middle East/N. Africa average	51.3	World average	42.6

Notes: egional and world means are unweighted averages of national values. Low number of work hours in Transition Economy countries may be due in part to workers being put on short hours non-voluntarily, and/or not getting paid for work performed. Both are common in these countries.

When hours were reported per month, weekly hours were calculated by author by dividing by 4. When hours were reported per day, weekly hours were calculated by author by multiplying by 5. Data are generally based on an establishment census or survey for male wage employees.

Source: ILO Yearbook of Labour Statistics (2002).

Table 18 indicates the assumptions used in this paper on full-time working hours (based on data in the above Table 17) to calculate national living wage rates. They are 40 hours for high income countries and Transition Economy countries, 44 hours for Latin American countries, and 48 hours for all other countries.

Table 18: Full-time weekly working hours used to calculate our national living wage rates, by region

Region	Work hours per week for calculating living wage rate
Asia	48
Middle East/North Africa	48
Sub-Saharan Africa	48
Latin America	44
Transition economy	40
High income	40

Source: Based on data in Table 17 drawn from 2002 ILO Yearbook of Labour Statistics.

Since the above full-time working hours do not allow for any days off for sickness or paid holidays, they implicitly assume that full-time workers work 52 weeks a year. As I felt that this implicit assumption is unrealistic and too stringent, *estimated living wage rates in this paper are increased by the factor 1.04 (i.e., 52/50) to allow for an implicit two weeks off per year with income.*

6. Possible limitations of methodology

The methodology developed and used in this paper necessarily involves a number of assumptions. This section discusses some possible limitations of this methodology along with suggestions on how to possibly improve or take them into account in the future. Interested readers are referred to Appendix A for a sensitivity analysis of how these assumptions affect poverty line and living wage rate estimates.

6.1 Ignoring non-labour income when estimating living wage rate

Living wage rate estimates in this paper implicitly assume that a poor person's only source of income is from work. Although obviously an oversimplification, this assumption should not cause major problems for calculating cross-nationally comparable living wage rates.

First of all, the poor rarely have substantial income earning assets on which to rely. Indeed, the opposite is often true, as the poor often have debt and must pay interest to debt collectors. Second, the fact that many poor families receive transfers which help them out of poverty - - from relatives and friends (particularly in developing countries) and/or from the state (particularly in higher income countries) - - is not especially relevant for estimating living wage rates, since one is interested in how much a full-time worker needs to earn in order to support a small size family at an adequate minimum living standard. The basic premise of a living wage is that full-time workers should receive sufficient compensation from their work to be able to support a small family at least at a minimum acceptable living standard.

6.2 Ignoring multiple earners in households when estimating living wage rate

Living wage rate estimates in this paper indicate how much a full-time worker would need to earn to support a family of four at a poverty level. This means that there is an implicit assumption that one worker is the breadwinner for a small size family.

Some may disagree with this implicit assumption, and feel that allowance should be made for multiple earners in a household. One reason could be that this is common in poor households. Another reason could be that this implicit assumption resembles too much a sexist male-breadwinner model of the family.

To get an idea of how common multiple earners are per couple I made what I feel are reasonable assumptions in Table 19 for a low income country (India), a middle-income country (Mexico), and a high income country (Germany) as regards (i) labour force participation rates for relevant age groups; (ii) unemployment rates; (ii); (iii) extensiveness of part-time work. This was done using adult labour force participation rates for ages 15+ (all adults) and ages 25-54 (adults who are likely to have dependant children). According to results in Table 19, the average number of full-time equivalent earners per two persons was around 1.0 to 1.1 for persons ages 15+, and around 1.3 to around 1.5 for persons ages 25-54. These *rough estimates indicate that multiple earners per couple are common*, and this obviously helps explain in part how many poor families are able to make ends meet when hourly wage rates are very low, even below a living wage rate.

Table 19: Estimated number of full-time equivalent earners per couple, by age group and development level

Assumptions[a]	Low income (India)		Middle income (Mexico)		High income (Germany)	
	15+	25-54	15+	25-54	15+	25-54
Adult workers per couple using:	1.26	1.45	1.23	1.41	1.18	1.73
Adult male LFPR	0.85	0.97	0.84	0.96	0.69	0.96
Adult female LFPR	0.41	0.48	0.39	0.45	0.49	0.77
Unemployment rate	0.03[b]	0.03[b]	0.02	0.02	0.08	0.08
% Part-time	0.15	0.15	0.14	0.14	0.17	0.17
Estimated full-time equivalent earners per couple	1.13	1.30	1.12	1.29	0.99	1.46

Notes:

LFPR indicates labour force participation rate.

[a] For simplicity, it is assumed that the adult population is one-half male and one-half female, and that the unemployment rate and percent part-time are the same for all age groups.

[b] Author's assumption.

Number of equivalent full-time earners per couple is estimated as: (Adult male LFPR + adult female LFPR) * (1.0-unemployment rate) * [(1.0-(% part-time*0.5)].

Sources: ILO KILM (2002) for assumptions except where noted by superscript b.

The fact that there are often multiple earners per couple does not invalidate the approach used in this paper to measure living wage rates, which assumes one earner per couple. As noted above, this assumption provides consistent and cross-nationally comparable living wage rate estimates. And, it is important to keep in mind that there are well below 2 full-time equivalent earners per couple on average as shown in Table 19.

On the other hand, there is a very good case for using between one and two full-time earners per couple. This is especially the case when one takes into consideration unpaid

family work (both housework, such as cleaning and cooking) that is not considered labour force activity according to the current international definition of labour force activity, as well as unpaid work with family animals and farms that is labour force activity (but is often undercounted in practice). This is an area where additional thought is warranted and so an area for possible improvement in our methodology in the future. Readers are referred to Appendix A for a sensitivity analysis of our assumption here. When it comes to a country making its own living wage rate estimate for national usage such as an input to setting a statutory minimum wage rate, the number of earners per couple should be viewed as a policy choice.

6.3 Ignoring differing family sizes around the world for estimating poverty lines and living wage rates

Living wage rate and poverty line estimates in this paper are done for a family of four, consisting of two adults and two children. A family of four was chosen for several reasons - - in part because it is often used to estimate poverty lines and living wages, in part because it represents a compromise family size between the smaller average family size in high income countries and the larger average family size in low income countries, and in part because it represents the family size necessary to (almost) ensure population reproduction over time.

There are good reasons why some might disagree with the use of a family of four. Some might feel that it is too large and others that it is too small. Still others might feel that family size should vary across countries to represent differences across countries in average family size.

It is, of course, possible to estimate poverty lines and living wage rates for any family size. For example, estimates could be done for a family of two (one adult and one child) to represent a situation where each adult supports himself/herself plus one offspring. This would have the added advantage of moving away from the implicit assumption of a main (mainly male) breadwinner. In this situation, every adult would need to work full-time to almost ensure reproduction of the population. This family size assumption is not used, because it is felt to be unrealistically low, especially for lower income countries where family size is often greater than four.

It can be argued that a country's typical (or average) family size is the right concept for living wage rates and poverty lines. This would mean that the average family size in each country should be used. Indeed, it is common for countries to use average family size when they estimate their poverty line (Tabatabai, 1996). To get an idea of what this would imply for poverty line and living wage rate estimates, data are presented in Table 20 from a United Nations' publication on average family size for around 1990. Notice that average family size in the world was somewhat above 4 (4.5 on average). There was, however, considerable variation across regions. While average family size in 1990 was slightly below 3 in high income and Transition Economy countries, it was around 4.5 in Asia and Latin America, around 5 in Africa, and around 6 in Middle East/North Africa. This indicates that a family size of four is low for many developing countries, and high for high income countries and Transition Economy countries. Average family size is not used in this paper partly because we did have not up-to-date average family size estimates and partly because family structure and extensiveness of joint families (which creates problems of multiple adult earners in households) is such an important determinant of average family size.

Table 20: Average family size in the world, 41 countries by region around 1990

Region/country	Average family size	Region/country	Average family size
Sub-Saharan Africa		*Latin America*	
Burundi	5.2	Bolivia	4.4
Kenya	5.2	Colombia	5.1
Uganda	4.5	Ecuador	4.8
Botswana	4.8	Peru	5.1
Zimbabwe	5.2	Uruguay	3.3
Ghana	4.8	Trinidad & Tobago	4.2
Liberia	5.0	Latin America average	4.5
Mali	5.0	*Transition Economy*	
Togo	5.1	Bulgaria	2.9
Sub-Saharan Africa average	5.0	Former USSR	3.0
Asia		Transition Economy average	3.0
China	4.0	*High income*	
Hong Kong, China	3.7	Japan	3.0
Korea, Rep. Of	4.1	Finland	2.6
Sri Lanka	5.0	Sweden	2.2
Indonesia	4.8	Malta	3.3
Thailand	4.6	W. Germany	2.3
Viet Nam	4.8	Canada	2.8
Asia average	4.4	USA	2.6
Middle East/N. Africa		N. Zealand	2.9
Algeria	7.0	High income average	2.7
Egypt	5.5	World average	4.5
Morocco	6.0		
Sudan	6.3		
Tunisia	5.6		
Kuwait	6.5		
Qatar	5.6		
Turkey	5.2		
Yemen	6.8		
N. Africa/Middle East average	6.1		

Notes: Average is unweighted average of national values.
Source: United Nations (1995).

There are possible approaches that might make it possible to take into consideration differences across countries in average family size that are independent of family structure and the extensiveness of joint families. One might be able to use national total fertility rates and age specific mortality rates (that are available for all countries) to estimate the average number of surviving children per couple in each country for women who are say 35-39 years of age. This could be an area for future development and improvement of our methodology. Another possibility for the future might be to estimate the wage rate required to ensure that a worker is able to support himself or herself over his or her own life,

including hypothetical support for the periods of life when s/he is not economically active (such as when young, old, unemployed) or working part-time. Or, it might be possible to collect data on average household size from national household surveys or census, as households are used for their sampling frame.

For the time being at least, we are left with our assumption of a reference family of four persons (two adults and two children).[37] It has the advantages of simplicity, common usage, common sense, and consistency of treatment across countries. Since this is, none-the-less, a questionable assumption, future users may want to change it. And of course, policy-makers and the public in each country will definitely want to think about how large a family they feel would be appropriate for a worker to support when estimating a living wage rate as an input to setting a statutory minimum wage rate. An analysis of how sensitive our poverty line and living wage rate estimates are to different assumptions about family size is provided in Appendix A.

6.4 Ignoring home production work that is self-consumed

Many poor families, especially in lower income countries, make ends meet by supplying some of their own needs through home production that they self-consume - - which means that they can have a standard of living that is above the poverty line even when cash earnings are below the poverty line. Poor families, for example, often grow food in a home garden or on a subsistence farm; keep animals at home for their milk, eggs or meat; sew their own clothing at home; repair and construct of their dwelling; gather wild fruits and firewood. Although the imputed value of these various forms of home production/self-consumption is supposed to be included in national income, it is often poorly measured or accounted for. This can have important implications for estimating the poverty rate, since it is estimated by comparing the poverty line to household income.

Interestingly, some countries take into consideration the value of own production/self-consumption when estimating their poverty line - - thereby reducing their poverty line and in essence arriving at a cash income poverty line. The United States, when it set up its poverty line in the 1960s, assumed that the poverty line for a farm household was lower than the national poverty line to account for the value of own production/self-consumption on U.S. farms; 70 percent of the national poverty line was used in 1963 and 85 percent of the national poverty line was used in 1969 (U.S. Department of Commerce, 1969). Zimbabwe's Central Bureau of Statistics (1998) assumes that own production is responsible in its model diet for 183 grams of vegetables and unspecified amounts of maize, milk and eggs.

This situation where poor families engage in home production/self-consumption (despite its importance and prevalence) does not invalidate calculations in this paper of poverty lines and living wage rates in my opinion. The main reason is that the poverty lines and living wage rates estimated in this paper measure how much is needed to support a small size family in the absence of any other income, be it transfers (Section 6.1), additional earners (Section 6.2), home production/self-consumption (this section). In my opinion, home production should be seen as similar conceptually to additional hours of work when estimating a living wage rate; and its value should be included in the household income that is compared to the poverty line to arrive at a poverty rate.

[37] The following age groups are used for our reference family of four whenever possible - - 25-54 for adults, and 4-6 and 10-12 for children.

6.5 Incomplete and inappropriate information on food prices and local food habits for establishing and costing model diet

Food costs in our methodology are estimated using ILO food price data for 93 food items, since this is the most comprehensive annual international data set available. The ILO data set includes official government food price data for over 100 countries, and indicates average prices for the month of October. Interested readers are referred to Appendix E for a complete list of the food items in the ILO data set.

Potential problems with ILO food price data that could affect poverty lines and living wage rate estimates are discussed in this section.

6.5.1 Incomplete list of foods in ILO food price data set

The list of food items in the ILO food price data set is of necessity incomplete - - even though it includes 93 food items. This could bias upward estimates of poverty lines and living wage rates if there are less expensive food items than those included in the ILO list. I do not feel that this poses a major problem for estimating food costs in large part because the ILO list includes almost all of the most important foods. For example, it includes 12 vegetables (such as carrot, cabbage and onion), 8 fruits (such as banana, apple, orange and pineapple), 6 pulses (such as moong beans, chick peas, split peas and haricot white bean), 3 roots and tubers (such as yams, cassava and potato), 15 cereals (such as rice, wheat flour, wheat bread, pasta, and maize flour), 18 meats (such as beef, chicken, veal, pork and fish), 2 eggs (chicken and duck), 7 dairy products (such as milk and cheese), and 5 oils and fats (such as salad or cooking oil, olive oil and margarine) Another reason I am not overly concerned about the completeness of the ILO list of food is that the major food groups where completeness is most likely to be a problem are vegetables and fruits, and they only tend to represent 10-20 percent of food costs around the world (see Section 7.5). In addition in order to account for the possibility that there may be less expensive fruits and vegetables in a country than are in the ILO list, we purposely limit in our methodology the price the second vegetable (and fruit in low income countries) included in a country's model diet to a maximum of 50 percent more than the unit price of the least expensive vegetable in the country according to the ILO food price data.

6.5.2 Missing food price data in ILO food price dataset

As with any data set, there is incomplete reporting of food prices in the ILO data set. While missing food prices tend to be of less important foods, prices by important foods are sometimes missing. This is can be a serious problem to estimating particular national poverty lines and living wage rates. Among our study countries, this may be a problem for Zimbabwe and Ecuador. It would have been a serious problem for the United States if we had not obtained American food price data from United States government web sites.[38] Readers interested in the details of the decisions we made regarding food prices for our 12 study countries when a price was not reported in the ILO data set are referred to Appendix

[38] Food price information for the United States is often missing in the ILO food price data set. The reason is that the United States is reluctant to report national average prices, because this is often felt to be meaningless for the United States which is a large and diverse country. A much more complete food price data series is available for urban areas of the United States (on government web site). Interestingly, these urban prices are generally quite similar to those for the United States as a whole.

D. Since the methodology developed in this paper requires up-to-date food prices, it implies that additional efforts will sometimes be necessary to obtain unreported food price data directly from publicly available national sources such as through use of the web, as we did for the United States. It also implies that ILO should make greater use of the web in the future for its October Inquiry food price data set.

6.5.3 Poor and non-poor may consume different varieties of certain food items

The poor might tend to purchase a particular variety of a food item that is not included in the ILO list of foods. One important example of this in the ILO food price data set is rice, as the only variety of rice in the ILO data set is long grain rice.[39] Yet it is likely that the poor eat less expensive varieties of rice such as short grain rice. Since this could significantly bias upward food cost estimates in countries that rely heavily on rice in their diet, we asked CORT (Center for Operations Research and Training in Baroda, India) to conduct a small quick inquiry for us in India and Bangladesh in November 2003 on the price of different varieties of rice. CORT found that the price of the least expensive variety of rice was approximately one-half the price of the least expensive long grain rice in India and Bangladesh.

Type of rice	Delhi, India (Rs per kg)	Baroda, India (Rs per kg)	Dhaka, Bangladesh (Thaka per kg)
Long grain (basmati)	20 to 40	40 to 48	35 to 40
Nareja	10		
Parimal	12 to 16		
Krishna kamal		43	
Kolam		23 to 28	
Gujarat-17		20	
Short grain			30 o 45
Broken rice			16 to 17
Ratio of least costly rice to least costly long grain rice	0.50	0.50	0.53

Based on this inquiry and a desire to be conservative in our estimates of food costs, we reduced the price of long grain rice reported in the ILO food price data set by one-half for India and Bangladesh and by one-third for other study countries when estimating national food costs. In the future, ILO should be encouraged to collect data on the price of different varieties of rice as part of its regular October Inquiry. Although the precision of prices for additional varieties of rice may be lower than for long grain rice because increased variation in quality makes it difficult to get precise values, it would enable users to better estimate food costs for the poor. In the meantime, it would be a good idea to collect the cost of different varieties of rice for a range of countries so that the cost of model diets can be better estimated.

A related issue is deciding on the form in which wheat is consumed in our model diets, and whether it is in the form of bread or flour (with people baking their own bread or making their own gruel) or in some other form such as pasta. This decision is important, because

[39] Another example is peanut which is an important source of protein for the poor in some countries and is included in the model diet of at least South Africa and the United States among our 12 study countries.

bread (and pasta) tend to be over twice as expensive as flour per kg. In the absence of knowledgeable about local food habits of the poor in each country and a desire to limit food costs for the main staple especially in lower income countries, it is assumed in our calculations that people in low income countries and lower middle income countries purchase flour and make their own bread or gruel (making chapattis in India and mealy in Zimbabwe for example), and that people in upper middle income countries and high income countries purchase a combination of bread and flour. Assumptions on how wheat is consumed should be rethought in the future.

6.5.4 Food prices paid by poor may differ from prices in ILO food price data set

The food prices used in our methodology for a country are those provided by national statistical agencies to ILO. They are almost always based on a survey of retail establishments and are the prices used to estimate the official CPI. However, they may not represent the prices faced by poor people. The poor may, for example, shop in different types of establishments (e.g., informal shops or street markets) with different prices than the establishments surveyed by the government for estimating CPI (e.g., formal sector stores or supermarkets).

In order to take into account the possibility that the food prices the poor pay may differ from those reported from establishment surveys and CPI estimates, some countries use food prices the poor report paying in household income and expenditure surveys by dividing reported expenditure by reported quantity consumed for each food item to get unit food prices. In Egypt, this procedure produces somewhat lower food prices compared to those reported in the ILO data set (and presumably the prices used by the Egyptian government to estimate CPI). Based on an income and expenditure survey according to World Bank (June 2002), the average price per kg for food in their model diet for Egypt was .87 pounds in metropolitan Egypt in 1999/2000 (approximately .91 pound for 2001 adjusted for inflation), whereas the estimated average food price for our model diet for Egypt was 1.00 in October 2001 based on ILO food price data for urban Egypt. In India according to Deaton and Tarozzi (1999),[40] prices people report paying based on data from the Indian National Sample Survey of households (NSS) are similar to prices from official establishment surveys for rural areas, but prices people report paying in the NSS are substantially lower than prices from establishment surveys in urban areas.

Although food prices in the ILO data set might not represent the prices paid by the poor and this would have an important affect on our poverty line and living wage rate estimates, it is not something that can be systematically addressed in an international methodology as very few countries report food prices specifically for the poor. But even if many countries did have food price data from an income and expenditure survey that allowed one to calculate unit food prices paid by the poor, it is not clear that these would always be more accurate than the prices derived from establishment surveys. Whereas the latter has a long tradition and track record, the former are done infrequently and are known to be subject to considerable recall and other errors.[41] In any case, food prices paid by the poor could be higher or lower than those used to estimate CPI. On the one hand, prices paid by the poor could be lower, because the poor buy from outdoor markets and informal establishments

[40] The Deaton and Tarozzi (1999) study is based on Indian NSS data for 243 thousand households and 8.3 million quantity-expenditure pairs of purchases.

[41] NSS Expert Group (2003) and Deaton (2003a) report that the amount of food expenditure people report on surveys is quite sensitive to the recall period used, and this has a large affect on the estimated poverty rate. Shorter reporting periods generally produce greater reported expenditures.

that have lower overheads and markups. On the other hand, prices paid by the poor could be higher, because the poor cannot afford to buy in bulk; in addition, informal establishments where the poor shop for food might have higher prices because they themselves are unable to buy in bulk. According to my own experience, I have found food prices to be lower in informal sector establishments as compared to formal sector establishments in Asia but higher in East Africa and South Africa. In the end despite the possibility that the poor might face different food prices than others, food prices in the ILO food price data set are generally appear reasonable.

6.5.5 Food prices may differ within countries and over the year

Prices in the ILO food price data set are supposed to represent national averages for the month of October. There are several possible problems here.

First, food prices vary over the year depending on seasonable availability (especially for vegetables and fruits). There is not much that can be done about this, although October is a reasonable month for representing average food prices over the year as it is neither a peak summer month nor a trough winter month for food.

Second, food prices often differ within countries, especially between rural and urban areas. This is a potential problem especially for large and diverse countries where prices differ markedly across the country. For this reason some countries, such as India, have two official poverty lines, one for rural areas and one for urban areas. Further complicating measurement for us is that prices in the ILO food price data set are not always national prices but sometimes are only for urban areas or one city. Among our 12 study countries, national prices are reported for seven countries, while prices for urban areas or a specific city are reported for Egypt, Bangladesh, India, China, and South Africa. In the future, ILO should be strongly encouraged to collect national food prices and/or food prices for rural and urban areas for more countries.

Tables 21 and 22 indicate relative prices for different areas within India and China according to ILO food price data. Reported food prices are similar in the only two areas of China with reasonably complete data in the ILO food price data set (Table 21). As the food poverty line is four percent lower in Hebei Province (where Shijazhuan is located) than the national average according to Hussain (2003), food price differences within China should not present a major problem for us. The data for Shijazhuan are used in this paper for China, because prices are lower than in Tianjin on average (Table 21) and we want to be conservative when estimating poverty lines and living wage rates for China.

Food price data for India are a concern. Only food prices for Bombay are reported in the ILO food price data set for India after 1996, but food prices in Bombay are much higher than in the rest of India. According to ILO food price data for India (Table 22), milk and rice prices are approximately twice as high in Bombay than in rural areas, Calcutta, Delhi, or Madras; flour, gram and oil prices are around 10-20 percent higher in Bombay. This means that there is an upward bias in our poverty line and living wage rate estimates for India. ILO should also be strongly encouraged to report more complete and up to date food price data for India in the future than just for Mumbai.

Table 21: Comparison of food prices in ILO food price data set at sub-national level, China 2000

Food	Tianjin	Shijazhuan	Ratio of costs (col 2/col 3)
Rice	2.36	2.43	0.97
Flour	2.35	2.18	1.08
Milk	3.00	4.00	0.75
Oil	6.50	7.82	0.83
Bean curd	0.43	0.42	1.02
Cabbage	1.47	1.07	1.37
Chinese Cabbage	1.29	0.98	1.37
Sugar	5.93	5.60	1.06
Fish	4.67	4.42	1.06
Chicken	11.27	8.07	1.40
Beef with bone	11.24	11.25	1.00
Eggs (dozen)	2.98	2.93	1.02

Notes:

Only two areas in China have reasonably complete food price data in the ILO food price data set. Data for Shijazuan is used in this paper, because its food prices tend to be lower.

According to Hussain (2003), the food poverty line in 1998 was 24.1 percent higher than the national average in Tianjin Province, and 4 percent less than the national average in Hebei Province (where Shijazhuan city is located). Also according to Hussain (2003), the food poverty line is much higher in provinces with major cities than the national average: 42.5 percent higher in Beijing, 49.6 percent higher in Guangdong and 69.0 percent higher in Shanghai.

Source: ILO October Inquiry food price database.

Table 22: Comparison of food prices in ILO food price data set at sub-national level, India 1993 (relative to Mumbai)

Food	Rural	Calcutta	Delhi	Madras
Milk	0.50	0.61	0.50	0.54
Rice	0.65	0.53	0.61	0.56
Flour	0.84	1.01	0.89	0.67
Gram	0.85	0.64	1.05	0.97
Oil	na	0.81	0.78	0.92

Notes:

1993 is the latest year with data for several areas in the ILO food price data set.

After 1996, the only data in the ILO food price data set are for Mumbai.

na indicates not reported.

Source: ILO October Inquiry food price database.

6.6 Inexactness of number of calories per gram of edible food

It is important to be aware that even though the information on nutritional content of foods (see Appendix G) appears to be exact, as these data are drawn from an authoritative source, judgment was necessary when completing this table especially as regards meats. McCance and Widdowson (2002) provide information for a wide variety of forms of chicken, beef, and fish (e.g., raw with and without skin and bone, with different percentages of fat, and cooked in various ways), and it is not always obvious which variety to use. Also McCance and Widdowson (2002) provide relatively little guidance as regards wastage (i.e., inedible proportion) for whole fish, whole chicken, and beef with fat and bone. For example, the inedible proportion for whole fish is only indicated for a few species of fish; different cuts of beef have varying amounts of fat and bone; and the proportion of whole chicken that is inedible is not indicated. This means that some judgment was necessary when completing Appendix G.

To illustrate that it is not necessarily straightforward to know the nutritional contents of food, Table 23 compares information on the number of calories per hundred grams of edible food from Appendix G with numbers used by national authorities to establish their own model diet. We were able to find such data for Armenia, Bangladesh, Ecuador, Egypt, Zimbabwe, and United States among our study countries. To assist readers in looking at Table 23, I highlighted (with shading) when others have used calories per hundred grams that are quite different from ours (defined as when difference is at least 10 percent and 20 calories). Notice that there is wide variation across countries in the number of calories per hundred grams for fish, beef, chicken and bread. In contrast, other foods have similar calories per hundred grams in almost all instances. This large variation for meats probably reflects variation in the amounts of fats, bones, and skin assumed; in addition, there is considerable variation for specific varieties of fish and bread. The reason the United States is often different is because its recommended diet contains a wide variety of food items in each major food group and this affects the average calorie content for the food group as a whole. For example, cereals include breakfast cereals, pasta, bread and biscuits; nuts include peanut butter; dairy includes cheese; and there are several types of meats. In the end, our assumptions on calories per hundred grams appear reasonable, although the correct assumption for fish depends on knowledge of the most common variety of fish consumed in a country (although it is worth noting that the variety of fish which is priced is often indicated in the ILO data set).

Table 23: Number of calories per 100 grams used in national model diets by national authorities compared to values used in this paper

Food	Our value	Armenia	Bangladesh	China	Ecuador	Egypt	Zimbabwe	United States
Milk	66	75	67	152	35	89	150 [d]	66
Meats								172
Fish	95 or 239[a]	79	106	109	129	135	299	
Beef	203	203	117	175	127	114[b]	251	
Chicken	177			184	170		216	
Pulses/nuts	297		383			271	330	421
Egg	151	152		164	138			143
Potato	79	79	96		97		78	71
Cereals		341		315		324[c]		443
Rice	359		349		361		311	
Wheat	341		348				291	
Bread	219				335			
Maize	351						310	
Oil	899	898	900	899	889	906	895	831
Sugar	394	400	410	397	384	407	375	368
Vegetables		26	20	20		43		46
Cabbage	26						20	
Carrot	35				41			
Onion	36				49		24	
Fruits		47		60		68		
Apple	47				54			
Orange	37				40			33
Banana	95		30		83			

Notes: Shading of a national value is done to highlight a major difference from our value. Country value shaded when it differs from our value by at least 10 percent and 20 calories.

[a] There are two types of fish: white flesh fish with 95 calories per 100 grams and fatty fish with 239 calories per 100 grams (see Appendix G).

[b] Value for meats other than fish.

[c] Average for cereals and starches.

[d] Average for milk and eggs.

Sources: Zimbabwe Government Central Statistical Office (1998) for Zimbabwe. Ravallion and Sen (1996) for Bangladesh. Government of Republic of Armenia (2004) for Armenia. World Bank (June 2002) for Egypt. Sangui (2004) for China. ILO Multidisciplinary Team for Andean Countries (2004) for Ecuador. United States USDA (1999) for United States.

6.7 Ignoring private cost of typical public goods such as health care and education

The methodology developed in this paper to estimate national poverty lines does not specifically consider the cost to households of typical public goods such as health care, education, sanitation and environment. Although we are not alone in this as most official national poverty lines also do not do this, it is a widely acknowledged shortcoming of national poverty lines and represents an important source of non-comparability across countries. Some countries provide, for example, free or highly subsidized health care and

education while other countries do not. Private education expenses are quite substantial in some countries but not in others. And, the move toward privatization and costing of health care and education in recent years has important implications for the measurement of poverty across countries as well as over time within countries. One reason the value of private expenditures on typical public goods is not incorporated into our methodology for estimating national poverty lines is that it is very difficult to do in practice. For example, it is virtually impossible (especially on a global basis) to agree on what should be the quality level for these services, or on the value of government provided services and facilities especially when they are available free but are of relatively poor quality as in many poorer countries; nor are data on this widely available. Despite these difficulties, this is an important area of international non-comparability and so deserves further thought in the future.

There is evidence that private expenditures on typical public goods can represent an important cost for households, and so substantially affect poverty lines, poverty rates and living wage rates. Hentschel and Lanjouw (2000) estimate that the poverty rate in Ecuador in 1994 would have been almost 20 percent lower if one took into consideration the value of the subsidization, rationing and marginal pricing of water, gas and electricity, three typical public goods. It is estimated in Section 9.3 below that the living wage rate in the United States would be between $1 and $3 higher per hour and our estimated poverty line for the United States would be about $1.35 to $2.70 higher if private medical expenses were considered.

6.8 Ignoring crises and debt

Our poverty line and living wage rate estimates do not provide for the interest payment or debt repayment faced by many poor households. Nor do our estimates consider the need of poor households for a nest egg so that they can remain out of poverty when they are hit by a crisis such as an illness or accident. This is, however, not really a shortcoming of our methodology as we are interested in measuring the amount of income required so that current income exceeds the poverty line. This provides a snapshot view of the situation. Our methodology is, however, deficient if one is interested in the dynamics of poverty, and the extent to which households move in and out of poverty.

6.9 Ignoring taxes

Poverty lines generally ignore taxes. A rationale for this is that poor people do not pay much if income tax, either because of a progress tax schedule or because of poor enforcement; in addition, the poor may receive transfers from the government based on their low income level.

One major problem with ignoring taxes is that the poor are often obliged to pay taxes other than income taxes, such as sales taxes and payroll taxes. In the United States for example, sales taxes are generally around 5 percent[42] and the payroll social security tax is 7.65 percent on the earnings of employees and 15.3 percent on the earnings of self-employed.[43]

[42] Sales tax in the United States is complicated. Not only does the rate vary across states and municipalities, but the items subject to sales tax also vary across states and municipalities. For example, around 43 of the 50 states in the United States exclude food from sales tax.

[43] The social security tax for self-employed workers in the United States is twice that for employees, since self-employed workers have to pay both the worker's portion and the employer's portion of this tax.

This means that a low wage worker in the United States who spends all of his/her earnings would need to earn approximately 12 percent more than what is needed for family requirements in order to have a living wage rate, even in the absence of income taxes. According to estimates in Section 9.4, our estimated living wage rate would be approximately $1 higher (and our estimated poverty line would be around $1.35 higher) if these taxes were taken into consideration.

An important implication for our methodology is that not taking taxes into consideration affects cross-national comparability, since they vary so much around the world. In the future, it would be a good idea to improve estimates of living wage rates and poverty lines by collecting information on sales taxes paid by the poor as well as payroll taxes paid by low wage workers in order both to improve the measurement of the poverty line and living wage rate as well as to increase international comparability.

Part 3: Poverty line and living wage rate estimates for 12 countries: Testing the methodology

As our methodology is still in the developmental stage, poverty lines and living wage rates are estimated in this part of the paper for 12 countries - - in part to test the methodology and in part to see what can be learned about poverty and living wage rates in the world. Given the complexity of the issues involved in developing and applying a methodology for estimating national poverty lines and living wage rates, we also evaluate our national estimates to help us draw conclusions about how to improve the methodology in the future. This analysis should also help readers to draw their own conclusions about the methodology developed in this paper and how to improve it in the future.

The twelve study countries are drawn from different development levels to ensure that a range of situations are encountered in terms of economic development, culture, region, data availability and data quality.[44] They include a number of large and important countries such as the United States, India, China, Egypt and South Africa. There are 3 Asian countries, 2 Transition Economy countries, 2 Latin American countries, 2 Sub-Saharan African countries, 1 Middle Eastern country, and 2 OECD countries. There are two are high income countries, 2 upper middle income countries, 5 lower middle income countries, and 3 low income countries. Thus, this set of countries provides an excellent testing ground for the methodology developed in this paper.

This part of the paper is divided into three sections. Section 7 describes and evaluates the composition and cost of the national model diets established for the 12 study countries using our methodology. It is important to evaluate these model diets, because poverty lines and living wage rates are determined by food costs to a large extent. The composition and cost of our national model diets are evaluated as regards: their composition in terms of calories, proteins, fats and carbohydrates; and the distribution of food cost across ten food groups. Our national model diets are also evaluated by comparing them to the model diets actually used by national authorities to estimate their own poverty lines. Section 8 presents and discusses our national poverty line estimates for 12 study countries and evaluates them by comparing them to World Bank $1 PPP a day and $2 PPP a day poverty lines as well as to the poverty line countries use themselves. Section 9 presents and discusses our estimated national living wage rates and compares them to national median wage rates to help evaluate them.

[44] Countries included in this paper are for the most part the countries included in the recent work of Bescond, Chataignier and Mehran (2003) where median wage rates for selected countries are reported, because one of the main concerns of the present paper is to evaluate national living wage rate estimates made using our new methodology by comparing them to the actual median wage rate in the country. To the set of countries in Bescond et al, I added a few other countries to increase regional diversity and to include some large and important countries such as India, China, United States, and Egypt.

7. National model diets and food cost estimates for study countries

In this section, our model diets for study countries are reported and discused. These model diets are then evaluated in three ways. First, we evaluate the composition of model diets in terms of quantities for our 10 major food groups as well as in terms of proteins, fats and carbohydrates. Second, we compare our model diets to the model diets countries themselves use, usually to estimate their own poverty line. Third, we look at the total cost and distribution of costs across food groups for our model diets.

7.1 Composition of our national model diets

Table 24 indicates our model diets for the 12 study countries. By costing a model diet, it is possible to estimate the amount of income people need to purchase a low cost nutritious diet. This cost is used to help estimate the national poverty line and living wage rate. Readers interested for each country in the specific foods selected as well as the amounts of calories, proteins, fats and carbohydrates in the model diet are referred to Appendix C where this information is contained in EXCEL spreadsheets.

Table 24: Amount of food in major food groups in our national model diets, study countries (in grams)[a]

Country[b]	Cereals[c]	Potato	Pulses/nuts	Milk	Eggs	Meat	Oil	Sugar
Bangladesh	401	52	23	196	26	10	23	18
India	413	40	40	83	11	4	30	18
Zimbabwe	422	57	49	46	6	2	35	18
Low income average	412	50	37	108 (1/3 cup per day)	14 (2 eggs per week)	5 (2 times per month)[f]	29	18
Armenia	403	199	8	281	30	30	25	25
Ecuador	376	60	10	345	36	30	23	26
Egypt	417	42	24	274	31	28	27	30
China	389	171	71[e]	0[d]	32[d]	83[d]	30	30
South Africa	412	50	18	334	38	35	29	24
Lower middle income average	399	104	26	247 (1 1/4cup per day)	33 (5 eggs per week)	41 (2-3 times per week)[f]	27	27
Costa Rica	399	52	48	345	30	45	23	24
Lithuania	422	276	8	372	33	79	30	36
Upper middle income average	411	164	28	359 (1 1/2 cups per day)	32 (5 eggs per week)	62 (5 times per week)[f]	27	30
Switzerland	402	97	8	400	50	126	34	42
USA	393	110	35	365	48	110	37	42
High income average	398	104	22	383 (1½+ cups per day)	49 (7 eggs per week)	118 (10 times per week)[f]	36	42

Notes: Average is unweighted average of national values.

Data year for study countries is: 2001 (Armenia, Lithuania, Egypt, South Africa, Switzerland, and USA); 2000 (China, Costa Rica, and India); 1999 (Zimbabwe), 1997 (Ecuador); 1996 (Bangladesh). It is determined mainly by year of the median wage rate data provided by Bescond et al (2003) except for India, China, USA, and Egypt that are not in Bescond et al, and where latest year in ILO October Inquiry data set is used.

See EXCEL spreadsheet tables in Appendix C for specific foods included in national model diets.

[a] Vegetables and fruits are included in model diets at approximately 250, 270, 270, and 335 grams of edible food for low income, lower middle income, upper middle income and high income countries respectively.

[b] Countries are listed within development level in the order of their national income per capita in 1999 World Bank PPP.

[c] Sum of two cereals. Note that wheat is taken as flour in low income and lower middle-income countries, and as half bread and half flour in upper middle income and high income countries.

[d] Milk is not included for China, because much of its population is lactose intolerant. Needed additional animal-based protein is taken equally in form of egg and meat; this helps explain relatively high consumption of meats in China for its development level.

[e] Amount of pulses is relatively high in China, in part because it is taken in the form of bean curd that has far fewer grams of protein per gram of food as compared to other pulses and beans.

[f] Serving is 3 ounces or 85 grams as consumed.

Source: Author's calculations, see Appendix C.

7.2 Evaluation of composition of our model diets by major food group

Differences in the composition of our national model diets across development levels generally appear reasonable. In low income countries, model diets contain relatively small quantities of high cost animal-based foods. And among animal-based foods, model diets are biased in favor of milk and egg, because milk and egg are generally less expensive than

meat per available calorie. On average in the model diet, people in *low income countries have approximately one cup of milk 3 times per week, one egg 2 times per week, and one 3 oz/85gram serving of meat 2 times per month.* In contrast, people in high income countries have on average in their model diet approximately 1 ½ cups of milk a day, 1 egg a day, and a 3 oz/85 gram serving of lean meat 10 times per week.

The *quantity of cereals in model diets is similar in all countries.* This is surprising, because one would intuitively have expected the quantity of cereals to decrease with development and ability of people to afford more desirable and expensive foods. Indeed, our methodology begins with the assumption that the percentage of total calories coming from cereals and starches decreases with development level. One partial explanation for the surprising result shown in Table 24 of similar amounts of cereals for the four development levels is that the total number of calories required per person tends to increase with development level (because of larger body sizes and older age distributions on average in higher income countries). For example compared to low income study countries, lower middle income study countries need approximately 6 percent more calories per capita, upper middle income study countries need approximately 11 percent more calories per capita, and high income study countries need approximately 14 percent more calories per capita.[45] Another explanation is that wheat in our methodology is taken in the form of flour in low income and lower middle income countries and in equal quantities of flour and bread in upper middle income and high income countries. This means that more grams of cereals are needed ceteris paribus in upper middle income and high income countries; since bread contains approximately 2/3rds as many calories as flour, more grams of bread are needed as compared to flour to obtain the same number of calories.

The *quantity of potatoes and other roots and tubers in model diets varies considerable across countries.* This reflects differences in national food habits and preferences, as the percentage of calories from this food group is set at the percentage actually observed for each country according to FAO food consumption data. Lithuania, Armenia, China, USA and Switzerland have relatively high consumption of potatoes.

Consumption of pulses and nuts (protein-rich vegetal foods) in our model diets varies considerably across countries. This reflects differences in national food habits, because the percentage of calories from pulses/nuts in model diets is determined by observed actual national consumption according to FAO food consumption data. For example, India, Bangladesh, Zimbabwe, Costa Rica, China, Egypt and United States have relatively high pulses/nuts consumption. The form in which pulses/nuts are consumed also varies across our model diets. In India and Bangladesh it is dhal; in Egypt it is chickpeas; in China it is bean curd; in other countries it is usually beans.

Amount of cooking/salad oil in model diets is more or less unrelated to development level, except that it is highest in high income countries. It is around 27 grams per day per person on average in low income countries, lower middle income countries and upper middle income countries; and around 36 grams per day in high income countries. The reason for the lack of a relationship to development level is that we often change the quantity of oil in our model diets when we adjusted model diets to ensure that they have the required total number of calories and acceptable amounts of proteins, fats and carbohydrates. There are several reasons why we often adjusted the quantity of oil in model diets. Firstly, oil is an inexpensive source of calories. Second, changing the quantity of oil has a marked affect on percentage of total calories from fats, carbohydrates, and proteins, because oil is 100

[45] Differences across development level in the quantity of potatoes consumed does not have a very large effect on the quantity of cereals consumed even though we assume that a certain percentage of calories come from cereal and starches together. The main reason for this is that cereals have approximately 4.5 times more calories per gram than potatoes.

percent fat and has 9 calories per gram (compared to 4 calories per gram for carbohydrates). Third, low income countries tended to have model diets that were relatively low in fats as they included relatively little meats; this meant that it was necessary to increase the quantity of oil and so fats. In contrast other countries sometimes had relatively high fat consumption. Readers are referred to an EXCEL spreadsheet in Appendix C for details on the adjustments we made to model diets so that they would be acceptable and remain relatively inexpensive.

Amount of sugar in model diets increases with development level and the ability of people to afford this universally desired but unnecessary food. Thus, daily sugar consumption rises on average from about 18 grams per day per person in model diets for low income study countries, to about 30 grams per day for middle income study countries, and to about 42 grams per day for high income study countries. This increase with development level is consistent with observed sugar consumption in the world that rises with development.

7.3 Evaluation of model diets in terms of proteins, fats and carbohydrates

To be considered acceptable, our model diets need to meet certain criteria besides being generally reasonable as discussed above and providing a sufficient number of calories. In particular, the percentage of total calories from proteins, fats, and carbohydrates have to be within acceptable ranges (see Table 5 for recommended ranges according to WHO and others).

Table 25: Percentage of calories in our model diets coming from proteins, fats and carbohydrates, study countries

Country	% from proteins	% from fats	% from carbohydrates
Bangladesh	10	16	74
India	10	17	75
Zimbabwe	10	19	73
Low income average	10	17	74
Armenia	12	20	72
Ecuador	12	20	69
Egypt	12	19	71
China	12	22	67
South Africa	12	21	69
Lower middle income average	12	20	70
Costa Rica	14	20	67
Lithuania	14	22	68
Upper middle income average	14	21	67
Switzerland	16	24	61
USA	16	24	60
High income average	16	24	60

Notes:

WHO recommended ranges (see Table 5) are 10-15% from proteins, 15-30% from fats (20% best), and 55-75% from carbohydrates (60% best).

Average is unweighted average of country values.

Sum of percentages can slightly exceed 100, because of rounding error.

Source: Author's calculations, Appendix C.

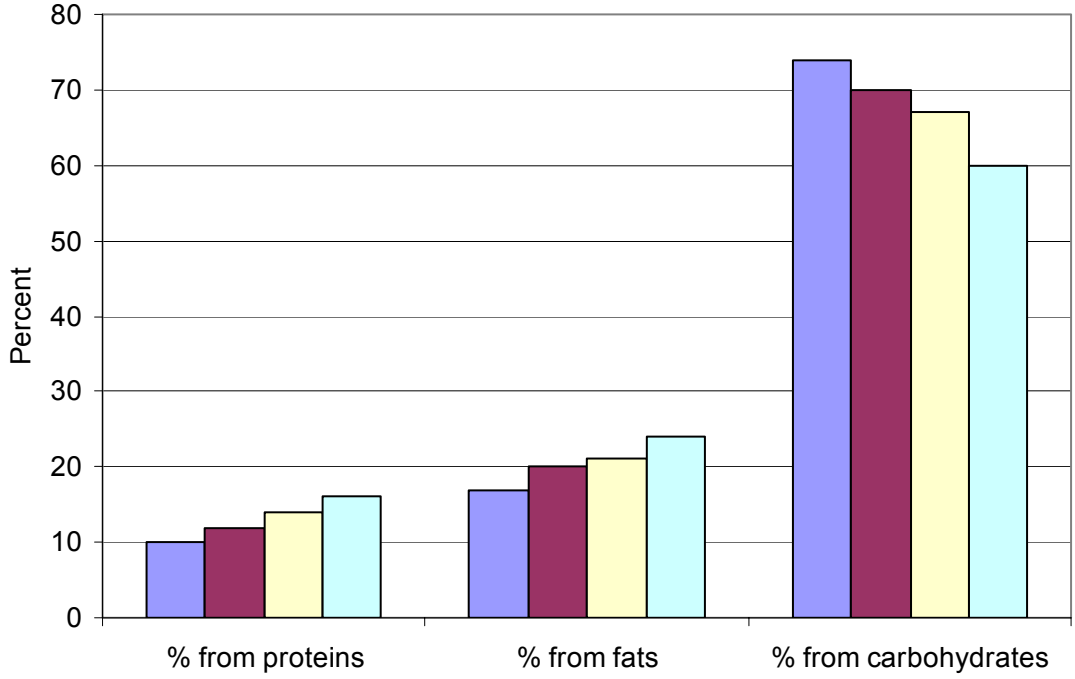
Table 25 and Figure 5 indicate the percentage distribution of calories in model diets coming from proteins, fats, and carbohydrates for our 12 study countries. **Percentages of total calories from proteins, fats and carbohydrates** in model diets are all **acceptable.** Furthermore, percentages **change along with development level in the expected direction.** Thus, percentage of calories from proteins increases with development from 10 percent in low income countries to 16 percent in high income countries: this is consistent with people's increased ability to afford preferred, but more expensive, animal-based protein-rich foods such as milk, egg, and meat. Percentage of total calories from fats increases with development level from 17 percent in low income countries to 24 percent in high income countries; this is consistent with observed relationships in the world. And percentage of total calories from carbohydrates decreases from 74 percent in low income countries to 60 percent in high income countries, which is again consistent with observed relationships in the world.[46]

The percentage of calories from fats and carbohydrates do not have to fall within acceptable limits in our first go at establishing a country's model diet in our methodology. Nor will the total number of calories be the number required (see Table 2). It is for this reason that model diets are adjusted in a low cost way to ensure that the total number of calories is the number required and that the percentage of calories from fats, carbohydrates and proteins are all acceptable. An ad hoc approach is used, just as the United States did in 1961 when it established the Economy Food Plan that became the basis for its original (and still valid) poverty line (Cofer et al, 1962).[47] One rule we followed when making these adjustments is that we do not allow total food cost to exceed what it would have been if the originally estimated total food cost had been adjusted by the ratio of the required total number of calories to the originally estimated total number of calories (e.g., if 2250 calories were required and the original diet contained 2200 calories, then food cost would not be allowed to exceed its originally estimated total cost by more than 1.023, or 2250/2200 in this example).

[46] According to FAO food consumption data (WHO/FAO, 2003), cereals (that are relatively high in carbohydrates, as approximately 75 percent of their calories are from carbohydrates) account for 81, 60, and 52 percent of total calories for the population as a whole in our three low income countries of Bangladesh, India, and Zimbabwe respectively. Percent of calories from cereals are 63, 55, 55, 53, 38, 36, and 35 percent according to FAO food consumption data for Egypt, Armenia, South Africa, China Lithuania, Costa Rica, and Ecuador respectively. In our high income countries, percentages are 24 and 23 percent in Switzerland and USA respectively. Readers should keep in mind that FAO values are national averages and not values for the poor who consume more cereals than average; nor do these FAO values take into consideration consumption of roots or tubers.

[47] Although linear programming could be used as the United States does at present to establish its recommended diets (USDA, 1999), we do not feel that this would be worth the effort. Recent articles by Darmon, Ferguson and Briend (2002) and Ferguson, Darmon, Briend and Premachandra (2004) describe how formal linear programming could be used to optimize diets in terms of nutritional content and price.

Figure 5: Percent of total calories in our model diets coming from proteins, fats and carbohydrates by development level, study countries



Notes: Colour of bar indicates development level: low income, lower middle income, upper middle income, high income.
Source: Table 25.

7.4 Composition of our model diets compared to composition of model diet used by countries to estimate their national poverty line

Another way to look at the reasonableness of our model diets is to compare them to the model diets countries themselves use often to estimate their own national poverty line. This should be a good measuring rod for assessing the reasonableness of our methodology, as a country's own model diet should be acceptable for local conditions. Although we do not expect our model diet to be identical to the country's own model diet (and indeed would not want it to be identical as ours is comparable across countries), the hope is that the two diets would be similar. The closer our model diets and national model diets are in general, the more confidence we would have in the methodology developed in this paper to establish model diets.

Before discussing results, it is useful to keep in mind one aspect of our methodology and one aspect of some national model diets. First, our methodology for establishing model diets is purposely conservative at this stage in its development as regards food costs as we select the least expensive food item in all major food groups with the exception of cereals. Second, it is possible for the model diet used by a country to be unacceptable nutritionally. As shown in Table 28 for example, the model diet used by China to estimate its poverty line prior to 1998 is far from acceptable nutritionally (and probably for this reason China changed its model diet in 1998); 81 percent of calories come from carbohydrates and only 8 percent from fats. Nor is the model used by Bangladesh to calculate its poverty line acceptable nutritionally as it has too little fat and too much carbohydrate (although its cost would not change much to account or this because oil is a relatively inexpensive source of calories and only somewhat more costly per calorie as compared to rice in Bangladesh).

Tables 26 and 27 compare our model diet and the country's own model diet for the nine study countries we were able to find a country model diet. Table 28 indicates the percentage of total calories in the country's own model diet that come from proteins, fats and carbohydrates (as estimated by us) in order to see if the country's own model diet is acceptable nutritionally. Table 28 also indicates the extent to which our model diet is more or less costly than the national model diet using the same ILO food price data.

First of all**,** it is important that the food groups used in our model diets are the same as those countries use in their own model diet.

Secondly, *it is encouraging that our model diets and country model diets are reasonably similar overall for six major food groups.* On average, the amounts of cereals, potato, pulses/nuts, fruits, oil and sugar in our model diets and the model diets used by countries are within 11 grams (see last row in Table 27).[48] At the same time, there are sometimes considerable differences for particular food groups, most of which can be explained. For example for China, differences are very large for almost every food group. This reflects the inappropriateness of China's own model diet prior to 1998 (see Table 28). The Ecuadorian and Costa Rican model diets include much higher quantities of oil and sugar than our model diets for these countries. In light of the fact the number of grams of sugar and oil in these countries' model diets are well above the amount in any other country's model diet, quantities in our model diets for these countries appear more reasonable. Even though differences for pulses/nuts are not large on average, those for Bangladesh, Zimbabwe, South Africa and United States deserve discussion with FAO in the future, because food costs in our methodology are sensitive to the amount of pulses/nuts included in a model diet (see Appendix A). Differences for cereals and potatoes are interesting, as they tend to have opposite signs. This deserves discussion with FAO about the interpretation of their food consumption data for roots and tubers, since potatoes are more expensive per calorie as compared to cereals. The large amount of fruit in the official United States' recommended model diet is due to the fact that Americans drink a considerable amount of orange juice.

Third, *our model diets are generally less expensive than the model diets used by countries*, by around 10 percent on average (Table 28)[49]. This is encouraging as one of our goals was to establish inexpensive yet nutritious diets and for this reason we have been purposely conservative in our assumptions.

[48] Median and mean values are reasonably similar in Table 27. Median values are used, because a country value for some foods (such as rice for China, and sugar for Costa Rica and Ecuador) are clearly inappropriate and this could have a major affect on the mean for all countries.

[49] This estimate does not consider miscellaneous food costs.

Table 26: Comparison of our model diet and country's own model diet, study countries

Country/ Food group	Country's diet (g)	Our diet (g)	Difference (g)	Country/ Food group	National diet (g)	Our diet (g)	Difference (g)
Costa Rica				*Armenia*			
rice	168	229	61	wheat	409	391	-18
bread/wheat	60	170	90	rice	0	10	10
potato	65	52	-13	potato	129	199	70
pulses/nuts	55	48	-7	pulses/nuts	0	8	8
milk	265	345	80	milk	114	281	167
egg	21	30	9	egg	10	30	21
meat	59	45	-14	meat	69	30	-39
vegetables	162	180	18	vegetables	152	210	58
fruit	68	60	-8	fruit	92	70	-22
oil	45	23	-22	oil	26	25	-1
sugar	98	24	-74	sugar	17	25	8
total calories	2169	2277		total calories	2111	2246	
Bangladesh				*S. Africa*			
rice	397	352	-45	maize	220	290	70
wheat	40	49	9	wheat	149	122	-27
potato	27	52	25	potato	60	50	-10
pulses/nuts	40	23	-17	pulses/nuts	51	18	-33
milk	58	196	138	milk	364	334	-30
egg	0	26	26	egg	20	38	18
meat	60	10	-50	meat	30	35	5
vegetables	150	188	38	vegetables	225	210	-15
fruit	20	63	43	fruit	0	60	60
oil	20	23	3	oil	35	29	-6
sugar	20	18	-2	sugar	46	24	-22
total calories	2118	2100		total calories	2197	2339	
Ecuador				*Egypt*			
rice	180	210	30	maize	243	272	29
wheat	96	167	71	wheat	129	145	16
potato	200	60	-140	potato	38	42	4
pulses/nuts	0	10	10	pulses/nuts	20	24	4
milk	300	345	45	milk	70	274	204
egg	16	36	20	egg	21	31	10
meat	120	30	-90	meat	140	28	-112
vegetables	162	200	38	vegetables	240	190	-50
fruit	170	70	-100	fruit	90	70	-20
oil	47	23	-24	oil	30	27	-3
sugar	82	26	-56	sugar	50	30	-20
total calories	2354	2151		total calories	2233	2263	

Country/ Food group	Country's diet (g)	Our diet (g)	Difference (g)	Country/ Food group	National diet (g)	Our diet (g)	Difference (g)
Zimbabwe CSO[a]				*China*			
maize	369	358	-11	rice	603	240	-363
wheat	62	64	2	wheat	0	149	149
potato	18	57	39	potato	0	171	171
pulses/nuts	52	49	-3	pulses/nuts	0	71	71
milk	43	46	4	milk	2	0	-2
egg	0	6	6	egg	4	32	28
meat	47	2	-44	meat	30	83	53
vegetables	242	188	-54	vegetables	183	225	42
fruit	0	63	63	fruit	8	75	67
oil	16	35	20	oil	10	30	20
sugar	36	18	-18	sugar	3	30	27
total calories	2081	2170		total calories	2425	2290	
Zimbabwe WB (rural) [a]			0	*USA*			
maize	328	358	30	bread/wheat	170	352	182
wheat	99	64	-35	rice	37	41	4
potato	0	57	57	potato	141	110	31
pulses/nuts	30	49	19	pulses/nuts	53	35	-18
milk	42	46	4	milk	436	365	-71
egg	0	6	6	egg	43	48	5
meat	46	2	-43	meat	150	110	-40
vegetables	158	188	30	vegetables	112	263	151
fruit	0	63	63	fruit	240	88	-152
oil	38	35	-3	oil	22	37	15
sugar	22	18	-4	sugar	17	42	25
total calories	2177	2170		total calories	1882[b]	2439	

Notes:

Country model diets were not available to the author for India, Lithuania, and Switzerland.

Total calories for country's own model diet were estimated using the food items selected for our own model diet.

[a] There are two country model diets for Zimbabwe. One is from the Zimbabwe Central Statistical Organization (1998), and one is from World Bank (WB) done by Hamdok (1999).

[b] Country diet for USA is USDA 1999 Thrifty Food Plan. Total calories reported above for this diet are so low mainly because major food groups in United States' food plan are comprised of a number of different food items that have higher calories per 100 grams than assumed in our calculations. This is because many food items in the USDA Thrifty Food Plan are prepared foods that have greater calories per 100 grams as compared to unprepared foods that are used in our calculations; for example, potatoes include raw potatoes and fried potatoes in the USA Thrifty Food Plan but only raw potatoes in our model diet.

Sources: Ravallion and Sen (1996) for Bangladesh. Zimbabwe Central Statistical Organization (1998) and Hamdok (1999) for Zimbabwe. Government of Republic of Armenia (2004) for Armenia. World Bank (June 2002) for Egypt. Sangui (2004) for China. Martins and Maritz (2002) for South Africa. United States USDA (1999) for United States. Costa Rica INEC (2004) for Costa Rica. ILO Multidisciplinary Team for Andean Countries (2004) for Ecuador.

Table 27: Difference in quantity by major food group between our model diet and in country's own model diet, study countries (in grams)[a]

Country	Cereal	Potato	Pulses/ Nuts	Milk	Egg	Meat	Veg	Fruit	Oil	Sugar
Bangladesh	-33	25	-17	138	26	-50	39	43	3	-2
Zimbabwe WB, rural	-4	57	19	4	6	-44	31	63	-3	-4
Armenia	-34	62	8	159	20	-43	48	-28	3	7
Ecuador	124	-123	10	71	21	-80	52	-85	-20	-49
Egypt	40	4	4	203	10	-114	-53	-21	-3	-21
China[b]	-180	171	71	-2	28	54	53	67	20	27
S. Africa	11	-15	-38	-62	16	1	-35	60	-9	-26
Costa Rica	160[c]	-16	-10	67	10	-17	10	-11	-24	-79
USA	81[c]	-73	-34	-200	-8	-84	118	-227	8	20
Mean	18	10	1	42	14	-42	29	-15	-3	-14
Median difference[d]	11	4	4	69	16	-44	39	-11	-3	-2

Notes: Country model diet was not available to the author for India, Lithuania, and Switzerland.

[a] To calculate quantities for country's own model diet in this table, its model diet was standardized to have the same number of calories as our model diet. For example if the national authority model diet for Armenia was estimated to contain 2300 calories and our model diet for Armenia contained 2200 calories, all quantities in the national authority model diet would have been decreased by 4.3 percent (i.e., by 2200/2300).

[b] Model diet for China is not acceptable nutritionally with too many carbohydrates (81 percent of calories) because approximately 90 percent of calories come from rice.

[c] It is assumed in our methodology that wheat is taken in the form of flour in low income and lower middle income countries and in equal quantities of flour and bread in upper middle income and high income countries. This helps explain in part higher quantity of cereals in our model diets as compared to the country's own model diet for Costa Rica and United States. Because bread has approximately 2/3rds as many calories as flour, more bread is needed as compared to flour to obtain the same number of calories.

[d] Median values, rather than mean values, are in bold, because country value for some foods (e.g., rice for China, and sugar for Costa Rica and Ecuador) are clearly inappropriate and this could have a major affect on the mean for all countries.

Sources: Author's calculations for new methodology values. For country values see sources for Table 26.

One possible concern is that quantities for four food groups are consistently different in our model diet compared to the country's own model diet. Vegetables, milk and egg have a systematic upward bias and meat has a systematic downward bias in our model diets. This result for vegetables is consistent with the observation of WHO (WHO/FAO 2003) that vegetable consumption is almost always below recommended levels. This occurs despite the fact that we included fewer grams of vegetables in our model diets than WHO recommends. *In the future when our methodology is revised, perhaps the amount of vegetables in our model diets could be reduced further.* The result for animal-based foods (more milk and egg and less meat) should also be rethought. Future revisions should consider changing the relative quantities among animal-based foods by increasing consumption of meat relative to the consumption of milk and egg. While this would not greatly affect total food cost (see sensitivity analysis in Appendix A), it would bring the composition of our model diets more into line with the model diets of the countries.

Table 28: Estimated cost difference between our model diet and country's own model diet, and distribution of calories in country's own model diet from proteins, fats and carbohydrates

Country	Percentage cost difference between our model diet and country's own model diet		Percent of total calories in country's own model		
	Total[b]	from meat only[c]	% protein	% fats	% carbs
Bangladesh	13	-29	11	11[a,e]	77[a,e]
Zimbabwe WB (rural)	-3	-34	11	22	71
Armenia	17	-15	13	19	72
Ecuador	–17	-33	12	27	60
Egypt	-49	-69	15	21	67
China	60[e]	13	10	8[a,f]	81[a,f]
S. Africa	–10	1	13	25	64
Costa Rica	–23	-9	12	29	60
USA	-14	-9	19[d]	27	55
Mean	–3	-20	13	21	67
Median	-10	-15	13	22	67

Notes: Percentages of total calories in a country's model diet from proteins, fats, and carbohydrates are estimated using values per 100 grams for calories, fats and carbohydrates in Appendix G.

[a] Country value is shaded when percent is above or below range of acceptable values according to WHO recommendations (10-15 percent for proteins, 15-30 percent for fats, 55-75 percent for carbohydrates; see Table 5 in Section 4.4).

[b] Cost difference is estimated by costing both model diets using the same food items and same unit prices. For this calculation, the country's model diet from Table 26 is standardized so that it has the same number of calories as our model diet by using the estimated ratio of total calories in our model diet to estimated total calories in the country's own model diet. Quantities used were those specified in our model diet and in the country's own model diet. To the estimated total food cost for the ten food groups, a percentage for miscellaneous food costs was added as indicated by the country and as assumed in our methodology.

[c] Percent indicates difference in cost of meat in the two diets divided by total cost of our own diet.

[d] Value for United States for proteins (19 percent) is not shaded even though it is above the WHO recommended range, as this is not believed to be unhealthy.

[e] Although percentages for fats and carbohydrates are outside WHO recommended ranges, adjusting the diet to move within the recommended ranges would not change total cost by much. The reason is that oil is a relatively inexpensive source of calories, and only somewhat more expensive per calorie than rice in Bangladesh.

[f] China's own model diet here is clearly unacceptable nutritionally. Correcting this would substantially increase total food cost, which explains why the cost of our model diet for China is so much higher than the cost of China's own model diet.

Source: Author's calculations as explained in notes.

In summary, the model diets we establish for study countries tend to be similar to the model diets countries use themselves. Both include the same major food groups, and quantities tend to be similar on average for most major food groups. This means that our model diets have the desirable attribute of generally reflecting national food habits as well as broad nutritional needs. At the same time, there are areas of possible improvement in the future, such as paying greater attention to the amount of pulses/nuts and possibly reducing the amounts of vegetables, milk and egg and increasing the amount of meats.

7.5 Evaluating distribution of food costs across food groups in our model diets

Another way of looking at the reasonableness of our model diets is to look at the distribution of food costs across food groups - - as one would expect: (i) similar patterns within development levels, and (ii) reasonable differences across development levels (or it should be possible to explain anomalies). Table 29 and Figure 6 indicate the percentage distribution of food costs by major food group for our 12 study countries excluding miscellaneous food costs.

Table 29: Percent distribution of food costs by food group in our model diet, study countries

Country	Cereals/ starches	Pulses/ nuts	Milk	Egg/ meat	Vegetables/Fruit	Oils	Sugar
Bangladesh	22.4	3.9	28.2	16.5	20.9	4.9	3.1
India	46.2	7.3	13.7[a]	4.8	17.1	9.0	2.0
Zimbabwe	47.9	10.9	6.9	3.9	16.6	12.2	1.7
Low income average	38.9	7.4	16.2	8.4	18.2	8.7	2.2
Armenia	37.9	1.4	24.8	17.8	11.2	4.5	2.4
Ecuador	42.1	1.1	19.2	20.8	11.3	3.4	2.1
Egypt	24.7	4.0	26.7	24.4	13.5	4.5	2.2
China	39.1	4.2	0.0	26.2	17.7	7.0	5.7
South Africa	27.3	2.4	23.7	22.2	18.8	3.7	1.9
Lower middle income average	34.2	2.6	18.9	22.3	14.5	4.6	2.9
Costa Rica	31.8	4.4	16.9	29.1	11.1	3.3	3.4
Lithuania	32.5	0.4	17.3	30.3	12.6	3.3	3.6
Upper middle income average	32.2	2.7	17.1	29.7	11.8	3.3	3.5
Switzerland	21.2	0.5	10.8	48.6	15.6	2.2	1.1
USA	28.8	2.3	18.5	22.8	22.2	3.7	1.7
High income average	25.0	1.4	14.6	35.8	18.9	3.0	1.4
All countries average	33.5	3.6	17.2	22.3	15.7	5.1	2.6

Notes: Shading indicates when national value is 1/3rd greater or 1/3rd less than the average value for the development level.

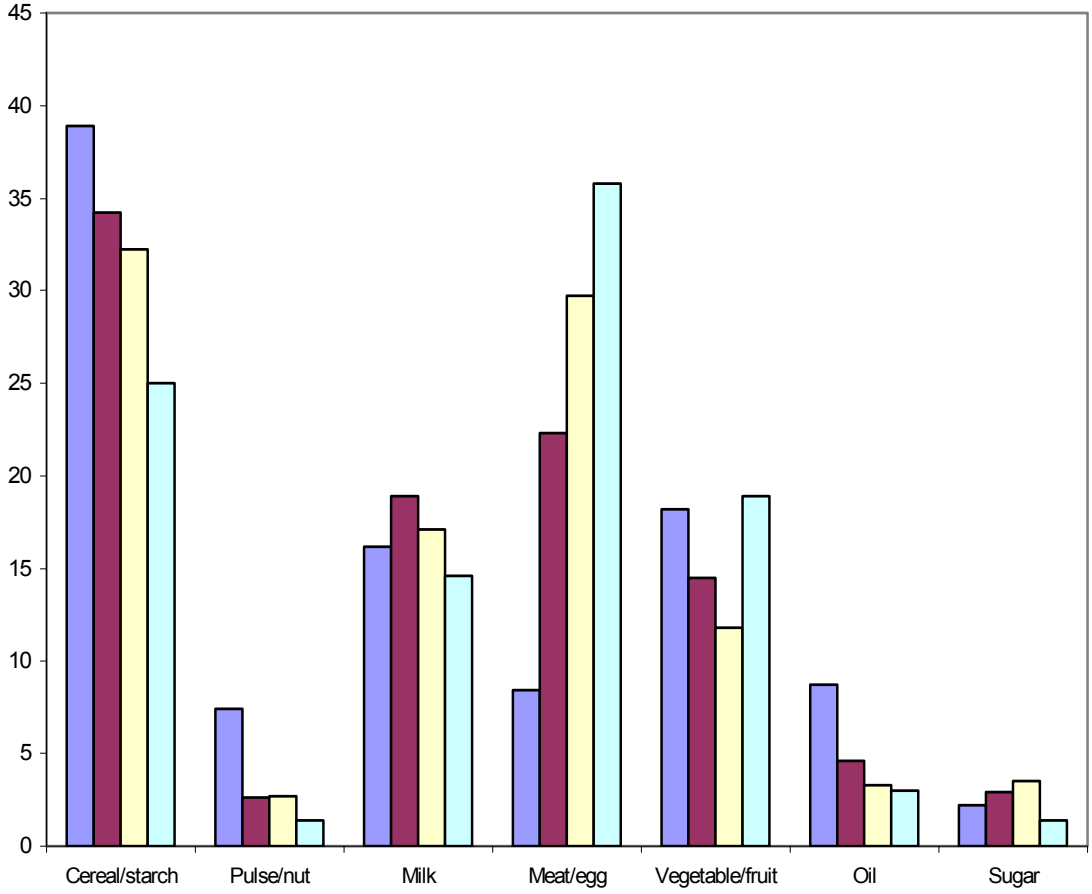
Average is unweighted average of country values.

Data year for study countries is: 2001 (Armenia, Lithuania, Egypt, South Africa, Switzerland, and USA); 2000 (China, Costa Rica, and India); 1999 (Zimbabwe); 1997 (Ecuador); 1996 (Bangladesh). It is determined mainly by year of the median wage rate data provided by Bescond et al (2003) except for India, China, USA, and Egypt that are not in Bescond et al, and where latest year in ILO October Inquiry data set is used.

[a] Percentage for milk is consistent with Indian National Sample Survey (NSS) data for the 50th round (1993/94) where milk was responsible for 10.8 percent of all household expenditures in Uttar Pradesh, India's largest state (Deaton and Tarozzi, 1999).

Source: Author's calculations.

Figure 6: Percent of food cost by major food group in our model diets, by development level



Notes: Colour of bar indicates development level: low income, lower middle income, upper middle income, high income.
Source: Table 29.

Results by development level for the percentage distribution of food costs by food group are generally consistent with a priori expectations. Cereals and starches are responsible for the greatest portion of food budgets in low income countries (about 40 percent) and animal-based foods are responsible for the largest part of food costs in countries at other development levels (about 45 percent). This pattern is reassuring, because cereals are the major inexpensive source of calories in the world and animal-based foods are the most expensive. Together cereals and animal-based foods account for approximately 70 percent of food costs for all of our study countries (approximately 63 percent in low income countries and approximately 75 percent in other countries). Percentage for non-dairy animal-based foods (eggs and meats) display a large increase with development level going from about 8 percent on average in low income countries to about 36 percent in high income countries.

There are some interesting results by development level shown in Table 29 and Figure 6. First, the percentage of food costs for vegetables and fruits, at around 16 percent on average, is roughly the same for low income countries and high income countries (with lower percentages for lower middle income countries and upper middle income countries). This is a little surprising, because the quantity of vegetables/fruits in our model diets increases with development level. This result implies that relative vegetable/fruit unit prices decrease with development level, and that vegetables/fruits are relatively expensive in low income countries. Second, the percent of food costs for pulses/nuts (around 4 percent on average) and oil (around 5 percent on average) tend to decrease with development level - - partly because greater quantities are consumed in low income

country model diets as these foods provide an inexpensive source of proteins and calories respectively. Third, the percentage of food costs for milk does not vary much across development levels. This is due in part to two counterbalancing effects: the assumption that the consumption of animal-based foods increases with development level, and the assumption that the percentage of animal-based protein provided by milk decreases with development level; there is also an unusually high and unrealistic level of milk consumption in Bangladesh.

We also looked at national values to see if any are unusual for their development level, as this might indicate some problem with ILO food price data. This is done in Table 29 by shading a country value when it is either 1/3 more or 1/3 less than the average for its development level. Although relatively few national values are unusual for their development level, almost all national values for pulse/nuts are shaded. This is realistic and reflects the fact that the amount of pulse/nut consumption is so country specific. An unusually high percent of food costs in China's model diet go for oil and sugar, which is due to China having relatively high unit prices for sugar and oil according to ILO food price data. The main worry from Table 29 is that Bangladesh's cost pattern is not believable for a low income country. The percent of food costs for animal-based protein-rich foods (at 45 percent, with 28 percent for milk and 17 percent for eggs/meat) is not reasonable for such a poor country. There appear to be two likely explanations. First, the consumption of pulses may be too low in our model diet for Bangladesh. Notice how much lower this is than in our model diets for India and Zimbabwe, as well as in the model diet Bangladesh uses to estimate its own national poverty line. If Bangladesh's pulses/nuts consumption were changed to be the same as in India,[50] the percent of food costs for animal-based foods would fall from approximately 45 percent to 34 percent (and total food costs would fall by about 11 percent). These percentages are more reasonable although still too high for a low income country. Second, the price per liter of milk in Bangladesh in the ILO food price data set may be on the high side. This possibility is supported by information collected for the author in November 2003 from Dhaka in Bangladesh and New Delhi and Baroda in India by CORT who found that the price of one liter of milk was 0.7 times the price for one kilogram of long grain rice in Bangladesh (and 0.5 in India), whereas this ratio is approximately 1.7 for Bangladesh (and 0.7 for India) according to ILO food price data. Finally, there is an interesting difference in food cost patterns for our two high income countries, USA and Switzerland - - meats are a much lower percent of food costs in the United States than in Switzerland because the unit price of chicken is much lower in the United States than in Switzerland (something which is apparent to the author who has lived in both of these countries). This has important implications for food PPPs (see Appendix B), since it implies that the more meat in a model diet, the higher food PPPs will be because meat is relatively inexpensive in the comparator country, the United States.

Our methodology requires good quality food price data. Although ILO food price data are generally complete and of good quality, they can be improved. There are examples of missing data that are potentially important. For example, we had to estimate the following food prices for our 12 study countries: maize for Zimbabwe, wheat flour for Ecuador, split peas for Costa Rica, pulses for Switzerland, and milk for United States. When the price of a potentially important food is missing in the ILO food price data set or its price is suspect (e.g., milk price in Bangladesh), a serious effort should be made to obtain this price (as we do for the United States in this paper). In the future, Also, ILO should be strongly encouraged to collect in the future information on the prices of lower quality varieties of rice, as well as for a wider variety of vegetables.

[50] The amount of pulses would then be approximately the same as the amount Bangladesh uses in its own model diet to estimate its national poverty line (Ravallion and Sen, 1996). The model diet used by Bangladesh is provided in Section 7.4.

8. National poverty lines for study countries

This section discusses poverty line estimates for our 12 study countries. Section 8.1 is concerned with World Bank $1 PPP a day and $2 PPP a day poverty line definitions. It is important to evaluate World Bank poverty lines, since they are so widely used and quoted. World Bank estimates of poverty are an important basis for monitoring achievement of the United Nation's Millennium Development Goals, as well as for providing poverty statistics to the mass media and the public. It is particularly important to observe if World Bank estimates are biased in any way. Section 8.2 reports and discuses our own poverty line estimates for study countries. These are evaluated by comparing them to the country's own poverty line as well as to the World Bank poverty line. These comparisons are important as our methodology is new and so needs to be assessed in some way.

8.1 Inappropriateness of World Bank PPP methodology for estimating national poverty lines

It is important to briefly discuss conceptual and empirical issues and problems with basing national poverty line estimates on the World Bank $1 PPP a day and $2 PPP a day definitions of poverty. Before beginning this discussion, it is necessary to acknowledge the considerable effort the World Bank has put into measuring poverty around the world at the national and international levels, and the important influence these estimates have had in bringing attention of poverty issues.

According to the World Bank, $1 PPP a day is the best internationally comparable measure for the "poorest countries", while $2 PPP a day represents a "poverty line more typical of low-middle income countries" (Chen and Ravallion, 2000). The $1 PPP a day value is said by the World Bank to be based on the median of national values for the ten poorest countries with good quality poverty line estimates; the $2 PPP a day is arbitrarily set at two times $1 PPP (Chen and Ravallion, 2004). I did not find in World Bank publications an indication of the appropriate number of PPPs for upper middle income countries or high income countries, although it seems possible that $2 PPP a day can be used for some upper middle income countries since the World Bank provides poverty rate estimates for some upper middle income countries in its latest World Development Report (see Table 30). Karshenas (2003) concludes that $1 PPP a day and $2 PPP a day are consistent on average with the national poverty lines estimated by countries, but Reddy and Pogge (2003) disagree.

8.1.1 Conceptual issues on use of World Bank PPP methodology for estimating national poverty lines

First, it is **inappropriate to use World Bank PPPs to estimate national poverty lines.** According to Ravallion (2001) of the World Bank "At the country level, poverty monitoring is based on poverty lines considered appropriate in each country. The PPP rates are required only for forming regional or global aggregates. ... PPP exchange rates were not designed for the purpose of making internationally comparable poverty lines, but rather for making comparisons of average national income and consumption (underlining added for emphasis)."[51] Deaton (2003) elaborates on the inappropriateness of PPPs for measuring

[51] The exchange between Reddy and Pogge (2002) and Ravallion (2002) of the World Bank about the appropriateness of basing poverty lines estimates on PPPs makes for interesting reading.

poverty lines, "PPPs price a representative bundle of goods in each country and compare the local cost of the bundle with the U.S. dollar cost of the same bundle. ... Although it might be argued that changes in the prices of beans and rice ought to change the relative poverty lines of Brazilians and Indians, it is much harder to make the case for changes in the world price of oil. Even in theory, PPP exchange rates as currently defined are not designed to convert poverty bundles." This means that it would be wrong to place much confidence in particular national poverty line estimates based on the World Bank PPP methodology. Indeed, the World Bank and others have noted that country values vary greatly around these $1 PPP and $2 PPP averages (World Bank, 1990; Karshenas, 2003).[52]

Second, it is difficult to understand the appropriateness of basing an international poverty line on an average of official national poverty lines (the median of ten lines is used for the 1993 $1 PPP a day definition) when national poverty lines are not comparable as they are based on different methodologies, some are clearly wrong, and countries come from different development levels. As discussed in Section 3, countries use different approaches to estimate their poverty line. Seven of the 33 countries the World Bank used to make their 1985 and 1993 $1 a day estimates are our study countries. India and Bangladesh set their poverty line by observing the income of households with sufficient calorie consumption; the poverty lines for China, Costa Rica, Ecuador, Egypt and the United States are estimated by costing a model diet and adding non-food necessities; the poverty line for South Africa is set by costing a model diet and a list of non-food necessities. In addition, some countries use unrealistic assumptions; China's official poverty line is clearly much too low as shown in this paper. Also, it is not clear why the World Bank used the median of the ten lowest official poverty lines for its 1993 $1 a day estimate, or why the World Bank did not use the median of poverty lines of poor countries only (e.g., poverty lines for Thailand and Tunisia were used and poverty lines for Burundi and Kenya were not used), or why poverty lines for ten countries was used and not some other number of countries.

Third, when national PPPs (and therefore national poverty lines and poverty rates) are revised by the World Bank as improved data become available, it is common for this to result in large changes (see Reddy and Pogge 2002). When I looked up PPP values in the World Bank World Development Indicators online database for study countries in September 2004 to revise this paper, I found that the value for 8 of our 12 study countries had changed at least 0.1 PPP compared to the value for the same historical year I found on this same database in December 2003. Although changes were generally small, it is disconcerting when historical PPP values change.

Fourth because PPPestimates are difficult and costly to make, the World Bank periodically makes a benchmark estimate, and calculates PPP values for subsequent years by adjusting for inflation. Estimating PPP by extrapolated to a subsequent year from a benchmark year using CPI (as is done) adds imprecision and is especially problematic in high inflation countries, since inflation faced by the poor may differ from CPI.[53] Once again this means that one has to be very cautious about putting much confidence in particular World Bank PPP-based estimates of national poverty lines.

Fifth, *it is very difficult for anyone to understand what a current PPP or a 1993 PPP means, or that they difer*. How many laypersons or scholars know what 1 PPP can buy?

[52] Because $1 a day and $2 a day poverty lines are supposedly correct on average, the World Bank feels that they are appropriate for making regional and international estimates of poverty. Reliance on counterbalancing overestimates and underestimates of national values, however, is an undesirable attribute for regional and global estimates.

[53] For example in Ecuador in 2000, CPI was 96 percent while food inflation was 120 percent according to World Bank World Development Indicators online database in January 2005.

How many know that World Bank poverty lines refer to the current value of a 1993 PPP? How many know that a 1993 PPP is not the same as a current PPP which one might naturally imagine given that PPPs are intended to provide a measure of relative purchasing power that is unaffected by exchange rates. When I followed World Bank instructions below in Section 8.1.3 and increased the 1993 PPP for each study country by inflation in that country over the period under consideration (e.g., from 1993 and 2000) to obtain the World Bank poverty line in current local currency for a more recent year, [54] I learned that World Bank poverty lines in local currency tended to be higher than the country's current PPP by around 20 percent on average.[55] While this is reassuringly in some sense since this difference is similar to inflation in this period in the United States the comparator country, I doubt that many people know how much the World Bank's $1 a day poverty line differs from the current PPP.

Sixth, the World Bank's $1 a day poverty line is actually $1.08 PPP, and its $2 a day poverty line is actually $2.15 PPP, with the $2 PPP a day line arbitrarily set by multiplying $1 by 2. These points may seem trivial, and indeed they are almost always ignored by the media and in press releases. In my opinion, however, they are important as they reflect a lack the transparency and ease of understanding that statistics on poverty should have.

8.1.2 Empirical evidence on use of World Bank PPP for estimating national poverty lines

This section examines the degree to which World Bank poverty lines and poverty rates are unbiased and consistent with those used by national authorities, as well as the degree to which there is consistency in reported PPP values between different World Bank sources. First, poverty rates from the World Bank are compared to poverty rates from national authorities. Next, World Bank PPP values from two World Bank sources are compared for our 12 study countries.

Table 30 and Figure 7 indicate poverty rates for 53 developing countries reported in the 2004 World Bank World Development Report from (i) national sources, and (ii) the World Bank. A priori expectations are that values from these two sources will tend to be similar and the average of the differences between them should be close to zero, as this would be consistent with the principles of the World Bank methodology for estimating national poverty lines.

Surprisingly, national poverty rates are consistently lower according to the World Bank than according to national sources (Table 30 and Figure 7). Poverty rates are higher according to national sources for over 80 percent of the countries in Table 30 (44 of 53 countries), and for approximately 90 percent of the low income countries (25 of 28 countries). On average, **poverty rates are approximately 1/3rd lower according to the World Bank than according to countries.** As expected, there is considerable variation between particular World Bank and national estimates of the poverty rate.

It is difficult to reconcile these results with the idea that $1 PPP a day and $2 PPP a day poverty lines represent national poverty lines of low income and lower middle income countries respectively. While discrepancies for some countries are consistent with World

[54] Instructions in Chen and Ravallion (2000) are explicit on this point: "Having converted the international poverty line to local currency at PPP in 1993 we convert to the prices prevailing at each survey date using the official country-specific Consumer Price Index (CPI)."

[55] Also, it is not always easy to understand how to calculate the current value of a 1993 PPP. I had problems doing this for study countries Armenia and Ecuador (see Section 8.1.3).

Bank statements (and indeed a justification for a standard international measure of poverty), the consistently lower World Bank poverty rate estimates are unexpected. One possible explanation for part of the observed differences could be that World Bank PPPs were fixed for an earlier time period (first for 1985 and then for 1993), while poverty rates from national authorities have been updated to represent an improved current situation. *A rough approximation of the downward bias in World Bank national poverty lines is around 10-15 percentage points* given that the elasticity of the poverty rate to the poverty line is around 2 to 3 according to national data shown in Table 35 in Appendix A.

Table 30: Poverty rate according to World Bank compared to poverty rate according to country, as reported in World Development Report

Development level/country	Poverty rate according to country (2)	Poverty rate according to World Bank [a] (3)	Column (3) – Column (2)	Column (3)/ Column (2)
Low income				
Azerbaijan	49.6	3.7	-45.9	0.07
Bangladesh	49.8	36.0	-13.8	0.72
Burkina Faso	45.3	44.9	-0.4	0.99
Cambodia	36.1	34.1	-2.0	0.94
Cameroon	40.2	17.1	-23.1	0.43
Ethiopia	44.2	26.3	-17.9	0.60
Georgia	11.1	2.7	-8.4	0.24
Ghana	39.5	44.8	5.3	1.13
India	28.6	34.7	6.1	1.21
Kenya	52.0	23.0	-29.0	0.44
Kyrgyz Rep	64.1	1.0[b]	-63.1	0.02
Lao PDR	38.6	26.3	-12.3	0.68
Madagascar	71.3	49.1	-22.2	0.69
Malawi	65.3	41.7	-23.6	0.64
Mali	63.8	72.8	9.0	1.14
Mauritania	46.3	25.9	-20.4	0.56
Moldova	23.3	22.0	-1.3	0.94
Mongolia	36.3	13.9	-22.4	0.38
Mozambique	69.4	37.9	-31.5	0.55
Nepal	42.0	37.7	-4.3	0.90
Nicaragua	47.9	45.1	-2.8	0.94
Pakistan	32.6	13.4	-19.2	0.41
Senegal	33.4	26.3	-7.1	0.79
Tanzania	38.6	19.9	-18.7	0.52
Ukraine	31.7	2.9	-28.8	0.09
Uzbekistan	27.5	21.8	-5.7	0.79
Yemen Rep	41.8	15.7	-26.1	0.38
Zambia	72.9	63.7	-9.2	0.87
Low income average	42.9	29.8	-13.14 mean 25 negative 3 positive	0.68 median (0.65 mean)
Lower middle income				
Albania	25.4	11.8	-13.6	0.46
Algeria	22.6	15.1	-7.5	0.67
Armenia	53.7	49.0	-4.7	0.91
Belarus	41.9	1.0[b]	-40.9	0.02
Bolivia	62.7	34.3	-30.4	0.55
Bulgaria	12.8	16.2	3.4	1.27

Development level/country	Poverty rate according to country (2)	Poverty rate according to World Bank [a] (3)	Column (3) – Column (2)	Column (3)/ Column (2)
China	4.6	46.7	42.1	10.15
Columbia	64.0	22.6	-41.4	0.35
Dominican Rep	28.6	1.0[b]	-27.6	0.03
Ecuador	35.0	40.8	5.8	1.17
Egypt	16.7	43.9	27.2	2.63
Guatemala	56.2	37.4	-18.8	0.67
Guyana	35.0	6.1	-28.9	0.17
Jamaica	18.7	13.3	-5.4	0.71
Jordan	11.7	7.4	-4.3	0.63
Morocco	19.0	14.3	-4.7	0.75
Peru	49.0	37.7	-11.3	0.77
Philippines	36.8	46.4	9.6	1.26
Sri Lanka	25.0	45.4	20.4	1.82
Trinidad and Tobago	21.0	12.4	-8.6	0.59
Tunisia	7.6	6.6	-1.0	0.87
Lower middle income average	30.9	26.7	-6.7 mean 15 negative & 6 positive	0.71 median (1.26 mean)
Upper middle income				
Chile	17.0	9.6	-7.4	0.56
Estonia	8.9	5.2	-3.7	0.58
Hungary	17.3	7.3	-10.0	0.42
Panama	37.3	17.6	-19.7	0.47
Upper middle income average	20.1	9.9	-10.2 mean 4 negative & 0 positive	0.52 median (0.51 mean)
All countries			44 negative & 9 positive	0.67 median (.88 mean)

Notes: Countries included in this table are developing countries that report a national poverty rate and a World Bank international poverty rate for years that are less than five years apart and in the 1990s.

Poverty rate is percent of population below the poverty line.

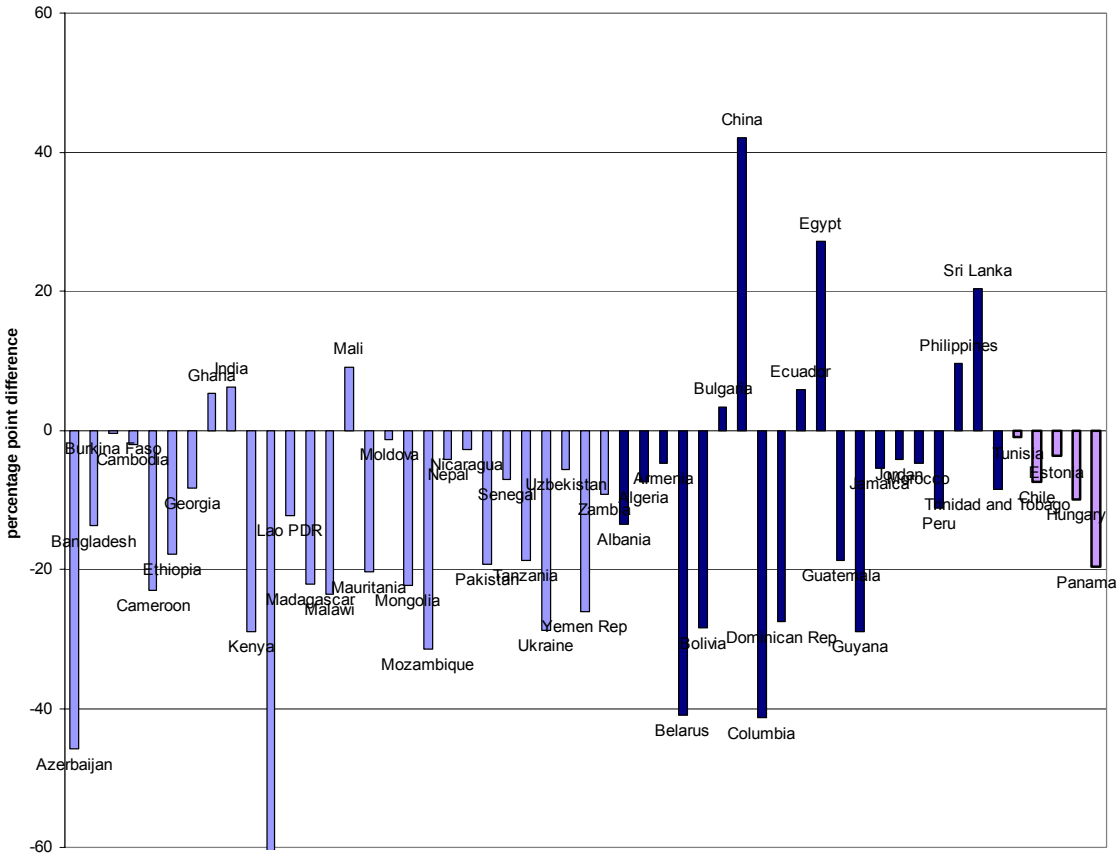
As poverty rates are sensitive to the level of the poverty line (with an elasticity of the poverty rate to the poverty line of 2 to 3, see Table 35 in Appendix A), this implies that the average underestimate of the national poverty rate of about 1/3rd by the World Bank should be associated with a World Bank poverty line that is around 10-15 percent too low.

[a] According to World Bank, the poverty line is $1.08 a day in 1993 PPP for low income countries and $2.15 a day in 1993 PPP for lower middle income countries. There is no guidance from the World Bank on what PPP value to use for upper middle income and high income countries - - although World Bank does estimate the poverty rate in this table for four upper middle income countries.

[b] Indicates that poverty rate is reported to be < 2 percent in the source.

Source: World Bank World Development Report 2004 (2004a).

Figure 7: Difference between poverty rate according to World Bank and poverty rate according to national source, 53 developing countries (percentage points)



Notes: Colour of bar indicates development level: low income, lower middle income, upper middle income.

Source: World Bank World Development Report 2004a

Table 31 indicates World Bank PPP values for study countries reported in two World Bank sources for the same historical year: (i) World Development Report publication, and (ii) online World Development Indicators from December 2003. PPP values for the same historical year differ in these two World Bank sources for 7 of our 12 study countries. While differences are less than 10 percent for five countries, differences are large for Armenia and South Africa. In addition for Ecuador, values in both sources are inconsistent with the inflation rate for the years bracketing the year we are interested in (1997). Although small differences between PPP values in Table 31 might represent rounding error, large differences are worrying because poverty rates are sensitive to changes in the poverty line.

Another inconsistency of PPP values from the World Bank online World Development Indicators database is that they often change over time for historical years. For example, they changed slightly for 9 of our 12 study counties for the historical year of our food price data by at least one decimal point between December 2003 (when I did the original draft and analysis) and September 2004 (when I began to revise and complete the present paper). PPP was now 10.7 compared to 10.6 for Bangladesh, 8.5 compared to 8.7 for India, 6.1 compared to 6.2 for Zimbabwe, 139.4 compared to 146.5 for Armenia, .61 compared to .52 for Ecuador, 2.2 compared to 2.3 for South Africa, 1.4 compared to 1.5 for Lithuania, 144.8 compared to 146.7 for Costa Rica, and 1.9 compared to 2.0 for Switzerland. There is no explanation why so many of these PPP values changed, or why the USA value (1.01) could be other than 1.00 as USA is the comparator country.

In summary, discussion and data presented in this section illustrate important problems with the World Bank methodology for estimating national and international poverty lines based on PPPs: (i) conceptual inappropriateness of using PPPs to measure national poverty lines; (ii) considerable imprecision of World Bank poverty lines for particular countries based on the PPP methodology; (iii) consistent tendency for World Bank PPP-based poverty lines to be lower than official national poverty lines; (iv) questionable approach to establishment of $1 a day and $2 PPP a day as the international poverty lines; and (v) lack of transparency and clarity in the World Bank PPP methodology to measure poverty. This means that one should not take too seriously the World Bank PPP implied poverty line for a particular country - - a point on which the World Bank concurs - - or therefore the difference for any particular country with the poverty line we estimate for a country in Section 8.2 below using our new methodology.

8.1.3 PPPs used for our study countries

We require the World Bank PPP for each study country for our historical study year so that our poverty line and living wage rate estimates (Sections 8.2 and 9) can be expressed in PPP and be internationally comparable. We also require 1993 PPPs for study countries so that our poverty line estimates can be compared to World Bank poverty lines which are based on 1993 PPP. In light of problems with PPP values noted above, decisions had to be made about which PPP value to use for the study year, which 1993 PPP value to use, and how to calculate the study year value of 1993 PPP.

It was decided to use the PPP values for study years from the online World Development Indicators online database (from December 2003 when this paper was first being written), since it should have been based on up-to-date information (see Table 31). In addition for Ecuador, it was decided to use different years to estimate our living wage rate and our poverty line. 1997 was used to estimate Ecuador's living wage rate, because Bescond et al (2003) report a median wage rate for this year for Ecuador, and we needed to compare our living wage rate estimate to the actual median wage rate in Section 9. The year 2000 was used to measure our poverty line for Ecuador, because I could not figure out what Ecuador's 1997 PPP in sucre should be or how to estimate the 1997 value in sucre of its 1993 PPP (and therefore how to estimate the 1997 World Bank poverty line for Ecuador in sucre). The reason is that the World Bank reports PPP for Ecuador in US$, but inflation in sucre. According to the World Bank World Development Indicators online database (January 2005), PPP increased only somewhat between 1993 and 1997 (from 0.47 to 0.61) despite approximately 250 percent inflation in this period. The World Bank obviously adjusts in some way for exchange rate changes over time. With this background in mind, I decided that it would be easier and more reliable to estimate our poverty line for Ecuador for October 2000 as this is after dollarisation of the sucre in March 2000 (at 25000 sucre to one dollar), and consequently both our estimate and World Bank PPPs would be expressed in US$. Using 2000 had the added advantage that it is within one year of a new estimate of the poverty line for Ecuador (World Bank, April 2004).[56]

[56] Note that ILO does not report food prices for 2001 for Ecuador.

Table 31: World Bank PPP values for study year from different World Bank sources and PPP values used in this paper, study countries

Country	From online World Development Indicators Dec 2003	From published World Development Report	Value used in this paper for study year[a]
Bangladesh	10.6	10.6	10.6
India	8.7	8.7	8.7
Zimbabwe	6.2	6.3	6.2
Armenia	146.5	116.2	**146.5** [b, f]
Ecuador for PL[c]	na[d]	0.48[e]	0.48
Egypt	1.5	1.6	1.5
China	1.8	1.8	1.8
South Africa	2.3	2.0	**2.3** [f]
Lithuania	1.5	1.6	1.5
Costa Rica	146.7	148.5	146.7
Switzerland	2.0	2.1	2.0
USA	1.0	1.0	1.0

Notes: World Bank PPP values are for the same year used to estimate poverty line and living wage rate using our new methodology except for Ecuador (see note c).

PL indicates poverty line. na indicates not ascertained.

[a] World Bank PPP values used in this paper for our study year are from World Development Indicators online database in December 2003, except for Ecuador (see note d). Preference is given to the World Bank online database rather than data from the World Bank publication, because it is assumed that the online database is more up-to-date. The imprecision of PPP values is illustrated by how they change. For example, when I looked online at PPP values in September 2004 when revising this paper and needed to calculate the value of 1993 PPP for study years, I found that study year PPP values had changed at least at the first decimal level for 9 of 12 study countries.

[b] Armenia's PPP is obviously sensitive to how inflation is treated, as Armenia had extremely high inflation in the years 1993 to 1995 (4962 percent in 1994 for example).

[c] Different years are used to estimate our poverty line and our living wage rate for Ecuador. Year of median wage rate from Bescond et al (2003) is used for our living wage rate estimate so that these rates could be compared in sucre. 2000 (October) is used for our poverty line estimate as this is after dollarisation of the Ecuador currency in March 2000, and so our poverty line estimate would be calculated in US$ and therefore comparable to World Bank PPP which are reported in US$ even back to 1993. This also allowed us to express our poverty line in PPP and so to compare our poverty line to a 2001 national poverty line and the World Bank $2 a day poverty line.

[d] PPP values used for Ecuador are from January 2005 online World Bank World Development Indicators database. This is when the serious problems with calculating PPP in sucre before dollarisation in March 2000 became apparent; therefore, I do not have a value from the December 2003 online database.

[e] PPP value for 2001 (0.48) is used rather than PPP value for 2000 (0.38). The 2001 value was felt to be more appropriate for October 2000 which is after dollarisation, since the 2000 PPP value would have been greatly affected by the months prior to and immediately after the March 2000 dollarisation. Note that Ecuador's PPP remained basically unchanged between 1993 (0.47) and 2001 (0.48).

[f] Numbers are highlighted in **bold** when PPP values from different World Bank sources differ substantially.

Sources: World Bank World Development Report (2003b) and online World Bank World Development Indicators.

To obtain the study year value of 1993 PPP, I multiplied the 1993 PPP reported in the September 2004 World Bank World Development Indicators online database by reported inflation between 1993 and the study year, except for Armenia and Ecuador.[57] These 2004 data were the most up-to-date data available at the time these calculations were made.

[57] Since I was uncertain how to take account of inflation in Armenia (as the inflation rate was 4962 percent in 1994 and was not reported for 1993 in the World Bank database), I decided to estimate its value by increasing its current PPP by inflation in the United States over the period under consideration; this implicitly uses the World Bank implied inflation rate for 1993-2001 and assumes that there has been no structural change in Armenia's PPP during this period. While the latter assumption is dubious, it should provide a ballpark value. For Ecuador as I did not know how to

Adjustment for inflation from 1993 to the study year adds imprecision in part because there is some ambiguity as to how these calculations should be done (e.g., whether inflation for the years at both ends of the time interval should be considered, or whether total inflation for the time interval should be estimated using continuous functions).[58] To check on the reasonableness of these calculations, I compared my calculated study year value of 1993 PPP to the World Bank reported PPP for the same study year (after adjusting them for inflation in the United States over the relevant time period) on the idea that PPP for a country should change only according to the difference between national and USA inflation if there were no structural change. The only study countries where this adjusted 1993 PPP and World Bank reported PPP for the same year differed by more than 12 percent were Armenia, Ecuador and South Africa. These are the same countries where there were inconsistencies between World Bank sources in Table 31. It is also interesting that two of these countries that have experienced very high inflation. It is clearly difficult to update PPPs in high inflation countries.

In summary, World Bank PPPs are often imprecise, especially for high inflation countries. This means that comparison of our poverty line estimates using our new methodology reported below in Section 8.2 to World Bank poverty lines should not be taken too seriously for particular countries and especially for study countries Armenia and Ecuador and to a lesser extent South Africa.

8.2 Our poverty line estimates for study countries and comparison to poverty lines of countries and the World Bank

Poverty lines are estimated for the 12 study countries using our new methodology in this section. They are also compared to the poverty line from national sources as well as to the World Bank poverty line using its PPP methodology. We are interested in the extent to which our estimates are internally consistent across development levels, as well as how they compare to national poverty lines and World Bank poverty lines. Readers should keep in mind that PPPs and therefore World Bank poverty lines are imprecise (see discussion in Section 8.1 immediately above). This implies that both our poverty line estimates expressed in PPP as well as the ratio of our poverty line to the World Bank poverty line are also imprecise, especially for study countries Armenia, Ecuador, and Zimbabwe and to a lesser extent South Africa.

Table 32 and Figure 8 indicate that our **estimated poverty lines expressed in World Bank PPP for the 12 study countries tend to increase with development level.** Average values in current PPP increase from around $2.6 for the three low income study countries, to around $2.9 for the five lower middle income countries, $4.5 for the two upper middle income countries, and $12.8 for the two high income countries (column 5 in Table 32 and Figure 8).[59] The difference between estimates for low income study countries compared to

adjust the 1993 PPP reported in dollars for inflation reported in sucre, I decided to use the 1993 PPP (0.47) since PPP remained virtually unchanged between 1993 (0.47) and 2001 (0.48).

[58] I ignored the first end year and used the last end year in part because this it tracked India's PPP over time. For simplicity, inflation over the period of concern was calculated by multiplying annual inflation rates.

[59] Average values are around $0.4 PPP a day lower for low and lower middle income study countries when they are expressed in study year value of 1993 PPPs (i.e., value the World Bank uses to define its $1 a day and $2 a day poverty lines). 1993 PPPs in current value are higher than current PPP, because inflation was higher outside the comparator country the United States than in developing countries in the 1990s.

lower middle income study countries (only around 18 percent on average) is much smaller than the ad hoc assumption by the World Bank of a 100 percent difference. The relatively small difference between our poverty line estimates for low income study countries and lower middle income study countries is due in large part to food costs being relatively high compared to the cost of other goods and services in low income study countries as compared to other study countries[60] (see Appendix B and Table 38 for ratio for study countries of estimated food PPP compared to overall PPP).

Estimated poverty lines in PPP for some study countries overlap with values found at a different development level. Zimbabwe's estimated poverty line in PPP is higher than that of three lower middle income study countries; South Africa's estimated poverty line is similar to that of upper middle income country Costa Rica; and Ecuador's estimated poverty line is lower than Bangladesh's while Egypt's is similar to Bangladesh's. Interestingly, the two African and two Transition Economy study countries have relatively high poverty lines compared to other study countries at their level of development. These anomalies could reflect reality or could be due to problems with our estimated poverty lines and/or to problems with World Bank PPPs discussed above. As regards the possibility of problems with our poverty line estimates, readers are referred to discussion below in this section which shows that our estimated poverty lines tend to be reasonably similar to the poverty lines used by countries. As regards the possibility of problems with World Bank PPP, readers are referred to Sections 8.1.2 and 8.1.3 above for discussion regarding the imprecision of PPP values, especially for some of our study countries (such as Armenia, Ecuador, South Africa, and Zimbabwe).

It is worth noting that our poverty line estimates are much more consistent across development levels when expressed in food PPP. When our poverty line estimates are expressed in the new food PPPs estimated in Appendix B, there are now clear demarcations between development levels, with no overlaps in national values across development levels. Values range from $1.29 to $1.43 for low income study countries, from $1.90 to $2.46 for lower middle income study countries, from $4.15 to $4.85 for upper middle income study countries, and from $11.30 to $11.33 for our high income study countries.

[60] It is also worth noting that these differences are consistent with data and discussion in Ravallion (1998) where it is reported that the elasticity of the national poverty line to national income per capita in PPP is close to zero at low per capita income levels and that this elasticity is low for per capita income levels up to those of lower middle income countries. It is only for upper middle income and high income countries that the elasticity is around 1.

Table 32: Our poverty line estimates compared to poverty lines of countries and the World Bank, study countries (per capita per day)

Country	Our PL (in local currency)	Country's own PL (in local currency)[a]	World Bank PL (in local currency)[b]	Our PL (in study year PPP)	Our PL (in World Bank 1993 PPP)[b, c]	Our PL relative to country's own PL (2)/(3)	Our PL relative to World Bank PL[c] (2)/(4)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bangladesh	26.45	21.77[d]	12.54	2.49	2.28	1.21[d]	2.11
India	18.05	15.14U[e] 12.09R	11.44	2.07	1.70	1.19[e]	1.58
Zimbabwe	20.03	23.4	8.63 [i]	3.23 [i]	2.51 [i]	0.86	2.32 [i]
Low income average				2.60	2.16 World Bank PL is 1.08	1.09	2.00
Armenia	479.36	400.63	381.12[b,i]	3.27 [i]	2.70 [i]	1.20	1.26 [i]
Ecuador	1.03	0.94 [l]	1.01 [i]	2.15	2.19	1.10	1.02 [i]
Egypt	3.70	2.80 metro[f] 2.56 other U	3.72	2.47	2.14	1.32[f]	0.99
China	4.72	1.71	5.14	2.62	1.98	2.76 [g]	0.92
South Africa	9.10	11.16 Blacks	5.27	3.96	3.71	0.82	1.73 [i]
Lower middle income average				2.89	2.54 World Bank PL is 2.15	1.44 (1.11 excluding China)[g]	1.18
Lithuania	7.28	8.83[j]	na	4.85	4.11	0.82	na
Costa Rica	599.69	810.97[h]	na	4.09	3.54	0.81	na
Upper Middle income average				4.47	3.83 No World Bank PL	0.81	na
Switzerland	28.56	32.91[k]	na	14.28	12.81	0.85	na
USA	11.30	12.4	na	11.30	9.34	0.91	na
High income average				12.78	11.07 No World Bank PL	0.88	na
Total average						1.15 (1.01 excluding China)[g]	1.49

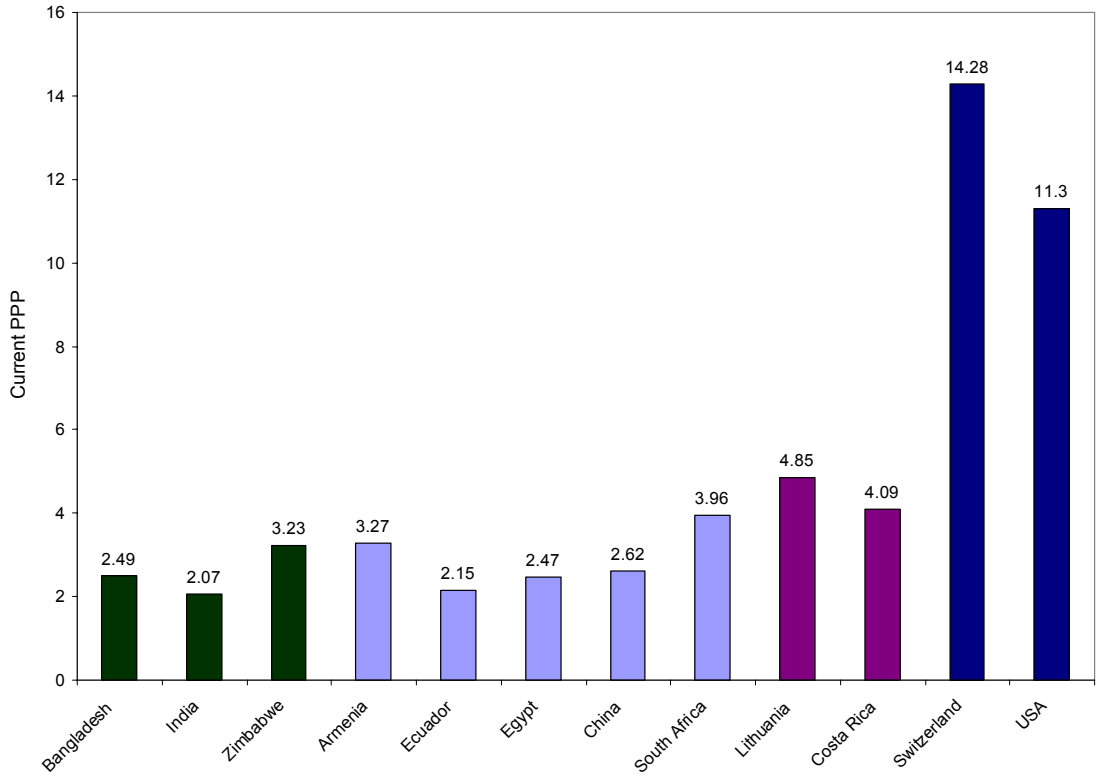
Notes: PL indicates poverty line. U indicates urban. R indicates rural. na indicates not available. Values in columns 2–6 are per capita per day.

Average is unweighted average of national values. Data year for study countries is: 2001 (Armenia, Lithuania, Egypt, South Africa, Switzerland, and USA); 2000 (China, Costa Rica, Ecuador, and India); 1999 (Zimbabwe); 1996 (Bangladesh). It is determined by year of the median wage rate data provided by Bescond et al (2003) except for India, China, USA, and Egypt (not in Bescond et al) and Ecuador (see notes to Table 31), and where latest year in ILO October Inquiry database is used. [a] To calculate a country's own per capita poverty line when its poverty line was reported for a household, this poverty line was divided by the household size reported. If poverty lines were provided for different household sizes, value for family size of four was used. [b] Value of World Bank 1993 PPP-based poverty line for our data year was calculated using instructions in Chen and Ravallion (2004) to increase the 1993 PPP by CPI in the country. This resulting value was multiplied by 1.08 for low income study countries (i.e., $1.08 a day in 1993 PPP) and by 2.15 for lower middle income study countries (i.e., $2.15 a day in 1993 PPP). As I was uncertain how to account for inflation in Armenia (as the inflation rate was 4962 percent in 1994 and there was no inflation data provided for 1993 on the World Bank online database), I assumed that Armenia's PPP remained unchanged and so increased its current PPP by U.S. inflation over the 1993-2001 period. [c] According to World Bank, values should be $1.08 1993 PPP for low income countries and $2.15 1993 PPP for lower middle income countries. There is no guidance for upper middle income countries or for high income countries. [d] Value for Bangladesh is the urban poverty line for 1991/92 reported in Ravallion and Sen (1996) updated to our data year 1996 by inflation between 1992 and 1996 reported in World Bank World Development Indicators online database. The urban poverty line was used, because our own poverty line was estimated for Bangladesh using food prices for Dhaka. Note

that the 1996 rural poverty line estimated in this way was 19.10. Also note that the U.S. Department of Labor (2000) reports that the official 1995/96 poverty line for Bangladesh was 18.33. [e] India has separate official rural and urban poverty lines. For comparison with our poverty line estimate, urban line was used because ILO food price data was for Bombay. [f] Poverty line for metropolitan Egypt is used for comparison to our poverty line estimate, because food prices for metropolitan Egypt were closest to those in the ILO food price database that are for urban areas. [g] Average was also calculated without China, as official poverty line for China is clearly much too low. [h] Urban poverty line for Costa Rica poverty line is used, because ILO food price data are for urban areas. Rural poverty line is 649.39. [i] PPP values are felt to be especially imprecise for Zimbabwe, Armenia, and Ecuador and to a lesser extent South Africa. This means that the World Bank poverty line, our poverty line in World Bank PPP, and our poverty line relative to the World Bank poverty line are also imprecise. [j] Lithuania's own poverty line differs from the other poverty lines in this table as it is a relative poverty line similar to those in the European Union. It equals 50 percent of average consumer expenditure for an equivalent consumer.[k] Switzerland does not have an official poverty line. It has a "semi-official" poverty line for a single adult household from CSIAS (Swiss Confederation of Social Institutions). This was converted to a per capita value for a family of four using a CSIAS family size scalar and updated to 2001 using reported inflation.[l] Poverty line reported in World Bank (June 2004) for 2001 was reduced by reported inflation in 2001. Note that the poverty line estimated to arrive at a living wage rate in sucre for 1997 (see Section 9) was 0.90 of a 1994 poverty line reported in World Bank (November 1995) which was increased by inflation to 1997.

Sources: Author's estimates and calculations for our poverty line values and World Bank poverty line values as described in text. Following sources were used for national poverty lines: Ravallion and Sen (1996) for Bangladesh. Government of India (2004) for India. Zimbabwe Government (2004) for Zimbabwe. Government of Republic of Armenia (2004) for Armenia. World Bank (April 2004) for Ecuador. World Bank (June 2002) for Egypt. Sangui (2004) for China. Martins and Maritz (2002) for South Africa. Government of Lithuania (2001) for Lithuania. Government of Costa Rica (2004) for Costa Rica. Romero and Torres (2003) for Switzerland. U.S. Bureau of Census (2003) for USA.

Figure 8: Our poverty line estimates in study year PPP, study countries



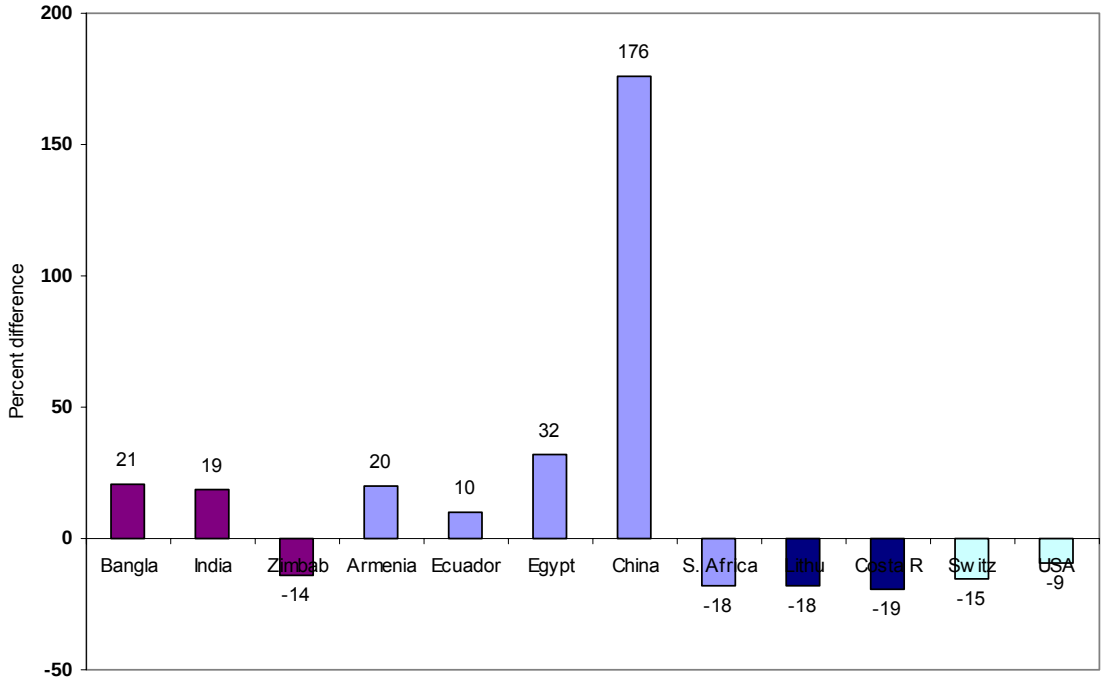
Notes: Colour of bar indicates development level: low income, lower middle income, upper middle income, high income.

Source: Column 5 Table 32.

Our poverty line estimates are generally similar to the poverty lines that study countries use themselves (Figure 9 and column 7 in Table 32). With the exception of China (which has an unrealistically low official national poverty line, see discussion below), our poverty line estimates are approximately the same on average as the poverty lines used by countries. Given the approximate nature of poverty line estimates, differences between our poverty line estimate and the country's own poverty line are all reasonably small except for China. Differences range only from around -18 percent for South Africa, Lithuania and Costa Rica to around +30 percent for Egypt. One consistent difference, however, is that our poverty lines tend to be higher by around 10 percent for low income and lower middle income study countries, and lower by around 15 percent for upper middle income and high income study countries.

It is reassuring that the difference between our estimated poverty line and the country's own poverty line tends to be consistent with how our poverty lines were estimated. For example as discussed in earlier sections, our poverty line estimate for Bangladesh is probably on the high side because of a problem with the quantity and cost of milk in our model diet for Bangladesh (see Section 7). Our poverty line estimate for India is definitely on the high side, because Mumbai food prices are used and these are considerably higher than in other parts of India (see Section 6.5). Our poverty line estimates for upper middle income and high income study countries are probably on the low side, because of less variety of food items in our model diets for these countries than recommended by national nutritional authorities in such countries (see Section 4.6). In addition, our poverty line estimate for the United States does not take into consideration medical expenses and taxes (see Sections 9.3 and 9.4 below). Our much higher poverty line for China (which is slightly lower than the World Bank's poverty line) is traceable to the fact that the official Chinese poverty line is woefully underestimated. Prior to 1998, the model diet China used to estimate its poverty line was clearly unhealthy with far too many carbohydrates (81 percent); this was due to an over-reliance on rice as it supplied around 90 percent of total calories. When national authorities in 1998 improved the model diet used for estimating the poverty line, they simultaneously reduced the non-food multiplier from 1.67 to 1.12 (making the unrealistic assumption that the percent of total expenditures for non-food necessities fell from 40 percent in 1997 to 11 percent in 1998). In this way, China's official poverty line and poverty rate remained basically unchanged between 1997 and 1998 despite an improved model diet, with the poverty line changing only from 630 yuan to 635 yuan and the poverty rate changing only from 30.1 to 29.3 percent (Sangui, 2004).

Figure 9: Percent difference between our poverty line estimate and poverty line of country, study countries



Notes: Colour of bar indicates development level: low income, lower middle income, upper middle income, high income.

Source: Column 7 Table 32.

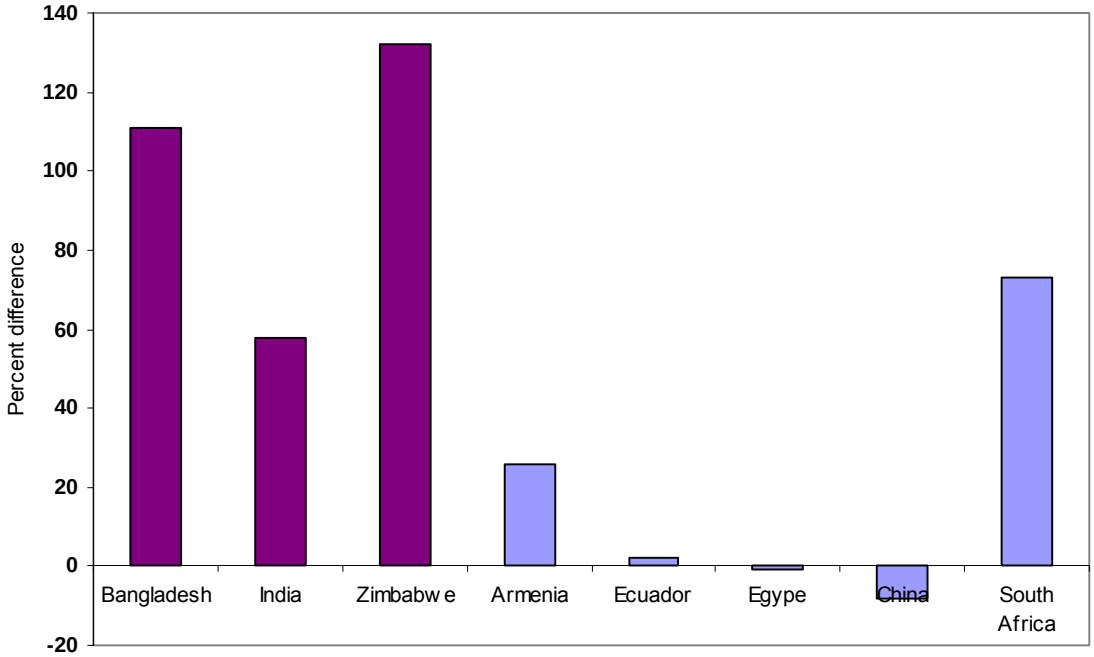
Figure 10 and Table 32 indicate that our poverty line estimates are generally higher, and often much higher than the World Bank poverty lines based on its PPP methodology, especially for low income countries. Our estimated poverty lines in 1993 PPP for our three

low income study countries are between 58 and 132 percent higher than the World Bank's $1.08 a day.

Comparisons for lower middle income study countries are mixed. Our estimated poverty line is lower than the World Bank's poverty line of $2.15 a day in 1993 PPP by around 10 percent for one study countries, similar for two study countries, and higher by 26 and 73 percent for two study countries.

There are no World Bank poverty line definitions for upper middle income and high income countries. However, our poverty line estimates for upper middle income and high income study countries display a reasonable progression compared to the $1.08 and $2.15 used by the World Bank for low income and lower middle income countries. Estimates increase on average to $3.8 and $11.1 for upper middle income and high income study countries respectively, and so are reasonably consistent with national poverty line data reported in Ravallion (1998), see footnote 51.

Figure 10: Percent difference between our poverty line estimate and World Bank poverty line, study countries



Notes: Colour of bar indicates development level: low income, lower middle income.

Source: Column 8 Table 32.

In the end given the imprecision in estimating poverty lines and PPPs, I feel generally comfortable with the poverty lines estimated for the 12 study countries - - and therefore the new methodology - - even though specific country values and the methodology can obviously be improved in the future. Estimates are similar to the poverty lines used by national authorities. The fact that our estimated poverty lines are higher than World Bank poverty lines, especially for low income study countries, probably indicates that World Bank poverty lines are too low in light of our use of a very basic model daily diet for a low income country which includes only around 1 cup of milk every third day, 1 egg every fourth day, and 1 three once/85 gram serving of meat or fish twice a month.

9. National living wage rates for study countries

National hourly living wage rate estimates for the 12 study countries are presented in this section in local currency and PPP for international comparison (Table 33). A national living wage rate is calculated by dividing our estimate of a country's poverty line for a family of four (Section 8.2) by the number of work hours for a full-time worker. Full time work hours ranged from 40 hours per week for high income and Transition Economy countries, to 44 hours per week for South American countries, and 48 hours per week for all other countries; these hours are consistent with national norms (see Section 5.3). For further details on how living wage rates were estimated for each of our 12 study countries, readers are referred to in Appendix C and a description of the EXCEL spreadsheet used. Readers are referred to Appendix F for a brief discussion on how a living wage rate could be used to estimate the number of working poor in a country. There are no a priori expectations regarding the level of living wage rates except that they should increase with development level, and should be somewhere around ½ of the actual median wage rate at least in high income countries as this is the approximate value of statutory minimum wage rates in the European Union (EUROSTAT, 2001).

9.1 Living wage rate estimates for study countries

A living wage rate is estimated to be approximately **$1.6** World Bank PPP per hour in low income study countries, about **$2.0** PPP per hour in lower middle income study countries, about **$3.1** PPP in upper middle income study countries, and about $9.3 PPP per hour in high income study countries. Thus as expected, living wage rates rise with development level (Figure 11 and Table 33).

Table 33: Hourly living wage rate estimates in local currency and in World Bank PPP, study countries

Development level/Country	in local currency	in World Bank PPP
Bangladesh	16.04	1.51
India	10.95	1.26
Zimbabwe	12.15	1.96[a]
Low income average		1.58
Armenia	348.97	2.38[a]
Ecuador	3886.87	na[b]
Egypt	2.24	1.50
China	2.86	1.59
South Africa	5.52	2.40[a]
Lower middle income average		1.97
Lithuania	5.30	3.53
Costa Rica	396.88	2.71
Upper middle income average		3.12
Switzerland	20.79	10.40
USA	8.22	8.22
High income average		9.31

Notes: Average is unweighted average of national values. Data year for study countries is: 2001 (Armenia, Lithuania, Egypt, South Africa, Switzerland, and USA); 2000 (China, Costa Rica, and India); 1999 (Zimbabwe), 1997 (Ecuador); 1996 (Bangladesh). It is determined mainly by year of the median wage rate data provided by Bescond et al (2003) except for India, China, USA, and Egypt that are not in Bescond et al, and where latest year in ILO October Inquiry data set is used.

[a] World Bank PPPs for Armenia and Zimbabwe are imprecise, because it is difficult to estimate PPP in very high inflation countries. Also, South Africa's PPP has some imprecision. See Table 31 and discussion in Section 8.1.

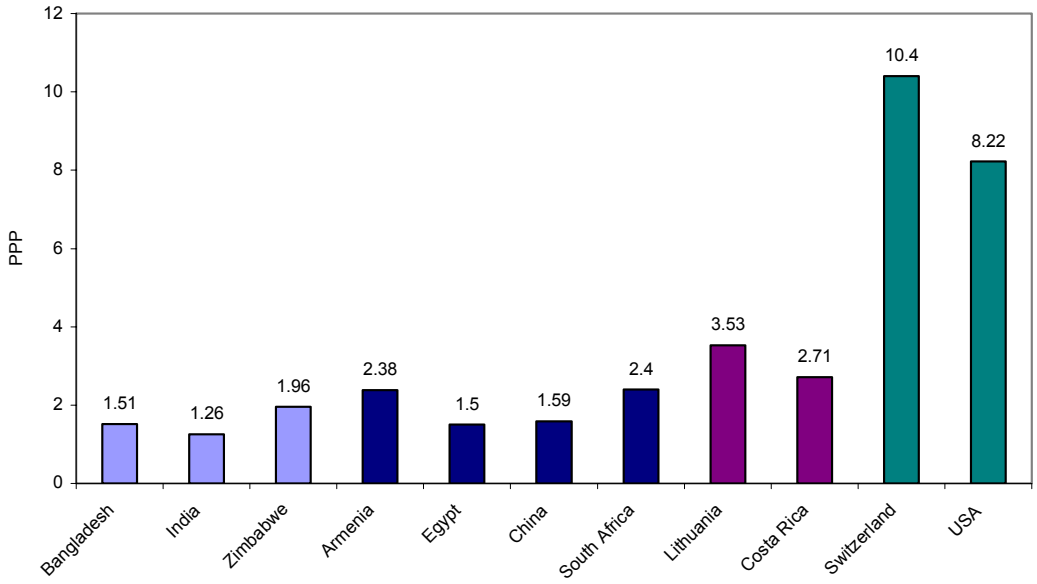
[b] na indicates not ascertained. Whereas our living wage rate estimate is in sucre, World Bank reports 1997 PPP for Ecuador in US$.

Sources: Author's calculations and Table 31.

Living wage rate estimates tend to be reasonably similar within development level, and generally different across development levels. There are, however, some living wage rate estimates worth noting that are not fully consistent with a country's development level. The two African study countries (Zimbabwe and South Africa) have high living wage rates for their development level. This is due in large part to the fact that food prices in these countries are higher relative to the prices of other goods and services as compared to the situation in other study countries at their development level.[61] The two Transition Economy study countries (Armenia and Lithuania) have high living wage rates for their development level. This is influenced partly by our assumption on number of full-time working hours (40 in Transition Economy countries compared to 44 in Latin America and 48 in other developing countries), and partly by Transition Economy model diets that include relatively few grams of pulses/nuts inexpensive source of protein. Third, living wage rate estimates for China and Egypt are relatively low for lower middle income study countries. This is due in part to relatively long normal working hours and in part to relatively low food prices in these countries. The lower living wage rate in the United States compared to Switzerland is due to lower food prices in the U.S. as well as to a lower cost model diet in the U.S. that includes more pulses/nuts and less meat.

[61] The extent to which food prices are relatively high or low compared to prices for all goods and services is indicated in Appendix B by the ratio of food price PPP to World Bank PPP shown in Table 38.

Figure 11: Hourly living wage rate estimates expressed in World Bank PPP, study countries



Notes: Colour of bar indicates development level: low income, lower middle income, upper middle income, high income.
Source: Table 33.

9.2 Comparing our living wage rate estimates to actual median wage rates for study countries

In this section, our living wage rate estimates are compared to actual median wage rates in study countries (Table 34 and Figure 12). This serves two purposes. First, it allows us to observe how our living wage rate estimates compare to the actual wage rate for an average worker (median wage rate) and a low wage rate workers (approximated by 1/2 the actual median wage rate, as this is approximately the value of the statutory minimum wage rate in the European Union).[62] Second, this comparison helps us to evaluate living wage rate estimates and therefore the methodology, since estimates should have some relationship to the actual median wage rate.

[62] Also ½ the median wage rate has been suggested as an indicator of a decent or adequate wage rate for ILO (Anker et al, 2003).

For the following comparisons, official national wage rate data provided by Bescond, Chataignier and Mehran (2003) are used for most study countries; to these, data from official national sources for India and United States were added. Adjustments and judgment were needed for most countries before actual median wage rates could be compared to living wage rates, because the median wage rate data provided by Bescond et al (2003) are drawn from national publications where values are reported in intervals, for different reference periods, and for different types of workers. In light of the adjustments and judgments needed,[63] comparisons in Table 34 and Figure 12 should be viewed as approximate.

[63] First, monthly, weekly and yearly reported values were converted to hourly rates using the average number of work hours per week in the country according to national data in Table 17 and assuming that there are four weeks in a month, 52 weeks in a year, and 8 work hours in a day. Second, a median wage rate point value was calculated by using the midpoint of the reported range. Third, median wage rate point estimates were adjusted for inflation when the year of the median wage rate data differed from the year of our living wage rate estimate; there was a one year difference for three study countries (Switzerland, Lithuania, and South Africa) and a two year difference for one study country (Costa Rica). Note that data for wage and salary workers were used whenever available, because these are the workers for whom the living wage rate concept is most applicable as well as because data for this group tend to be of relatively good quality.

Table 34: Comparing our living wage rate estimate to actual median wage rate, study countries (in local currency)

Development level/ Country	Actual median wage rates per hour[a, b]	Our living wage rate estimate per hour	Ratio of our living wage rate estimate to actual median wage rate[c, d, e] (col 3/col 4)
Bangladesh	4.92-9.80 (from per week for WS) 4.50-5.00 (from per day for WS)	16.04	2.18 for wage & salary 3.38 for daily workers
India	5.61 (from males casual per day) 3.63 (from females casual per day) 11.32 (from males agriculture per month) 5.94 (from females agriculture per month) (Note: central govt legal min wage per hour in 2001 about 6.5 for construction and 11.5 for agric)[f]	10.95	0.97 for male WS 1.84 for female WS 1.95 for male casual daily workers 3.02 for female casual daily workers
Zimbabwe	5.21-7.81 (from per month for employees)	12.15	1.87 for employees
Low income average			1.82 for wage and salary 2.93 for daily workers[h]
Armenia	67.57-135.14 (from per month for employees)	348.97	3.44 for employees
Ecuador	3333.3+ (from per month for WS+SE)	3886.87	1.11 for all workers[d]
South Africa	4.92-12.28 (from per month for LF)	5.52	0.64 for all workers
Lower middle income average			1.73 for all workers[g]
Lithuania	2.69-3.74 (from per month for employees)	5.30	1.65 for employees
Costa Rica	385.5-458.6 (from per month for employees)	396.88	0.94 for employees
Upper middle income average			1.30 for wage and salary
Switzerland	29.81-34.78 (from per hour for WS) 31.05-37.26 (from per year for full-time WS)	20.79	0.61 for wage and salary 0.64 for workers paid on an hourly rate
USA	14.62 (from per week for all full-time employees 10.46 (from per week for workers paid hourly rates) (Note: 5.15 is federal legal minimum wage rate)[f]	8.22[i]	0.56[i] for employees 0.79[i] for workers paid on an hourly rate
High income average			0.59[i] for wage and salary 0.72[i] for workers paid on an hourly rate

Notes: Average is unweighted average of national values. Data year for study countries is: 2001 (Armenia, Lithuania, Egypt, South Africa, Switzerland, and USA), 2000 (China, Costa Rica, and India), 1999 (Zimbabwe), 1997 (Ecuador), 1996 (Bangladesh). It is determined by year of the median wage rate data provided by Bescond et al (2003) except for India, USA, and Costa Rica that are not in Bescond et al, and where latest year in ILO October Inquiry data set is used. [a] Hourly rate is calculated by the author from reported monthly, weekly, daily and annual rates.

[b] WS and E indicate paid employee. SE indicates self-employed. Preference is given to data for employees for actual median wage rate when

available, because the living wage rate concept is probably most applicable to them.

[c] Anker et al (2003) suggest that a decent (minimum acceptable) wage rate be set at ½ of the actual median wage rate in part in knowledge that the statutory minimum wage in the European Union is around ½ of the median wage rate. This ratio was 42 percent of average gross earnings of employees in manufacturing industries on average in the European Union in January 2001, ranging from 34 percent in Spain to 57 percent in Portugal (EUROSTAT, 2001). Percentages would have been higher than 42 percent if they had been calculated using median wages, as the median wage rate is lower than the mean wage rate.

[d] For simplicity, the mid point of the range in column 2 for actual median wage rate is used to calculate this ratio. For Ecuador, 3500 is used; if 4000 had been used, the value would have been 0.93.

[e] Value of median wage rate for this calculation is adjusted for inflation for four study countries (South Africa, Lithuania, Costa Rica and Switzerland), as year of actual median wage data and year of our living wage rate differ.

[f] For readers interested in statutory minimum wage rates, each state and union territory in India has statutory minimum wage rates for specific occupations and industries (Government of India, 2004). On October 2001, there were 45 Indian central government minimum wage rates and 1237 separate state minimum wage rates. Central government rates per day for unskilled worker ranged from Rs52.0 per day for unskilled construction to Rs92.71 per day for unskilled agriculture. In the United States, some states have a state minimum wage rate that is higher then the federal minimum wage rate.

[g] Data on median wage rates were not available for Egypt and China. Data were available for these countries on mean wage rate (which is higher than the median wage rate). For Egypt, the mean hourly wage rate in 2001 was 2.70 pounds per hour based on weekly wage rate data for the labour force (Arab Republic of Egypt, 2004). Our estimated living wage rate for Egypt is 0.79 of this actual mean wage rate. For China, the mean hourly wage rate in 2000 was reported to be 4.60 yuan per hour based on annual money wage of staff and workers (China National Bureau of Statistics, 2003). Our estimated living wage rate for China is 0.59 of this reported actual mean wage rate.

[h] Average for low income countries uses for India the average of its values for males and females.

[i] Living wage rate estimate for United States is an underestimate in that it does not consider the cost of medical care and health insurance or the cost of the social security payroll taxes or sales taxes. Adding these would increase the living wage rate for the United States by somewhere between $2 and $4 per hour (see Sections 9.3 and 9.4). This would, in turn, increase the ratio of our living wage rate estimate to the median wage rate to between 0.70 and 0.84 for employees and to between 0.98 and 1.17 for hourly workers. The mean values for high income countries would thus rise to between 0.65 and 0.67 for wage and salary employees and to between 0.81 and 0.91 for hourly workers.

Sources: Table 33 for our living wage rate estimates. For actual median wage rates, Government of India CSO (2002), Bhalla (2003) and Government of India (2004) for India. US Bureau of Labor (2001) and US Census Bureau (2003) for United States. Bescond et al (2003) provided median wage rate data for all other countries.

The ratio of our living wage rate estimate to the actual median wage rate tends to decrease with development level (Table 34 and Figure 12). Our living wage rate estimates tend to be around:

2 to 3 times the median wage rate in *low income* study countries;

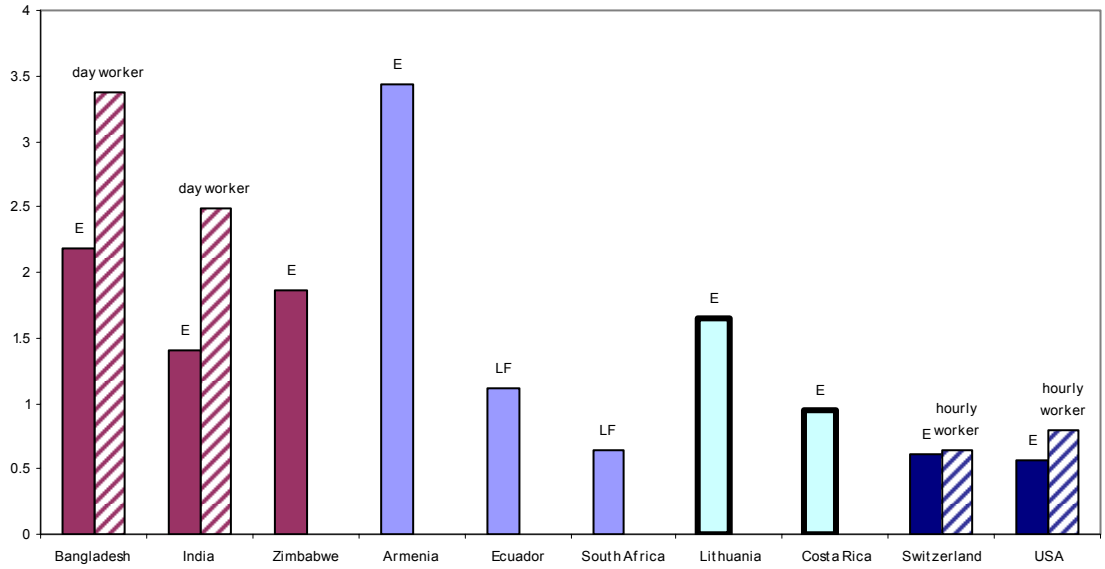
1.5 to 3.5 times the median wage rate in *Transition Economy* study countries;

60 percent to 1.0 times the median wage rate in *non-Transition Economy middle income* study countries; and

60 to 80 percent of the median wage rate in *high income* study countries**.**

With the exception of the two high income study countries and South Africa, estimated living wage rates are well above one-half of the median wage rate - - that is, well above the typical ratio between the statutory minimum wage rate and the median wage rate found in the European Union (EUROSTAT, 2001). This implies that the use of effective definition of a statutory minimum wage rate in the European Union would not be viable in developing countries or Transition Economy countries. A full time worker has to earn well above an average wage rate in these countries to be able to support a family of four on their wages. This does not invalidate the usefulness for developing countries and Transition Economy countries of the methodology developed in this paper for estimating living wage rates. Besides indicating that many workers in these countries do not receive a decent living wage, it may also be that different living wage rate definitions are relevant for these countries, such as assuming multiple earners in a family and that a living wage rate should be able to support only say one or two dependants.

Figure 12: Ratio of our living wage rate estimate to actual median wage rate, study countries



Notes: Colour of bar indicates development level: low income, lower middle income, upper middle income, high income.

E indicates wage and salary employee. LF indicates labour force or all workers.

Value for India day worker is average of male and female values.

Source: Table 34.

Our results provide interesting insights regarding labour markets and number of working poor for countries at different development levels, as well as for the living wage rate concept and its possible use as an input to establishment of a statutory minimum wage rate.

In terms of labour markets, results indicate in my opinion that:

- Prevailing wage rates in low income countries are well below the level required to support a small size family at even close to the poverty line in such countries. It seems that the large supply of labour in low income countries relative to the limited number of wage employment opportunities available has greatly depressed prevailing wage rates. This means that a large proportion of workers in low income countries do not receive a living wage and so are working poor.

- Prevailing wage rates in Transition Economy study countries are lower relative to the living wage rate compared to other study countries at the same level of development. Although some of this difference is due to the assumption of lower normal working hours in Transition Economy countries compared to developing countries, workers in Transition Economy countries might be helped by vestiges of communism in terms of subsidization of typical public goods and services. Irregardless, it appears that many workers in Transition Economy countries are working poor.

- The median wage rate in comparison to our living wage rate estimate is especially high in South Africa for its development level. Although conjectural, this might be due to the South African median wage rate being based to a large extent on data from the protected modern sector which has relatively high wage rates. If so, this would imply that the ratio of our living wage rate estimate to the actual median wage rate is considerably higher for the majority of workers in South Africa who work outside of the modern sector.

- Workers paid on a daily or hourly basis receive a much lower wage rate than workers paid on a weekly or monthly basis, approximately 50 percent less in India and 30 percent less in the United States. In Switzerland in contrast, there is only a small difference in the wage rate between workers paid on a yearly basis and workers paid on an hourly basis.

- Women workers are disadvantaged compared to male workers in being able to support a small family on their wages. For example, women earn only about 60 percent as much as men per hour according to evidence from India in Table 34.

In terms of principles for establishing living wage rates or statutory minimum wage rates, results imply in my opinion that:

- The reasonable degree of consistency in our living wage rate estimates for study countries within and across development levels provides empirical support for the feasibility and usefulness of our methodology.

- The principle that a full-time low wage worker should be able to support at least at a poverty line a family of four on his or her wages is not realizable in practice in low income countries at the present time for many workers.

- In middle income countries, it appears that many full time low wage full-time workers can often support additional persons at a poverty level, but only perhaps only one or two other persons - - if they are always able to find work all of the time, which is often not the case.

- It is confirmed that the living wage rate definition as used in this paper is basically consistent with labour market conditions in high income countries, although it is worth noting that this is not the case for hourly-based workers in the United States.

- Results for the United States demonstrate that the statutory minimum wage rate in democratic high income countries is not always set at the level of a living wage rate. The American federal minimum wage rate ($5.15) is far below our conservatively estimated living wage rate for the United States ($8.22). Further increasing the imbalance between the federal minimum wage rate and our living wage rate estimate for the United States is that our living wage rate estimate does not take into consideration that even low wage American workers have to pay sales taxes and payroll taxes and purchase typical public goods and services such as medical care and medical insurance. As shown below in Sections 9.3 and 9.4, purchasing private medical care and insurance in the United States would add somewhere between $1 and $3 an hour to an American living wage rate, and the payroll tax and sales tax together would add somewhere around another $1 an hour to an American living wage if they were taken into consideration. Including these three additional factors implies that a conservative estimate of a living wage rate for the United States becomes somewhere around $10 to $12 per hour.

In summary, outside of high income countries, actual wage rates of most full time workers are too low to support a family of four at a poverty level. This implies that a high percentage of workers in developing and Transition Economy countries are working poor. To make ends meet, families in these countries have to employ an array of strategies. Many families provide some of their needs through home production. This includes growing food in home gardens and family farms, foraging for food and fuel, keeping

livestock and poultry at home, sewing clothes, and constructing and repairing their house.[64] This does not include baking their own bread, as this is already assumed in our estimates for low and lower middle income countries. Also most adults (and often children as well) in poor families, especially in low income countries, often have no choice but to work and contribute to household income. And of course as already assumed in our methodology, poor families have to shop around for the lowest prices and be highly efficient in how they store and prepare food.[65]

Estimating national living wage rates in this paper required various assumptions. For example, it was necessary to decide what constitutes: an appropriate model diet, non-food essentials, full-time working hours, number of earners per family, full time working hours, and family size that a full time worker should be able to support. While some of these assumptions are technical (such establishing model diets and estimating food and non-food costs), others are more subjective (such as family size a full time worker should be able to support, and proportion of adult household members who should work).

This means that *if the living wage rate is to be used as a guide for setting a statutory minimum wage rate* - - which makes sense since the living wage rate is a normatively-based estimate of the wage rate required to ensure that a full-time worker is able to support a small family at the poverty line - - *policy-makers, technical advisors and the public should have no choice but to think about, discuss, and decide on what assumptions they consider reasonable for their country*. In some sense therefore, the necessarily subjective nature of the living wage rate concept is a good thing, because reflection and dialogue is good for public policy formulation. It is possible, even likely, that policy-makers and the public in developing countries will have a different opinion than those in high income countries about what assumptions should be used for estimating a living wage rate, and for establishing a statutory minimum wage rate. Those in low income countries may feel, for example, that there should be more than the one worker per couple, and/or that the family size a full-time worker should be able to support should be the average family size for the country and not four persons as we have assumed. Regardless of what decisions are made in each country, it is essential that the assumptions used to estimate a living wage rate (especially as an input into establishing a statutory minimum wage rate) are clearly stated and transparent so that they can be publicly debated and understood.[66]

9.3 Affect on living wage rate estimates of private costs for typical public goods: Example of health care in United States

A limitation of our poverty line and living wage rate estimates (just as it is for most other estimates) is that they ignore taxes that the poor need to pay. A typical justification for ignoring taxes is that progressive income tax schedules typically more or less exempt the poor from paying income taxes (Section 6.9). The poor, however, do pay other taxes. Ignoring taxes therefore not only affects living wage rate estimates, it also affects cross-

[64] Even as late as 1955 in the United States, 40 percent of the value of the food consumed by farm families came from home production (Orshansky, 1965).

[65] For example, I remember when I was growing up in the United States that my poor neighbor, who was a widow, would walk several miles to purchase day-old bread from the bakery because it was less expensive.

[66] For internationally comparable living wage rate estimates, however, one definition of the living wage rate for all countries would be necessary.

national comparability because the amount of taxes paid by the poor varies across countries. This section illustrates the importance of this omission in the United States.

All workers in the United States must pay a social security tax on their earnings. It is at present 7.65 percent of earnings for employees and 15.3 percent of earnings for self-employed workers up to $87,000 per year. This means that low wage workers in the United States would have either 7.65 or 15.3 percent deducted from their earnings and taking this payroll tax into account would raise the living wage rate for the United States by around $0.68.[67]

Most states in the United States have a state sales tax. In addition, a number of municipalities, including some large cities such as New York, have an additional city sales tax. (There is no federal sales tax.) As a typical state sales tax is around 5 percent (with different goods exempted in each state, including food in almost all states), this implies that a full time worker in the United States earning our estimated living wage rate, who does not save and spends 25 percent of his or her wages on food (see Section 5.1) on which sales tax is not levied, would need to earn $0.31 per work hour to pay sales tax.

This is an area that deserves to be addressed in future revisions of the methodology for estimating living wage rates and poverty lines. It should be possible to collect relevant information for many countries on sales taxes and payroll taxes.

[67] This estimate uses the payroll tax rate of 7.65 percent for employees and assumes that this tax is taken from the total wage received, which consists of our living wage rate estimate ($8.22) plus the payroll tax itself.

Part 5: Conclusions

10. Summary and Conclusions

This paper has been concerned with the measurement of two closely related concepts that are at the top of national and international policy agendas - - poverty lines and living wage rates. These represent the income necessary for a minimum acceptable living standard, and the hourly pay rate a full-time worker needs to earn to support a small family at such a minimum living standard. Indeed, poverty reduction is generally considered to be the most important United Nations' Millennium Development Goal, and the ILO Constitution notes that peace and harmony in the world requires "the provision of an adequate living wage rate".

Despite the importance of these concepts, cross-nationally comparable estimates of national living wage rates do not exist. And while the World Bank provides national, regional and global estimates of poverty, their methodology is primarily designed to estimate regional and global poverty, and the World Bank recognizes that their national poverty line estimates are not appropriate to use for national planning. To help fill the need for internationally comparable estimates of national poverty lines and living wage rates, the **main objective of this paper** was to develop **a methodology for estimating internationally comparable national poverty lines and living wage rates.**

The objective was to develop a **methodology** that is: **(i) normatively based** so that the underlying concepts of poverty and decent pay would be clearly reflected; **(ii) possible to use for all countries**, regardless of development level, because poverty and low pay are found in all countries; **(iii) understandable to the public** so that the meaning of being poor or having unacceptably low pay could be easily communicated; **(iv) transparent** so that the assumptions on which estimates are based could be understood; **(v) relatively inexpensive** to use; and **(vi) possible to update regularly** for a large number of countries. I also wanted **(vii) a flexible** methodology so that differences across development levels could be taken into account and underlying assumptions could be easily changed. The points about flexibility and transparency are especially important for estimating a national living wage rate that is to be used as an input to setting a statutory national minimum wage rate. This is because it is best for the minimum wage rate to be set through dialogue and debate and estimating a national living wage rate involves subjectivity where some required assumptions (such as what should be the number of full time work hours, and the family size each worker should be able to support) do not have a right or wrong answer and so are essentially societal or policy choices.

Developing this methodology required drawing on a number of literatures and disciplines such as on poverty, nutrition, labour economics, development economics, and demography. It was also necessary to draw on various national data sources and international databases on food consumption patterns, food prices, and labour statistics.

A secondary, but integral, aspect of this paper was testing the methodology in a set of diverse study countries to examine how the methodology works in practice, as well as to identify possible problems so that the methodology could be improved in the future. This had the added benefit of providing insights into labour markets, poverty, and working poor around the world. This also made it possible to shed some light on the widely used World Bank poverty line and poverty rate estimates based on its purchasing power parity methodology. It is noted how the World Bank methodology for estimating national poverty lines for low and lower income countries has conceptual and empirical problems - - and that the World Bank acknowledges that its $1 a day and $2 a day poverty lines should not be used for national purposes but only as inputs for regional and global estimates of

poverty. This means that particular national poverty lines of the World Bank should not be taken too seriously. Partly with this in mind, an appendix to this paper experiments with estimating new food PPPs, as the poor in developing countries spend most of their income on food. These new food PPPs are around 60 percent higher than World Bank PPPs for India and Bangladesh, around 25 percent higher for lower middle income study countries, and around 10 percent higher for upper middle and high income countries. This implies that differences between living standards of low and lower middle income countries compared to upper middle and high income countries are much greater than indicated by statistics on per capita income measured in World Bank PPP. The reason is that food is relatively more expensive than other goods and services in low and lower middle income countries compared to upper middle and high income countries.

The methodology uses the same approach that most countries use when estimating their own national poverty line. *It is the traditional approach to the measurement of a national poverty line,* and has been used since the classic 1899 study in York England by Rowntree. It establishes and costs a model diet and then adds an estimate of the cost of non-food necessities. What sets the methodology in this paper apart from earlier work on poverty measurement is that this traditional national approach has been used at the international level so that internationally comparable national poverty lines can be estimated. What made this possible is the availability of online international databases (FAO databases on food consumption patterns and calorie needs together with an ILO database on food prices) that make it possible select and cost foods for national model diets that are relatively inexpensive and reflect national food habits. These online databases were supplemented by national data on other aspects of the methodology (such as on typical working hours, household economies of scale in expenditures, miscellaneous food costs, and proportion of total expenditures spent on food) to help establish various parameters for the methodology.

The first step in the methodology sets a normative basis for the poverty line by establishing a model diet for each country that provides a sufficient number of calories and has acceptable levels of proteins, fats and carbohydrates. For this normative base, recommendations are drawn on from international agencies, such as WHO, UNHCR, and FAO as well as researchers and national authorities regarding what constitutes an acceptable diet. Several aspects of this part of the methodology are worth noting. Model diets include the same ten major food groups that are used by national authorities when they establish a model diet. The specific food items included in each major food group in a country's model diet are selected based in part on actual food consumption patterns according to FAO food consumption data (to ensure that selected foods are culturally acceptable), and partly on relative food prices according to ILO food price data (to ensure that food costs are low). The amount of food in each major food group included in model diets is varied by development level to account for typical changes in food consumption patterns that accompany rising income levels. The cost of a country's model diet is then estimated using the unit food prices that countries use to calculate their consumer price index which are reported in the ILO food price database.

Non-food costs are determined using the share of total expenditures for non-food items, as this is the approach generally used at the country level to estimate non-food costs for the poverty line. The non-food shares used in our methodology increase with development level and are based on observed country practices. To obtain the poverty line for an individual, estimated non-food cost is added to the normatively based estimate of food cost. This total cost for an individual is, then, scaled up to the household level to obtain an estimate of the poverty line for a household (family of four with two adults and two children) by taking into consideration typical economies of scale in household expenditures. Finally, the living wage rate is estimated by dividing our estimate of the poverty line by typical full-time working hours.

Because the methodology developed in this paper is new, considerable attention was paid to evaluating it honestly. One long section is devoted to discussion of possible problems with the methodology.

To test the methodology, poverty lines and living wage rates were estimated for 12 countries using EXCEL spreadsheets. This ensures transparency and makes it easy to change assumptions and data inputs. These 12 countries, often large and important countries, provided a good testing ground as they include 3 low income countries, 5 lower middle income countries, 2 upper middle income countries, and 2 high income countries. A sensitivity analysis of assumptions in the methodology was performed in an appendix to observe the extent to which poverty lines and living wage rates are sensitive to different assumptions in the methodology.

To help draw conclusions about our methodology and how it might be improved in the future, results for the 12 study countries were compared to available information on model diets used by countries, poverty lines used by the World Bank, poverty lines used by countries, and actual median wage rates. It was found that *our model diets are acceptable nutritionally and display a reasonable pattern by development level* whereby the percent of calories coming from carbohydrates falls with development level and the percent of calories from proteins increases with development level, in keeping with knowledge about how diets change with rising income levels. It was also found that *our model diets tend to be similar to the model diets that the countries themselves use.* Both use the same major food groups; and the quantity in each food group tends to be similar or there is generally an explanation of why there is a difference. The only systematic differences with the model diets that countries use are that our model diets tend to include greater quantities of vegetables, milk and egg, and fewer grams of meat. These results imply that it might be a good idea in a future revision of our methodology to alter model diets by reducing the amount of vegetables and adjusting the distribution of quantities among animal-based foods in our model diets.

Our estimated national poverty lines increase as expected with development level from an average of approximately $2.2 1993 PPP in low income study countries to $2.5, $3.8 and $11.1 1993 PPP in lower middle income, upper middle income and high income study countries respectively. The small difference between values for low and lower middle income study countries is due to relatively high food prices compared to other prices in low income study countries as compared to the situation in other study countries. Indeed when our estimated poverty lines are expressed in new food PPPs that are estimated in an appendix to this paper, values are now more evenly spaced across development levels going from an average of $1.4 food PPP in low income study countries to $2.2, $4.5 and $11.3 food PPP at the other three development levels.

Comparison of our estimated poverty line in local currency to the poverty line the country uses provides support for the reasonableness of our estimates, and therefore our methodology. **Estimated poverty lines are reasonably similar to the poverty line used by the country itself in all instances except for China whose national poverty line is clearly unacceptably low.** On average, they are approximately the same, although there is a tendency for our estimates to be slightly higher for low income and lower middle income study countries and slightly lower for upper middle income and high income study countries. Adding further confidence to our estimates and methodology is that most observed differences between our estimate and the country's own poverty line are consistent with how our estimate was made.

At the same time, **our poverty lines are higher than the World Bank poverty lines, especially for our three low income study countries.** Whereas the World Bank poverty line for low income countries is $1.08 a day in 1993 PPP, our estimated poverty lines are around $2.2 a day in 1993 PPP for our three low income study countries. Although our

higher poverty lines in low income countries is consistent with the finding in the World Bank World Development Report that World Bank poverty rates are consistently lower than poverty rates reported by countries, the magnitude of the difference between our poverty line and the World Bank poverty line is larger than expected. However, *I do not believe that anyone would feel that our model diet for low income countries is overly generous given that it tends to include only about 1/3rd cup of milk a day, two eggs a week, and one three once/85 gram serving of meat or fish two times a month.* This implies that there is probably more poverty in the world than estimated by the World Bank.

Our estimates of living wage rates for study countries increase consistently with development level from approximately $1.5 PPP per hour in low income countries, to $2.0 PPP per hour in lower middle income countries, $3.1 in upper middle income countries and $9.3 in high income countries. *Living wage rate estimates are approximately 2-3 times the median wage rate in low income study countries as compared to around 0.6-0.8 times the median wage rate in high income study countries.* These **results indicate that many workers in low income countries do not receive a wage rate sufficient to support a family of four at a poverty line (even if they could find work full time, which is often not the case), and so are working poor.** They imply that the idea that a statutory minimum wage rate based on a living wage rate sufficient to support a family of four at the poverty line is not transferable in practice to low income countries at the present time. Prevailing wage rates in low income countries are depressed too far by a large supply of workers willing to take up the relatively few wage and salary positions available. Families of low wage workers in lower income countries have to employ an array of strategies, such as engaging in home production of food, fuel and clothing; making all or most household members work (often including children); cooking all meals at home; and receiving transfers from more fortunate relatives and friends.

At the end of this paper, I feel that there is a basis for optimism about the feasibility and potential value of a normatively based methodology to measure cross-nationally comparable national poverty lines and living wage rates. The methodology developed in this paper provides reasonable estimates, even if further improvement in the methodology is recommended before it is used on a regular basis to make national, regional and global estimates. I look forward to the views of others about the approach and methodology developed in this paper.

Appendices

Appendix A: Sensitivity analysis of poverty line and living wage rate estimates to assumptions in our methodology

Assumptions and judgments are required to make poverty line and living wage estimates for countries, whether or not they are internationally comparable (see discussion in Section 2.4). For this reason, assumptions have been noted and discussed throughout this paper so that they are transparent. Although these assumptions appear reasonable, they are open to disagreement, debate, and improvement.

The typical way to look at the importance of assumptions in a methodology is to do a sensitivity analysis. Such an exercise enables readers and analysts to learn how sensitive estimates are to specific assumptions - - and therefore to see which assumptions are particularly important and so should be especially carefully scrutinized and possibly improved in the future. The remainder of this appendix contains such a sensitivity analysis for our poverty line and living wage rate estimates, as I believe that transparency should be an important aspect of any methodology to estimate internationally comparable poverty lines and living wage rates. This is especially important for a new methodology such as in this paper.

Another reason that a sensitivity analysis is important is shown by information in Table 35 for six (mostly study) countries on the elasticity of the national poverty rate to changes in the national poverty line. These data show that the poverty rate observed in a country is quite sensitive to where the poverty line is set. Elasticities in Table 35 are all well above 1.0. For a large increase in the poverty line of around 50 percent, elasticities range from about 1.4 for India to about 2 for Armenia and China. For a small increase in the poverty line of about 3 percent, elasticities range from around 3 in the United States to about 4 in Egypt. [68] These results indicate that many households have an income near to the poverty line - - and therefore that even a small change in the poverty line has a large affect on the poverty rate observed.

[68] The reason a small change in the poverty line has a higher elasticity as compared to a large change in the poverty line is that there is generally a higher concentration of households nearer to the poverty line than farther away from the poverty line.

Table 35: Elasticity of national poverty rate to change in national poverty line, national sources

Country (year)	Elasticity	Notes
India (rural 1993/94)	1.41 for 49.0% increase in PL	Calculated by author from tables 4 and 5 in Joshi, 1997
India (urban 1993/94)	1.46 for 34.4% increase in PL	Calculated by author from tables 4 and 5 in Joshi, 1997
Indonesia (rural 1990)	2.95 for 20.1% increase in PL	Calculated by author from tables 2 and 3 in Ravallion and Bidani, 1994
Indonesia (urban 1990)	4.14 for 11.3% increase in PL	Calculated by author from tables 2 and 3 in Ravallion and Bidani, 1994
Egypt (1999/2000)	3.4 for 5% increase in PL (4.09 for 3.6% increase in PL in metro) (5.26 for 3.9% increase in PL in lower urban) (5.39 for 4.1% increase in PL in lower rural) (2.93 for 4.0% increase in PL in upper urban) (2.43 for 4.2% increase in PL in upper rural)	World Bank June 2002 reports 3.1 % point increase in poverty rate for 5% increase in PL (implying elasticity of 3.4). Other values calculated by author from tables 2.4 and A2.2 in World Bank, June 2002.
China (urban 1998)	3.43 for 25% increase in PL (2.01 for 50% increase in PL) (2.38 for 100% increase in PL)	Calculated by author from table 5 in Hussain, 2003.
Armenia (1998/99)	2.10 for 41.0% decrease in PL (1.88 for urban & 2.55 for rural)	Calculated by author from table 3 in World Bank, Dec 2002.
United States (2000)	3.21 for 2.4% increase in PL for family of 2 adults & 2 children (1.03 for 11.9% increase in PL)	Calculated by author from page 6 in Short and Garner, 2002. Note that 0.60 is average elasticity for people's perception of where they feel a poverty line should be in Gallup polls[a] when related to national per capita income from 1957-1971; from Kilpatrick, 1973.

Notes:

Elasticity is % change in poverty rate for a 1% change in poverty line.

PL indicates poverty line.

[a] Gallup polls have asked for many years the following question in the United States: "What is the smallest amount of money a family of four (husband, wife, and two children) needs each week to get along in this community?" Kilpatrick (1973) related responses to this question (that should be related to people's opinion about where they think a poverty line should be) to U.S. income per capita for the years 1957-1971, and found an elasticity of 0.6. This means that for each 10 percent increase in US income per capita in real terms, the value reported by people increased by about 6 percent. If one adjusted the poverty line upward using this elasticity and took into consideration that per capita income rose between 1959 and 1971 in the United States by around 25 percent, the poverty rate would have fallen from 22 to 18 percent in this time period and not from 22 percent to 12 percent as officially estimated. Generally similar elasticities are cited in Kilpatrick (1973) for other time series studies. He reports an elasticity of 0.84 for New York City as regards the "minimum comfort" level reported by people based on eight years of observation between 1903 and 1959 from a study by Smolensky; an elasticity of 0.75 based on annual observations of "minimum subsistence" from 1905 to 1960 from a study by Ornati; and an elasticity of 0.70 for an average poverty line based on five observations between 1929 and 1960 from a study by Mack.

Sources: See column 3 in this table.

Tables 36 and 37 and Figure 13 contain results of a sensitivity analysis of assumptions used in this paper to estimate national poverty lines and national living wage rates. In keeping with the poverty literature and discussion in this paper, one table is concerned with assumptions used to establish and cost model diets (Table 36) and a second table is concerned with non-food assumptions and other assumptions used to estimate national poverty lines and living wage rates (Table 37).

Table 36: Sensitivity of our poverty line and living wage rate estimates to assumptions used to establish and cost model diets, study countries (percentage change)

Country	% total calories from cereals & starches (5% less) L→LM LM→UM	% calories from protein (2% more) L→LM LM→UM UM→H	% animal-based protein from milk(12.5% more)[a] L→UM UM→H	% animal-based protein from meat (12.5% more)[b] L→UM UM→H	Variety of rice consumed (long grain and not cheaper variety)	Vegetables[c] (50g more) L→LM L→UM LM→H UM→H	Oil (7g more) L→LM LM→UM UM→H	Sugar (12g more) L→LM LM→UM UM→H
Bangladesh	10	27	2	-2	15	3	-1	0
India	9	27	0	-0	30	2	-1	-1
Zimbabwe	11	30	1	-0	0	1	-0	-1
Low income average	10	28	1	-1	15	2	-1	-1
Armenia	7	15	2	-1	0	1	-2	-1
Ecuador	4	9	-1	-1	6	1	-2	-1
Egypt	10	20	1	2	0	1	-1	-1
China	5	8	na	-1	7	1	-1	0
South Africa	7	14	1	1	0	3	-1	-1
Low middle income average	7	13	1	0	3	1	-1	-1
Lithuania	6	11	-3	3	0	0	-2	-1
Costa Rica	5	10	-2	0	5	2	-2	0
Upper middle income average	6	10	-2	2	2	1	-2	-1
Switzerland	6	8	-6	-3	1	1	-2	-2
USA	4	5	2	2	1	2	-2	-1
High income average	5	6	-4	-1	1	2	-2	-1
Total average	7	15	-0	0	5	2	-1	-1

Notes: Values in table indicate the percentage difference between food cost in a base estimate and in an alternative estimate. When the alternative estimate causes the number of total calories to change (as occurs for columns 2-5 and 7-9), total food cost is re-calculated by proportionately increasing or decreasing estimated total food cost by the ratio of total calories in the base estimate to total calories in the alternative estimate.

Change in assumptions used for the sensitivity analysis is generally the difference in assumptions between two development levels. Miscellaneous food costs are ignored in calculations. L→LM indicates difference in assumptions of low income countries and lower middle income countries. LM→UM indicates difference in assumptions of lower middle income countries and upper middle income countries. UM→H indicates difference in assumptions of upper middle income countries and high income countries. na indicates not applicable as milk is not included in model diet for China because of lactose intolerance for much of its population. [a] Increase in animal-based protein from milk is taken in an equal reduction of egg and meat. [b] Increase in animal-based protein from meat is taken in a reduction of egg. [c] Increase in vegetables taken in the form of the least expensive vegetable in the country. Sources: Author's calculations.

Table 37: Sensitivity of our poverty line and living wage rate estimates to our non-food and other assumptions, study countries (percentage change)

Development level/ Country	Non-food necessities multiplier increased[a]	HH economies of scalar increased[b]	Additional earner per couple[c]	One less child per couple[d]	One more child per couple[d]
Bangladesh	12	-2	-23	-23	23
India	12	-2	-23	-23	23
Zimbabwe	12	-2	-23	-23	23
Low income average	12	-2	-23	-23	23
Armenia	13	-3	-23	-22	22
Ecuador	13	-3	-23	-22	22
Egypt	13	-3	-23	-22	22
China	13	-3	-23	-22	22
South Africa	13	-3	-23	-22	22
Lower middle income average	13	-3	-23	-22	22
Lithuania	14	-4	-23	-21	21
Costa Rica	14	-4	-23	-21	21
Upper middle income average	14	-4	-23	-21	21
Switzerland	16	-7	-23	-19	18
USA	16	-7	-23	-19	18
High income average	16	-7	-23	-19	18
Total average	13	-4	-23	-22	22

Notes:

L→LM indicates difference in assumptions of low income countries and lower middle income countries.

LM→UM indicates difference in assumptions of lower middle income countries and upper middle income countries.

[a] Used average of differences between three lowest development levels (i.e., average of 1.67/1.43 and 2.0/1.67). This represents the following percentage point decreases by development level in the assumed percent spent on food: 12.7, 11.0, 9.1 and 4.6 respectively. If instead we had used a 10 percentage point decrease in percent of expenditures spent on food (i.e., from 70 to 60, 60 to 50, 50 to 40 and 25 to 15 percent), poverty lines and living wage rates would have increased by approximately 17, 20 25 and 67 percent by development level respectively. These percentages are much larger than those reported in this table, especially for high income countries, because a fixed percentage point represents an increasing percent for non-food needs.

[b] Canadian scale used for these calculations, as it is simple to use and embodies almost the highest household economies of scale in use.

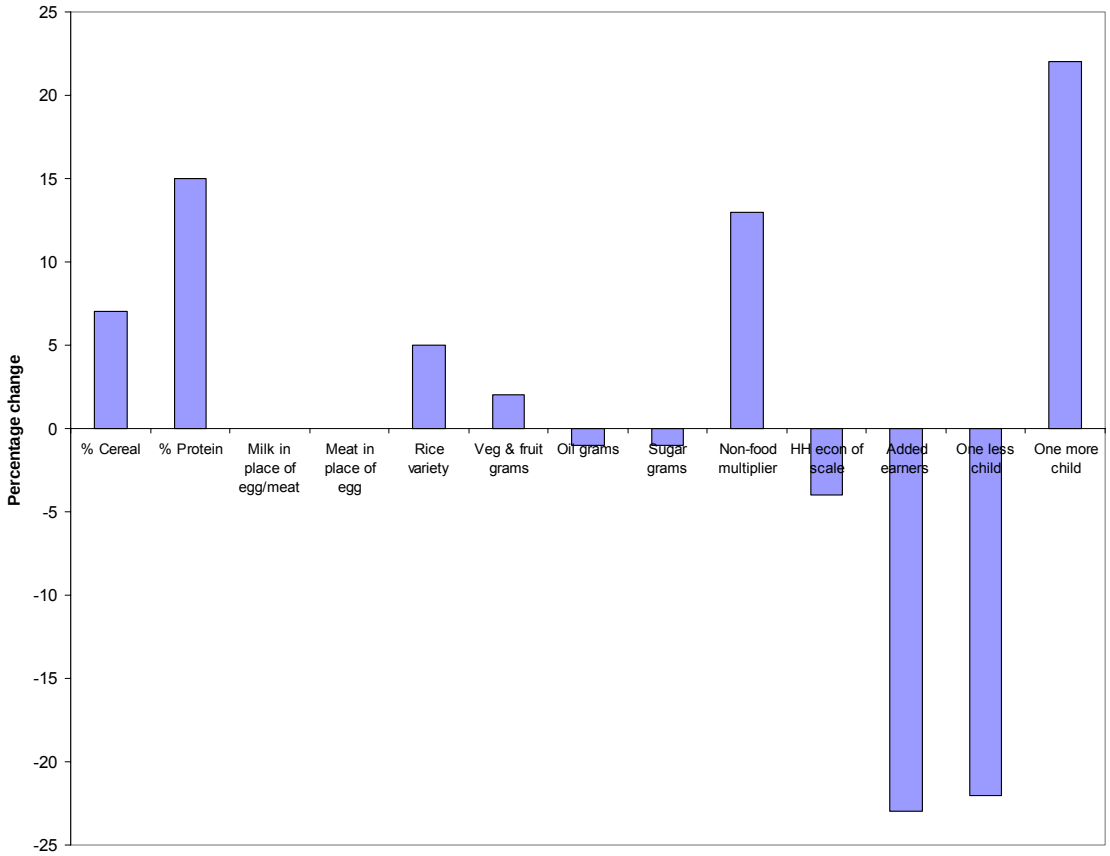
[c] 0.30 added earner is used as this is the average estimated for developing countries in Section 6.2. This could represent either income from another household member's employment and/or from own production of a household member.

[d] Family size of three is used, consisting of two adults and three children.

[e] Family consists of five is used, consisting of two adults and three children.

Source: Author's calculations.

Figure 13: Sensitivity of our national poverty line and living wage rate estimates to assumptions in our methodology, study countries (percentage change)



Source: Tables 36 and 37.

Food cost in our methodology (and therefore poverty line and living wage rate estimates) is sensitive to the amount of protein in a model diet. For a two percentage point increase in the percentage of total calories assumed to come from protein (difference between two development levels in our methodology), food costs and therefore poverty line and living wage rate estimates go up by around 15 percent on average. The reason food costs go up so much is that animal-based foods are an expensive source of calories. Interestingly, there is a large difference in results by development level, with the average increase in food cost for low income study countries much greater than for other development levels (28 percent compared to 13, 10 and 6 percent). This difference by development level is caused by two phenomena - - unit price of animal-based foods relative to other foods tends to fall with development level, and the fact that a two percentage point increase in protein represents a larger percentage of protein consumption in low income countries as compared to higher income countries (e.g., two percent represents a 20 percent increase when the base is 10 percent as for low income countries, and a 12.5 percent increase when the base is 16 percent as for high income countries).

Food cost in our methodology is somewhat sensitive to the amount of cereals/starches in a model diet. Food cost increases by 7 percent on average for a five percent decrease in the percent of calories from cereals and starches (the typical change between development levels in our methodology). It is interesting that this percentage increase is greatest at 10 percent in low income countries and least in high income countries at 5 percent. This difference by development level is due to an increase with development level in the relative unit cost of cereals compared to other foods. The reason food costs do not increase more than the observed seven percent is because cereals contain reasonable amounts of protein and are less expensive per gram of protein compared to animal-based foods.

Food cost is not very sensitive to the way in which animal protein is distributed between milk, egg and meat. The reason is that while milk and egg tend to be more expensive per edible gram in terms of protein, they tend to be less expensive in terms of calories. This result from the sensitivity analysis implies that adjusting the way our methodology establishes model diets in a way that increases the amount of meats and decreases the amounts of milk and egg (thereby bringing our model diets closer to the model diets countries themselves use, see Section 7.4) would not increase total food cost.

Food costs in our methodology are insensitive to an increase in the amount of oil, or sugar, or vegetables included in a model diet. Food costs only change by 1 or 3 percent for a typical increase between two development levels in one of these foods.

Finally, food costs and therefore poverty lines and living wage rates are sometimes sensitive to the price of a major food item such as rice. When we assume that everyone consumes long grain rice at the unit price reported in the ILO food price data set (and not as we do in our methodology at a reduced unit price to account for the likelihood that people consume a less expensive variety of rice such a short grain rice), we find that food costs would be much higher in India and Bangladesh (by about 30 and 15 percent respectively) and would be somewhat higher in China, Ecuador and Costa Rica (by about 6 percent). This shows that food costs can be sensitive to the unit price of major food items.

National poverty lines and living wage rates are found to be sensitive to some of the non-food assumption used in our methodology but not to others. Two assumptions that require judgment, and are in essence policy or societal choices for determining a living wage rate are especially important: family size a full-time worker should be able to support, and number of workers per couple assumed. An increase in the family size from 4 persons (2 adults and 2 children) to 5 persons (2 adults and 3 children) increases the living wage rate by about 22 percent on average, while a decrease to 3 persons (2 adults and 1 child) decreases the living wage rate by about 22 percent on average. An increase in the number of full-time workers per couple from 1 to 1.3 (our estimate of the average for developing countries) decreases the living wage rate by about 23 percent on average. It is clear that these policy type decisions are crucial for determining a living wage rate.

When the non-food multiplier is increased, poverty lines and living wage rates go up by around 13 percent on average. In contrast, national poverty line and living wage rate estimates are not too sensitive to the scalar used to take into account household economies of scale. When the Canadian scale is used (which embodies almost the greatest economies of scale in use at present in the world), poverty line and living wage rate estimates only go down only by about 4 percent on average.

The sensitivity analysis in this appendix provides useful information on the methodology developed in this paper. This is especially important in light of how sensitive observed poverty rates are to poverty line estimates as shown in Table 35. The sensitivity analysis in this appendix also provides important information for future improvements in the methodology developed in this paper, as it indicates which assumptions have the greatest affect on estimates of national poverty lines and living wage rates.

Appendix B: New food parity purchasing power (PPP) estimates (that are especially relevant for the poor) using methodology in this paper compared to PPP

Parity purchasing power (PPP) is a concept concerned with establishing "purchasing power equivalence, where one dollar purchases the same quantity of goods and services in all countries. PPP conversions allow cross-country comparisons of economic aggregates on the basis of physical levels of output, free of price and exchange rate distortions" (World Bank, 2003). For this reason, national per capita income is commonly expressed in PPP in order to obtain a measure of a country's relative living standard that is more comparable than a national per capita income estimate that is expressed in US dollars using foreign exchange rates.

World Bank PPPs are estimated by pricing a wide variety of items in each country in order to calculate an average price difference across countries. This is a costly and time consuming effort, as between 150 and 250 basic item headings in each country are priced (World Bank, 2003). In addition, revisions are sometimes large when PPP is re-benchmarked.

PPPs are used by the World Bank to estimate national poverty lines and therefore poverty rates around the world. It is now commonplace for the World Bank, the United Nations and the media to note the number of poor persons in the world said to be poor because they live on less than $1 PPP a day. However as discussed in Section 8.1, there are important conceptual and empirical problems with using PPPs to estimate national poverty lines. For example, PPP does not represent the consumption basket of the poor (Deaton, 2001).

Because food PPPs are conceptually more appropriate than PPPs, especially for low and lower middle income countries where a majority of household expenditures are for food,[69] it was decided to calculate our own food PPPs. This is possible to do using the spreadsheet we used to calculate the nutritional content and cost of model diets (Appendix C), by costing an equivalent food basket for all study countries. With this in mind, I estimated food costs in our 12 study countries for two model diets, one to represent a typical model diet for low income countries and another to represent a typical model diet for lower middle income countries; the same general rules were employed that were used to select and cost specific foods for estimating our poverty line.[70] One useful attribute of the approach used in this Appendix to estimate our new food PPPs is that the specific food items selected for cereals, pulses, vegetables, fruit and meats are those that are relatively inexpensive in each country.[71]

Table 38 reports new estimated food PPPs for study countries for 2001 using a typical low income country model diet (column 2) and a typical lower middle income country model diet (column 3). These are calculated by dividing estimated total food cost in a country by the cost of an equivalent

[69] Even though it is assumed in this paper that poor people in upper middle income countries spend 50 percent of expenditures on non-food items and poor persons in high income countries spend 75 percent on non-food items (see Section 5.1), food costs are still very important for them.

[70] Even though the food baskets used in this appendix would not be considered acceptable, even as a floor, in all countries, the exercise here is still valid since the purpose is to estimate food PPPs for equivalent food baskets.

[71] This means that food baskets are equivalent, not identical. Food baskets differ across countries in two ways. First, the type and relative amounts of two cereals differ across countries; this is determined in each country by national food habits (although the total amount of cereal consumption is the same). For example, the Bangladesh food basket includes mostly rice for its cereals and Lithuania's food basket includes mostly wheat for its cereals. Second, the specific food items for pulses, vegetables, meats and fruit differ across countries; the least expensive food in each food group is included in a country's food basket.

food basket in the United States. Column 4 provides World Bank PPP, while columns 5 and 6 indicate the extent to which our new food PPPs differ from World Bank PPPs.

Our estimated food PPP appropriate for a study country's development level is consistently much higher than the World Bank PPP for low income and lower middle income study countries (last two columns in Table 38 and Figures 14). They tend to be around 100 percent higher on average for low income study countries and approximately 25 percent higher on average for lower middle income study countries. Differences for upper middle income and high income study countries are much more muted, with food PPP higher than PPP by around 10 percent on average. These results of higher food PPP than PPP are similar to those in Reddy and Pogge (2003) where available international data were used to estimate food PPPs, thereby providing some confidence for our results.

Interestingly, there is a consistent tendency for food PPP relative to PPP to be higher when based on a lower middle income country model diet as compared to a low income country model diet (Figure 15). An important reason for this is that meats are relatively inexpensive in the comparator country (United States), and there is less meat in the low income country model diet. One difference within development level worth noting is that the two African study countries, Zimbabwe and South Africa, have a relatively high food PPP compared to PPP for their development level.

Table 38: Our new food PPP estimates compared to World Bank PPPs, study countries

Country	Estimated new food PPP, low income country diet	Estimated new food PPP, lower middle income country diet	World Bank PPP	Ratio of low income country food PPP to World Bank PPP (col 2/col 4)	Ratio of lower middle income country food PPP to World Bank PPP (col 3/col 4)
Bangladesh	19.9	23.5	11.5	1.73	2.04
India	13.86	14.55	8.7	1.59	1.67
Zimbabwe	37.55[b]	41.93[b]	16.4[a]	2.29[c]	2.56[c]
Low income average				1.87	2.09
Armenia	190.4	195.8	139.4[a]	1.37[c]	1.40[c]
Ecuador	0.54	0.54	0.48[a]	1.13[c]	1.13[c]
Egypt	1.4	1.7	1.5	0.93	1.11
China	1.9	2.1	1.8	1.06	1.15
South Africa	3.6	3.7	2.2[a]	1.56[c]	1.61[c]
Lower middle income ave				1.21	1.28
Lithuania	1.3	1.5	1.4	0.93	1.00
Costa Rica	176.4	184.7	158.3	1.11	1.17
Upper middle income ave				1.02	1.13
Switzerland	2.2	2.4	1.9	1.16	1.26
USA	1.0	1.0	1.0	1.00	1.00
High income average				1.08	1.13

Notes:

Food costs are estimated for typical model diets of low income countries (and lower middle income countries). These diets include: 410g (400g) of cereals distributed between the two most important cereals as actually observed in the country according to FAO food consumption data; 50g (80g) potatoes, 40g (22g) least expensive pulse; 1/3rd cup (1¼ cups) milk; 1/4 (2/3rd) egg; 5.7g (38.4g) lean meat; 240g (280g) of three least expensive vegetables or fruit (210g of two least expensive vegetables and 70g of least expensive fruit), 30g (27g) oil; 18g (26g) sugar. How food items are selected and costed in a country is as explained Section 4.5. For low income country model diet, unit cost of second vegetable and fruit each have a price cap at 1.5 times unit price of least expensive vegetable when necessary.

All values are for 2001 as this is the year for USA the comparator country. When food prices for a country are not for 2001, estimated food cost is increased by food inflation to 2001.

Data year for study countries is: 2001 (Armenia, Lithuania, Egypt, South Africa, Switzerland, and USA); 2000 (China, Costa Rica, Ecuador, and India); 1999 (Zimbabwe); 1996 (Bangladesh). It is determined mainly by year of the median wage rate data provided by Bescond et al (2003) except for India, China, Ecuador, USA, and Egypt, and where latest year in ILO October Inquiry data set is used.

Average is unweighted average of national values.

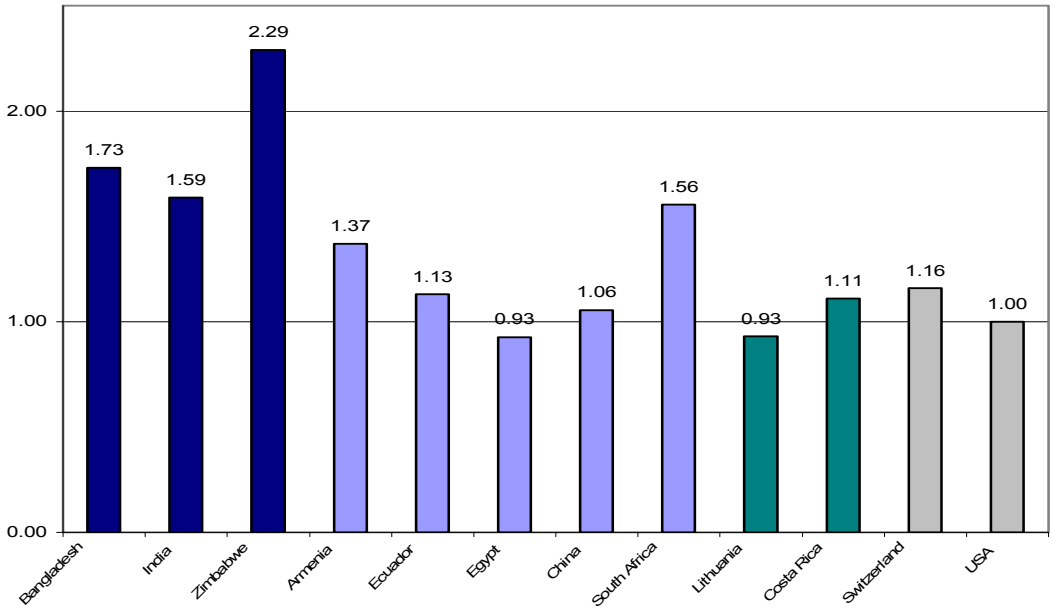
[a] PPP value is especially imprecise for Armenia, Ecuador and Zimbabwe, and to a lesser extent South Africa. See discussion in Section 8.1.

[b] Zimbabwe's food PPP values are imprecise, because food prices were for 1999 and increased by food inflation between 1999 and 2001 which was very high.

[c] Value is especially imprecise, because of problems noted in notes a and/or b.

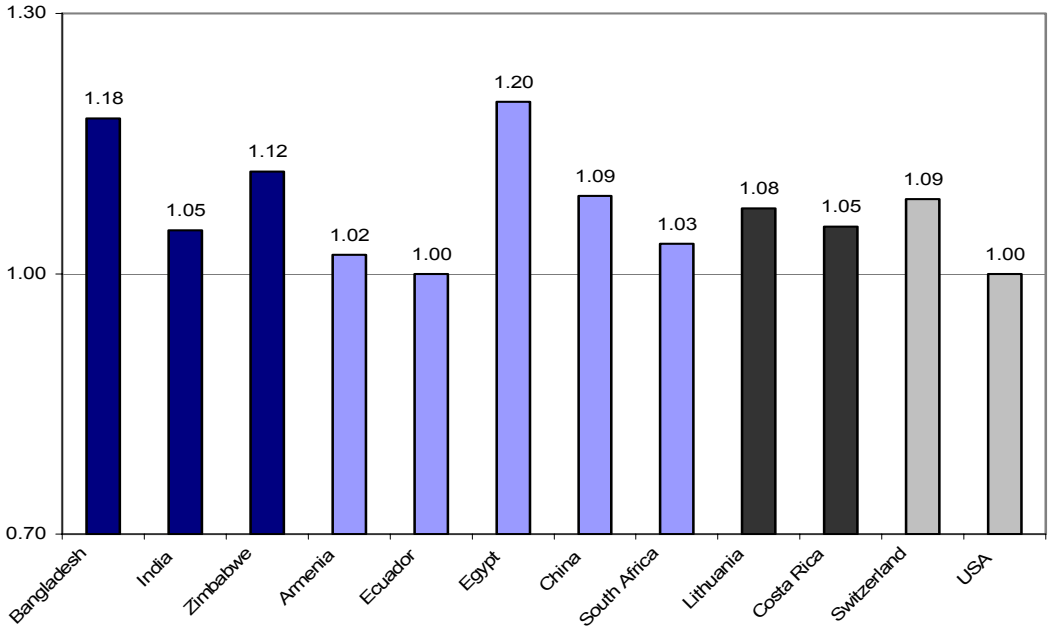
Sources: Author's calculations for food PPPs, and World Bank World Development Indicators online database from September 2004 for 2001 PPPs except for Ecuador which is from January 2005 database.

Figure 14: Ratio of our low income country food PPP estimate to World Bank PPP



Notes: Colour of bar indicates development level: low income, lower middle income, upper middle income, high income.
Source: Table 38.

Figure 15: Ratio of our new lower middle income country food PPP to our new low income country food PPP



Notes: Colour of bar indicates development level: low income, lower middle income, upper middle income, high income.
Source: Table 38.

Results in this appendix of higher food PPP than PPP, especially for low income and lower middle income countries, implies that:

- Poor people, especially in low income and lower middle income countries, need more local currency for food than implied by World Bank PPPs to have the same purchasing power as in the United States. The reason for this is that food in the United States is less expensive than other goods and services as compared to other countries.

- Cross-national differences in living standards of the poor (in low income countries compared to lower middle income countries, and in lower middle income countries compared to upper middle income and high income countries) are greater than indicated by the widely used national per capita income in PPP.

- The new food PPP estimates in this appendix help explain in part why our poverty lines estimates in Section 8.2 for low income study countries are higher than the World Bank's $1 PPP a day poverty line. They also help explain in part why our poverty lines estimates for lower middle income study countries are less than two times those estimated for low income study countries.

To provide another view of the poverty lines and living wage rates estimated in Sections 8 and 9, we express them in the new food PPPs estimated in Table 38 and report this in Table 39. Using this metric, poverty line and living wage rate estimates for study countries are quite similar within development level. They also display reasonable differences between development levels.

Living wage rate estimates for low income study countries (Figure 16) are around **$0.85 food PPP** on average with a small range of 0.79 to 0.85. Estimates for lower middle income study countries are around **$1.5 food PPP** on average, with all within a fairly narrow range of about $1.4 to $1.7. Estimates for upper middle income study countries are about **$2.9 food PPP** on average, with a range of $2.6 to $3.5. And estimates for high income countries are almost the same at about **$8.2 food PPP.**

A similar result is observed when for our **poverty line estimates** are expressed in our new food PPPs (Figure 17) - - there is no overlap between development levels. Thus, the average for low income study countries is approximately $1.4 food PPP, with a range of 1.3 to 1.4. The average for lower middle income study countries is **$2.2 food PPP** with a range from $1.9 to $2.5. The average for upper middle income study countries is **$4.5 food PPP** with a range from $4.2 to $4.9. And the average for high income study countries is **$11.3 food PPP** with no range.

Table 39: Our living wage rate and poverty line estimates expressed in our new food PPPs, study countries

Country	Our living wage rate estimate in PPP for study year	Our living wage rate estimate in new food PPP based on low income country model diet [a]	Our living wage rate estimate in new food PPP based on lower middle income country model diet [a]	Our living wage rate estimate in new food PPP appropriate for country's development level [a, b]	Our poverty line estimate in new food PPP appropriate for country's development level [a, b]
Bangladesh	1.51	0.87	0.74	0.87	1.43
India	1.26	0.79	0.75	0.79	1.29
Zimbabwe	1.96	0.85	0.77	0.85	1.42
Low income average	1.58	0.84	0.75	0.84	1.38
Armenia	2.38	1.73	1.70	1.70	2.34
Ecuador	na	na	na	na	1.90
Egypt	1.50	1.61	1.35	1.35	2.23
China	1.59	1.50	1.38	1.38	2.28
South Africa	2.40	1.54	1.49	1.49	2.46
Lower middle average	1.97	1.60	1.48	1.48	2.24
Lithuania	3.53	3.80	3.53	3.53	4.85
Costa Rica	2.71	2.44	2.32	2.32	4.15
Upper middle average	3.12	3.12	2.93	2.93	4.50
Switzerland	10.40	8.97	8.25	8.25	11.33
USA	8.22	8.22	8.82	8.22	11.30
High income average	9.31	8.60	8.24	8.24	11.32

Notes:

na indicates not ascertained.

Average is unweighted average of national values.

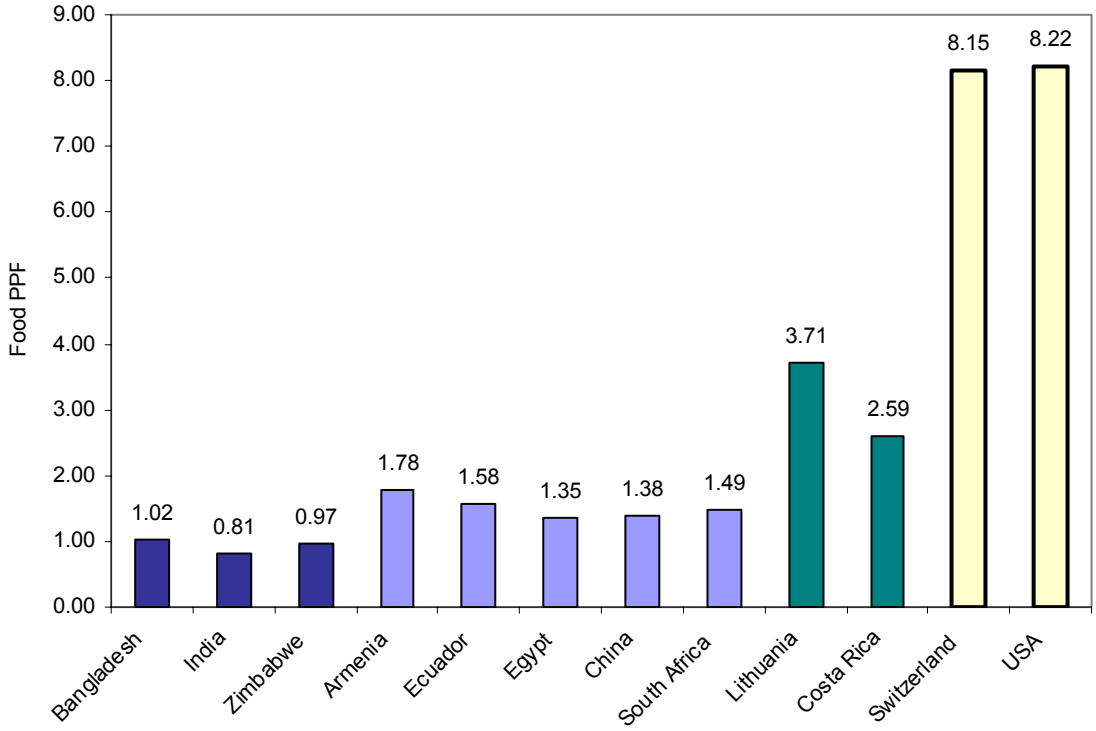
Study year for study countries is 2001 (Armenia, Lithuania, Egypt, South Africa, Switzerland, and USA), 2000 (China, Costa Rica, India, and Ecuador poverty line), 1999 (Zimbabwe), 1997 (Ecuador living wage rate), 1996 (Bangladesh).

[a] Calculated by dividing poverty line in PPP from Table 32 or living wage rate in PPP from Table 33 by ratio of food PPP to PPP from Table 38.

[b] For simplicity, food PPP based on lower middle income country model diet from Table 38 is used for upper middle income and high income countries.

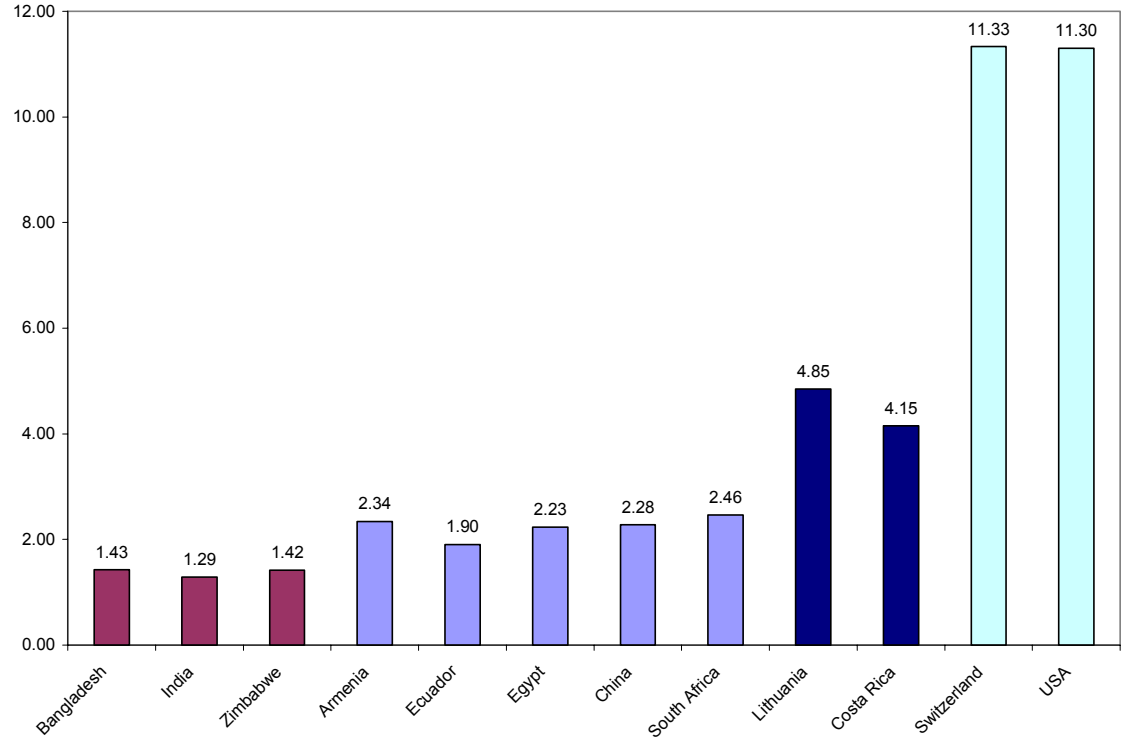
Sources: Author's calculations. Table 33 for our living wage rates. Table 32 for our poverty lines. Table 38 for our new food PPPs.

Figure 16: Our living wage rate estimate expressed in our new food PPP, study countries



Notes: Colour of bar indicates development level: low income, lower middle income, upper middle income, high income.
Source: Table 39.

Figure 17: Our poverty line estimate expressed in our new food PPP, study countries



Notes: Colour of bar indicates development level: low income, lower middle income, upper middle income, high income.
Source: Table 39.

Table 40: Spreadsheet used to calculate our new food PPPs, low income country model diet

Available on request

Table 41: Spreadsheet used to calculate our new food PPPs, lower middle income country model diet

Available on request

Appendix C: Spreadsheets used to estimate national poverty lines and national living wage rates for study countries

Two EXCEL spreadsheets are used in our methodology to estimate national poverty lines and national living wage rates. These spreadsheets for our 12 study countries are reproduced in Tables 42 and 43.

This Appendix describes how these EXCEL sheets are used to estimate the national poverty line and living wage rate (Table 42) and to establish the national model diet (Table 43). These spreadsheets use a modular approach to ensure transparency and to facilitate changes that author (or others) might like to introduce.

Spreadsheet for estimating national poverty line and national living wage rate (Table 42)

This spreadsheet starts with a set of rows that indicates what is included in an average person's model diet in broad terms based on international and national recommendations discussed in this paper. It indicates: total number of calories required; percent of calories from cereals and starches, roots and tubers, pulses/nuts, and proteins; number of grams of oil, sugar, vegetables and/or fruits; and miscellaneous food costs. Total calories required is determined using 2100 calories for Bangladesh as the base value, and multiplying this by the ratio of calories required in the country to calories required in Bangladesh according to FAO estimates (where average national calorie requirements per capita were estimated based on the height and weight of people in a country since calories required are affected by body size, as well as on the distribution of the population by age and sex since children have lower requirements compared to adults).

The second set of rows helps identify and indicate the potential foods and the selected foods included in a country's model diet. The specific food(s) selected for each food group in a country are determined by either actual food consumption patterns (from FAO food consumption data) or by relative food price (from ILO food price data). The reason why potential foods may not be selected is either because they are too expensive (for example when second vegetable is 50 percent more expensive than the least expensive vegetable), or because of national food habits (e.g., milk is not selected in China because of lactose intolerance in China). The two main cereals selected are determined by actual observed consumption in the country (e.g., when rice is the most consumed cereal and wheat is the second most consumed cereal, rice and wheat are selected); this is indicated here. The percentage distribution of cereal consumption between the two selected cereals is determined by actual consumption patterns according to FAO food consumption data; this percentage is indicated here. For example, 60.5 percent of cereal consumption comes from rice and 39.5 percent from wheat in India's model diet. For vegetables/fruits, oil, and pulses/nuts, the least expensive varieties per available gram (i.e., after taking into consideration wastage such as skin, seed, and outer leaves) according to ILO food price data are selected. For dairy, egg and meat, the least expensive variety per available gram of protein according to ILO food price data after taking into consideration wastage (such as skin and bone for beef/poultry/fish/pork) is selected. The specific type of salad/cooking oil used is indicated when it is specified in the ILO food price data; otherwise, it is a generic salad/cooking oil. When the unit price of the second vegetable and/or fruit is considered to be unacceptably high (see discussion immediately below), the phrase: "other w/cap" is noted. This indicates that the second vegetable or the fruit is an unknown variety with a capped unit price.

The third set of rows indicates the cost per unit for each selected food based on ILO food price data. The cost of rice reported in the ILO food price data set is reduced by one-third or one-half and this indicated here; this is done to account for the likelihood that the poor will buy a less expensive variety than the long grain rice variety included in the ILO data set. The cost indicated for potato, vegetables, fruits, eggs, and meats is per kilogram of food as purchased. This means that the reported retail price of these foods in the ILO food price data set was adjusted upward to take into consideration waste (such as from skin, outer leaves, shell, bone and fat) and losses from cooking. For example since a banana skin represents 34 percent of a banana's weight (see Appendix G), the cost per kilogram of available banana to eat was calculated as its reported retail purchase price divided by .66. For vegetables and fruits, a price cap is sometimes imposed, since we do not allow the cost per available gram of the second vegetable to exceed 1.5 times the price of the least

expensive vegetable. When this occurs, it is indicated in the spreadsheet by the phrase "price cap". It is done to keep down the cost of a poor person's food basket, since we do not have information on the prices of all foods and other less expensive vegetables/fruits may be available (especially due to seasonal variation in prices). When the price of a selected food is not reported in the ILO food price data set, this price was estimated; information on how this was estimated is indicated here. Appendix D contains a brief discussion for each study country of the relatively few instances in which it was necessary to make our own unit food cost estimates.

The fourth set of rows indicates the quantity of each selected food included in a country's model diet. This is expressed in grams. For animal-based foods, consumption is also indicated in quantities easily understandable. For example, consumption of milk is also expressed in cups, eggs in number of eggs, and beef/fish/poultry in number of 3 oz/85 gram servings. Note that there are two slightly different sets of amounts here. The first set represents the original quantities established by our methodology, while the second set represents the (slightly) adjusted quantities that are made in our second spreadsheet (see below) where ad hoc changes are introduced to ensure that the final model diet contains the required total number of calories and that the percentage of calories from proteins, fats and carbohydrates are acceptable.

The fifth set of rows indicates the estimated cost per day per person of each food item included in a country's model diet. This is calculated by multiplying the amount (from rows 4) by the price per unit (from rows 3). Total food cost is obtained by summing up the costs of all food items in the model diet and then adding miscellaneous costs to account for the cost of miscellaneous foods (such as spices, salt, condiments, non-alcoholic beverages, sauces), wastage in storage, and additional variety.

The sixth row indicates the multiplier used to account for the cost of essential non-food needs. Note that this multiplier increases along with development level, since non-food costs such as for housing and transport rise with development level and societal norms about what is acceptable.

The seventh row indicates the scalar used to go from the cost for one person to the cost for a family of four (two adults and two children). Notice that this scalar is highest for low income countries and lowest for high income countries. The reason is that there are no economies of scale for food in our methodology because model diets are for an average person, and the proportion of family budget spent on food is highest for low income countries.

The eighth row calculates the poverty line per day for a family of four. It is calculated by multiplying total food costs per day for an average person from row 5 by the multiplier from row 6 to account for non-food expenditures and the multiplier from row 7 to scale up from cost for an individual to cost for a family of four. The poverty line is also expressed per capita by dividing by the assumed family size of four as well as in local currency and internationally comparable World Bank PPP. Also indicated here are estimated non-food costs per month expressed in local currency and in World Bank PPP.

The ninth set of rows is concerned with working hours per week. It indicates full-time working hours (that varies by region, ranging from 40 to 48 hours per week) and a multiplier of 1.04 (i.e., 52/50) that "allows" workers to have two weeks off per year with pay.

The tenth set of rows calculates the living wage rate. This is estimated by dividing the poverty rate from row 8 (after scaling it up to a per week value by multiplying by 7) by full-time working hours from row 9 and multiplying this result by 1.04 from row 9 to allow for two weeks "paid vacation". Values are expressed in local currency as well as in World Bank PPP and our new food PPP estimates reported in Appendix B.

The eleventh set of rows provides national data on median wage rates. Since median wage rates are reported for different reference periods (e.g., hourly, weekly, monthly or annually), these are converted to equivalent hourly rates here. At the end of the eleventh set of rows is indicated an adjustment for inflation when it is necessary to harmonize the year of the national median wage rate data with the year of our living wage rate estimate.

The twelfth set of rows is concerned with the extent to which living wage rates are above or below actual median wage rates. It compares our estimated living wage rate from rows 10 to the median

wage rate from rows 11. When the median wage rate is reported as a range, the mid point of the range of values is used. Ratios are reported separately for workers paid on an hourly basis and for workers paid on a weekly, monthly or annual basis.

The thirteenth set of rows reports our estimated national poverty line in terms of World Bank PPPs. The reason for reporting this is to observe how our poverty line estimate compares to the World Bank's widely used PPP based poverty line of $1 PPP a day per capita for low income countries and $2 PPP a day for lower-middle income countries. Two World Bank PPP values are used here, the current PPP and the current local currency value of 1993 PPP (which the World Bank uses to define its $1 a day and $2 a day poverty lines)

The fourteen set of rows contain various additional useful information. This includes GDP per capita in current PPP, percent urban, development level according to World Bank, exchange rate, World Bank PPPs, our new estimated food PPPs, and country's own poverty line, It also includes the ratio of our poverty line to the country's own poverty line and to our new food PPP.

Spreadsheet for estimating nutritional content of our national model diets and ensuring acceptable diet

It is necessary that a country's model diet has: (i) the required number of calories, and (ii) acceptable amounts of proteins, fats, and carbohydrates. The methodology described above in this appendix does not ensure this. The reason is that the model diets in our methodology contains certain quantities of vegetables, fruits, sugar and oil, and so will not contain exactly the required number of calories and may not contain acceptable levels for fats, carbohydrates and proteins.

To ensure that a country's model diet is acceptable, a spreadsheet is used to calculate the number calories, proteins, fats and carbohydrates in the model diet. We start with the diet obtained from the methodology and spreadsheet described above. This diet is then adjusted to make sure that it contains the correct total number of calories, and that the percentage of calories from proteins, fats, and carbohydrates are all within acceptable limits. This adjustment is done in a way that does not increase average food costs. Ad hoc adjustments are made, rather than using complicated linear programming in part because of its simplicity and in part because necessary adjustments are generally small. Diets originally established contain on average 1.4 percent fewer calories than the total calories required for our 12 study countries, ranging from 5.3 percent too few calories for Zimbabwe to 6.8 percent too many calories for Costa Rica (with the country value within 2 percent of that required for 6 of the 12 study countries).

The following information is inputted from the other spreadsheet and the table in Appendix G:

- Number of grams in the country's model diet is taken from the other spreadsheet shown in Table 42 (column 2).
- Number of calories, proteins, fats and carbohydrates per 100g of edible food is taken from the nutritional data shown in Appendix G (columns 3, 6, 9, and 12)
- Cost per kg of edible food is taken from the other spreadsheet (column 15)

For each food, the following numbers and percentages are calculated:

- Number of calories (column 4, which equals column 2 times column 3)
- Number of grams of protein (column 7, which equals column 2 times column 6)
- Number of grams of fat (column 10, which equals column 2 times column 9)
- Number of grams of carbohydrates (column 13, which equals column 2 times column 12)
- Percent of calories (column 5, which equals column 4 divided by total from column 4)
- Percent of calories from proteins (column 8, which equals column 7 divided by total from column 7)

- Percent of calories from fats (column 11, which equals column 10 divided by total from column 10)
- Percent of calories from carbohydrates (column 14, which equals column 13 divided by total from column 13)
- Cost (column 16, which equals column 2 times column 15)
- Percent of total cost (column 17, which equals column 16 divided by sum of costs
- from column 16)

Based on these calculations, we learn the extent to which the model diet originally established in the other earlier spreadsheet (Table 42) deviates from the required number of calories, and if the number of proteins, fats and carbohydrates are within acceptable ranges. For example for India, the required number of calories is 2152 whereas the model diet established in the other spreadsheet produced 2112 calories. It was therefore necessary to increase the number of calories in the Indian model diet by 1.9 percent (i.e., by 2152/2112). This was done by increasing the amount of oil to 30 grams from the original 23 grams and decreasing the amount of rice to 243 grams from the original 247.2 grams. Amount of oil was increased, because the percent of total calories from fats was originally unacceptably low at 14.0 percent. This also helped reduce the percent from carbohydrates as this was originally unacceptably high at 77.4 percent.

How the model diet originally established in the other spreadsheet was adjusted is indicated at the top of the present spreadsheet as is what total food cost would have been if the original total food cost had been increased proportionally to account for the calories required. It is important to note that the second column of the spreadsheet in Table 43 contains the adjusted (and final) number of grams in our national model diet. These numbers of grams (from Table 43) are then transferred over to the fourth set of rows in the other spreadsheet shown in Table 42.

Table 42: Spreadsheet used to estimate our national poverty lines and living wage rates, study countries

Available on request

Table 43: Spreadsheet used to ensure that national model diets have required number of calories, and acceptable amounts of proteins, fats and carbohydrates, study countries

Available on request

Appendix D. Notes for study countries on unit food prices when they were not available in ILO food price database and on exceptions to general principles for establishing and costing national model diets

This appendix provides information for study countries on the relatively few instances when: (i) the unit price of a food included in a country's model diet was not available in the ILO food price data set and so had to be estimated or obtained from another source; or (ii) an exception to our general principles for establishing a model diet was introduced, such as the elimination of milk from the model diet of China.

Switzerland

The price of split peas for Switzerland (which is missing in ILO food price data set) was obtained from Migros, Switzerland's largest grocery. Banana was selected even though the unit price of grapes was slightly less according to ILO food price data (SF4.4 compared to SF4.0 per edible kg), because banana has a similar price year round whereas grapes are inexpensive only around October; this assumption increased food cost and therefore poverty line and living wage rate estimates by less than one percent. Pulses/nuts are assumed to provide 1 percent of total calories, as 1 percent is the minimum percent allowed in model diets; it is 0.8 percent according to FAO food consumption data.

USA

Prices for several food items are not available in ILO food price data set for the United States. One reason is that the United States does not like to disseminate average prices for the country as a whole (as it is a large and diverse country). For this reason, prices for several foods for the United States were obtained from government web sites for city food price series, because it is more complete than the national series. Prices are the national average for October 2001 for bread, egg, chicken, orange, milk and sugar and are drawn from data from the ILO food price data set. Price of milk was estimated by increasing 1997 price reported in ILO food price data set (note that this is also the most recent year available from city average price series on government website) by the average price increase for the other four dairy products in the ILO food price data set for the 1997 to 2001 period; this resulted in a milk price per liter that was approximately 25 percent higher than if the official food price inflation rate for this period had been used (which in turn implies an approximately 2 percent higher food budget, poverty line and living wage rate compared to use of overall food inflation).[72] Price of long grain rice was estimated by increasing its average price for October 1999 for cities reported on government web site by food price inflation for 2000 and 2001. National average prices of carrot and cabbage in 2000 according to the ILO food price data set were increased by food price inflation for 2001. Prices for beans, oil and potatoes are city average prices for October 2001 from government web site.

Armenia

Pulses/nuts were assumed to provide 1 percent of calories in Armenian model diet, as this is the lowest percent allowed in model diets. While pulses consumption in Armenia is not reported in the FAO food consumption database, pulses/nuts provide less than one percent of total calories according to FAO in Lithuania our other Transition Economy country from the former-USSR. Pulses and nuts only account for approximately 1 percent of our estimated food costs in Armenia.

China

[72] Food price inflation over this time period was 11 percent whereas the prices of butter, ice cream, cheddar cheese and other cheese rose by 69, 31, 35 and 18 percent respectively over this time period.

Milk was excluded from the Chinese model diet because many people in China are lactose intolerant. The remaining protein required was replaced by increased consumption of egg and fish. It was assumed that protein-rich vegetals were consumed in the form of bean curd. Note that prices are for Shijazhuang, a city in Hebei Province. The only other area with reasonably complete price data in the ILO food price data set is Tianjin where prices are similar to but slightly higher than those in Shijazhuang (see Section 6.5.4). The price of potatoes is estimated by multiplying the reported price of rice by the potato/rice price ratio from Beijing as the price of potatoes is missing for Shijazhuang and Tianjin. Potatoes are responsible for about 12 percent of food costs.

Costa Rica

The price of pulses for Costa Rica (which is missing in ILO food price data set) was estimated by assuming it was twice the price of rice in the ILO food price data set (approximate ratio for Latin America). Pulses/nuts are estimated to account for approximately three percent of food cost for Costa Rica. Prices are for urban areas.

Zimbabwe

The price of maize and pulses are missing in the ILO food price data set. This has important implications for poverty line and living wage rate estimates, since Zimbabwe's main staple food is maize and people in Zimbabwe consume a relatively large amount of pulses and nuts (6.5 percent of total calories according to FAO data). Since Zimbabwe is a very high inflation country (with an annual inflation rate in October 2003 of 526 percent) with price controls and we are concerned with 1999 prices, it is difficult to estimate precisely 1999 maize and bean prices. With this background, we estimated the maize meal price per kg by multiplying the price of wheat flour for Zimbabwe in 1999 according to the ILO food price data by the ratio of maize meal price to wheat flour price in 2000 according to ILO food price data set in Zambia (.3825) a neighboring country. This ratio is not far from the .30 value observed for Harare for 1989 the last available information of this type in the ILO data set. For pulses/nuts, we took the price ratio of milk to pulse for Zambia in October 2000 (1.51) and multiplied this ratio by the observed milk price in Zimbabwe. Using these assumptions, maize accounts for about 21 percent of food costs and pulses/nuts for about 11 percent of food costs in Zimbabwe.

Ecuador

The price of wheat flour was not available in the ILO food price data set for 1997 or 2000 our two study years. For 1997, it was estimated by taking the 1995 flour price in the ILO food price database (latest available) and increasing this by the average percentage increase in the prices of long grain rice, milk, eggs, and cooking/salad oil according to ILO food price data. Note that this average price increase of 66 percent is almost the same as the official food price inflation for the Ecuador for the1996-1997 period of 63 percent in the World Bank World Development Indicators online database. As wheat flour accounts for approximately 25 percent of our estimated food basket costs in Ecuador in 1997, this somewhat imprecise price estimate for wheat flour could have a measurable affect on our 1997 living wage rate estimates for Ecuador. For 2000, the flour price in 2000 was estimated by multiplying the price of rice in 2000 in Ecuador by the flour to rice price ratio in 1997 noted above. Note that flour accounted for approximately 21 percent of our food costs in 2000 in Ecuador.

India

The reported price of long grain rice for India is reduced by one-half to better represent the cost of less expensive varieties of rice that the poor are likely to purchase as observed in a recent small inquiry in India (see discussion in Section 6.5.3 on this). Note that ILO food prices are for Mumbai, and this biases upward food prices and food costs in India (see discussion on this in Section 6.5.5).

Bangladesh

The reported price of long grain rice for Bangladesh is reduced by one-half to better represent the cost of less expensive varieties of rice that the poor are likely to purchase in Bangladesh (see discussion on this in Section 6.5.3). Note that ILO food prices are for Dhaka.

Lithuania

The price of pasteurized milk is used even though the price of non-pasteurized milk is less expensive (.97 compared to 1.51 per liter) on the assumption that pasteurized milk is more widely consumed. This assumption is of some importance as it increases estimated food cost and therefore our estimated poverty line and living wage rate by approximately 6 percent. Pulses/nuts are assumed to provide 1 percent of total calories (minimum allowed in model diets) even though it is 0.8 percent according to FAO food consumption data. Pulse/nuts are responsible for around 0.3 percent of food costs.

Egypt

Prices are for urban areas.

South Africa

Prices are for urban areas.

All countries

The price of long grain rice according to the ILO food price data set is reduced for all countries. This is done, because the poor are likely to purchase less expensive varieties such as short grain rice. For India and Bangladesh, the price of rice reported in the ILO food price data set is reduced by 1/2, because this ratio was found in a recent inquiry in these countries (see Section 6.5.3). For other countries, the price of long grain rice is reduced by 1/3rd; this is indicated in the spreadsheet by the term “use 2/3”.

It is assumed that wheat is consumed in the form of white wheat flour in low income and lower middle income countries, and in equal amounts of bread and wheat flour in upper middle income and high income countries. These assumptions for wheat consumption would benefit from further thought, and perhaps should be done on a country-by-country basis.

It is assumed that pulses/nuts provide a minimum of 1 percent of total calories in a model diet. This means that 1 percent is used when less than 1 percent is observed in the FAO food consumption data set.

Appendix E: Food items included in ILO food prices database

The 93 food items included in The ILO October Inquiry data set are reproduced below (Table 44). Average retail prices actually paid in October for the country as a whole are reported unless otherwise indicated. Prices are, however, for one city or urban areas in some countries, such as for Bangladesh, Costa Rica, India, China, Egypt and South Africa among our 12 study countries. Prices are generally those which are used for estimating the consumer price index (CPI) in the country, although in some countries a special survey is conducted, such as in China and Lithuania among our 12 study countries. This ILO data set has been regularly collected since 1923 with a major revision in 1985. They are reported annually.

Table 44: 93 food items included in ILO October Inquiry annual food price data set by food group

Cereals	Meat, Poultry, Fish	Fruits and vegetables
Rice, long grain	Round of beef	Oranges
Wheat flour white	Beef, stewing	Lemons
Wheat flour, whole	Beef with bone	Bananas
Corn (maize) flour	Beef without bone	Pineapples, fresh
Corn (maize) flour whole grain	Corned beef	Pineapples, tinned
Rolled oats (oatmeal)	Veal, leg	Apples
Couscous wheat	Lamb, leg	Grapes
Sorghum (jowar)	Mutton, stewing	Papayas
Wheat bread, white sliced, wrapped	Pork chops, loin	Mangoes
Wheat bread, white, unsliced, unwrapped	Pork with bone	Coconut
Wheat bread, baguette type	Pork without bone	Peanuts, with shells
Rye bread	Ham, cooked	Peanuts, without shells
Tortillas (corn cakes)	Bacon, side	Potatoes
Dry biscuits (cookies)	Chicken, cleaned	Onions, cooking
Corn flakes	Chicken, live	Carrots
Infant's cereal	Duck, cleaned	Cabbage
Spaghetti	Fish, fresh	Chinese cabbage
Milk and dairy products	Cod, frozen	Tomato
Cows milk fresh, whole, pasteurized	Sardines in oil, tinned	Tomatoes puree, tinned
Cows milk, fresh, whole, not pasteurized	Mackerel, tinned	Spinach, frozen
Cows milk, powdered, whole	**Fats and oils**	Egg plants (aubergines)
Cows milk, powdered, Skim (nonfat)	Margarine	Green peppers
Infant's milk formula, powdered	Ghee	Chillies, dried
Cheese	Salad or cooking oil	Plantains
Butter	Olive oil	Okras (lady fingers)
Ice cream, vanilla	Lard	Haricot beans, white, dried
Eggs	**Starchy roots and tubers**	Soy bean sprouts
Chicken eggs, fresh	Cassava	Moong beans, dried
Duck eggs, fresh	Sweet potatoes	Bean curd, pressed

Cereals	Meat, Poultry, Fish	Fruits and vegetables
Non-alcoholic beverages	Yams	Chick peas dried
Coffee	Sugar	Split peas, dried (gram, dhal)
Instant coffee	Sugar, white	Soup mix, vegetable, for 4
Tea, black	Alcoholic beverages	Infant's food, vegetable based
Green tea	Red table wine	Miscellaneous
Mint tea	Beer	Salt
Soft drink, cola or orange flavour		Orange marmalade
		Milk chocolate

Notes: Food groups are those noted in the publication.
Source: ILO October Inquiry (2001).

Appendix F: Number of working poor implied by methodology used in this paper

This appendix is incomplete and suggestive in nature. It is included because of its importance and as a stimulus to others to take up the further developmental work required. In particular, the ILO work by Majid (2001) should be built on.

It is possible to think of two different concepts and definitions of the working poor.

- One definition is concerned with workers and the earnings s/he receives. When a worker's earnings fall below an acceptable level, s/he is considered to be part of the working poor. This concept of the working poor is similar to the concept underlying adequate living wage specified in the ILO Constitution. It is also the living wage rate concept used in the present paper. To estimate the number of working poor, one would need data on the distribution of earnings of all workers and compare this to our estimate of the living wage rate. For such a calculation, it is important to use earnings data are for the entire labour force and not just for some part of it, such as employees in formal sector establishments above a certain size. The reason is that many of the working poor are in the informal sector and many are self employed.

- A second definition of the working poor is concerned with households and insufficient household income. All labour force participants who live in a poor household would be considered as working poor in this definition. They are poor because they live in a poor household. And they would be considered working poor, because they work. This is the concept underlying estimates of the working poor in the world in a recent ILO publication (Majid, 2001). This approach is built for the most part on poverty rates from the World Bank on to which labour force activity rates are applied.

- Although these two definitions are different conceptually, they might result in reasonably similar national estimates, because there should be considerable overlap between being poorly paid and living in a poor household.

- It is an empirical issue how much overlap there is in estimates of the working poor based on these quite different definitions of the working poor. There are several reasons why the overlap is not perfect. For example, a worker with a good hourly pay rate could live in a poor household, because the household has many children and/or relatives who do not work. Or, a worker with a good hourly pay rate may not be able to find sufficient work during the year and so his or her household is poor. On the other hand, a poorly paid worker could live in a non-poor household, because his/her spouse, and/or children work.

- To investigate the extent to which these two ways to measure the number of working poor yield similar estimates, one would need to compare national estimates of the number of working poor based on the living wage rate concept used in this paper (i.e., poorly paid workers) with the number of working poor that uses a household-based definition of working poor (i.e. workers living in a poor household) such as in Majid (2001).

Appendix G: Nutritional content and edible proportion of foods

This Appendix provides detailed nutritional information in Table 45 on a large number of food items drawn from the sixth edition of the classic publication The Composition of Foods by McCance and Widdowson. Table 45 indicates for a wide range of foods contained in the ILO food price data set: (i) number of calories, proteins, fats and carbohydrates per 100 grams of edible food; (ii) proportion of each food that is edible after excluding for example the outer leaves of vegetables, the skin and pit of fruit, or the fat and bone of meat and fish; and (iii) percentage of food lost in cooking. To obtain the proportion of food available for eating after preparation and cooking, it is necessary to multiply the proportion edible by 1.0 minus the proportion lost in cooking. This resulting calculation is provided in the last column in Table 45.

Data in Table 45 are used to calculate the numbers of calories, proteins, fats and carbohydrates (and their percentage of total calories) in model diets in the spreadsheet in Table 43. These calculations are necessary, because adjustments may be necessary in a country's model diet to ensure that it is within acceptable ranges as regards calories, proteins, fats and carbohydrates.

Data in Table 45 are also used to help select specific foods to include in a country's model. They enable us to take into consideration differences in foods as regards inedible parts and loss in cooking when deciding on which foods are least expensive, since we select the least expensive foods per available gram for eating. For example among vegetables, carrot has more wastage than onion, and onion has more wastage than tomato. Among fruits, pineapple has more wastage than banana, and banana has more wastage than apple. This means that carrots "as purchased" must be less expensive than onions and pineapples less expensive than bananas for them to be selected for a country's model diet. A similar approach is used for selecting a specific type of meat except that here selection is based on the least expensive variety per available gram of protein.

Table 45: Nutritional content and edible proportion of foods

Food group /food	Edible proportion[1]	Calories (kcal) per 100g	Protein (g) per 100g	Fat (g) per 100g	Carbo-hydrates (g) per 100g	Weight change (% lost in cooking)	Proportion of cooked edible food from raw food[4]
Cereals							
Rice, white, basmati	1.00	359	7.4	0.5	79.8		
Wheat flour, white, plain	1.00	341	9.4	1.3	77.7		
Bread, white, sliced	1.00	219	7.9	1.6	46.1		
Maize meal[3]	1.00	351	8.0	1.3	78.0		
Roots and Tubers							
Main crop, old potato, raw	0.80	79.0	2.1	0.2	17.2		
Sweet potato, raw	0.84	87	1.2	0.3	21.3		
Yam, raw	0.81	114	1.5	0.3	28.2		
Dairy							
Milk	1.00	66	3.3	3.9	4.5		
Hard cheese, average	1.00	411	24.9	34.5	0.1		
Eggs							
Chicken egg[2]	1.00	151	12.5	11.2	0	11% shell	0.89
Pulses							
Lentils, green & brown, whole dried (USED FOR SOME COUNTRIES)	1.00	297	24.3	1.9	48.8[a]		
Moong beans, whole, dried, raw (USED FOR SOME COUNTRIES)	1.00	279	23.9	1.1	46.3[a]		
Chick peas, whole dried, raw (USED EGYPT)	1.00	320	21.3	5.4	49.6[a]		
Green beans	0.83	24	1.9	0.5	3.2		
Soya beans, dried, raw	1.00	370	35.9	18.6	15.8[a]		
Tofu, soy bean curd, steamed (USED CHINA)	1.00	73	8.1	4.2	0.7[a]		
Vegetables							
Bean sprouts, moong, raw	1.00	31	2.9	0.5	4.0		
Carrot, old, raw	0.70	35	0.6	0.3	7.9[a]		
Cabbage, raw, average	0.77	26	1.7	0.4	4.1		
Onion, raw	0.91	36	1.2	0.2	7.9[a]		
Tomato, raw	1.00	17	0.7	0.3	3.1		
Egg plant, raw	0.77	15	0.9	0.4	2.2		
Plantains, raw	1.00	112	0.8	0.2	28.5		

Food group /food	Edible proportion[1]	Calories (kcal) per 100g	Protein (g) per 100g	Fat (g) per 100g	Carbo-hydrates (g) per 100g	Weight change (% lost in cooking)	Proportion of cooked edible food from raw food[4]
Okra, raw	0.74	31	2.8	1.0	3.0		
Fruits							
Orange	0.70	37	1.1	0.1	8.5		
Banana	0.66	95	1.2	0.3	23.2		
Pineapple, raw	0.53	41	0.4	0.2	10.1		
Apple, eating, average, raw	0.89	47	0.4	0.1	11.8		
Grapes, average	0.95	60	0.4	0.1	15.4		
Papaya, raw	0.75	36	0.5	0.1	8.8		
Mango, raw	0.68	57	0.7	0.2	14.1		
Meats							
Chicken, whole, cleaned, roasted	0.80[8] (own estimate)	177	27.3	7.5	0	-25%	0.60
Chicken, whole, live, roasted	0.70[8] (own estimate)	177 (from above)	27.3 (from above)	7.5 (above)	0	-25%	0.53
Cod, grilled (USED FOR WHITE FLESH FISH)[5,7]	0.46	95	20.8	1.3	0	-15%	0.39
Mackerel, grilled (USED FOR FATTY FISH)[6,7]	0.71	239	20.8	17.3	0	-10%	0.64
Stewing steak, stewed, 14% fat, (USED FOR STEWING BEEF)	1.00	203	29.2	9.6	0	-36%	0.64
Braising beef, braised, 9% fat (USED FOR ROUND OF BEEF)	1.00	246	32.9	12.7	0	-42%	0.58
Beef minced, stewed, 13.5% fat (USED FOR BEEF W/O BONE)	1.00	209	21.8	13.5	0	-18%	0.82
Topside with bone, roasted (USED FOR BEEF W/BONE)	0.84 (use from rib roast)	246	32.9	12.7	0	-34%	0.55
Corned beef, canned	1.00	205	25.9	10.9	1.0		
Lamb leg, roasted, 11% fat	0.85 (Own estimate)	240	28.1	14.2	0	-31%	0.59
Pork loin chops, roasted, 22% fat	0.76	301	31.9	19.3	0	-38%	0.47
Pork steak, grilled, 8% fat	1.00	198	32.4	7.6	0	-38%	0.62
Ham	1.00	107	18.4	3.3	1.0		
Fats and oils							
Vegetable oil	1.00	899	0	99.9	0		
Sugar	1.00	394	0	0	105		

Food group /food	Edible proportion[1]	Calories (kcal) per 100g	Protein (g) per 100g	Fat (g) per 100g	Carbo-hydrates (g) per 100g	Weight change (% lost in cooking)	Proportion of cooked edible food from raw food[4]

Notes:

Zero value indicates either none or trace amounts. There is little difference in weight of cooked and uncooked vegetables and fruits, and roots and tubers.

[1] "Edible proportion for raw foods refers to the edible material remaining after the inedible waste has been trimmed away, e.g. the outer leaves of cabbage." (McCance and Widdowson, 2002)

[2] Average weight of egg with shell is assumed to be 53 grams (as indicated for a medium size egg in Migros, Switzerland's largest grocery store).

[3] Values from Migros (Switzerland's largest grocery), as values in McCance and Widdowson are only for cornstarch.

[4] "The majority of weight changes in cooking results from the loss or gain of water, but for many meats and fried foods there will have been a loss or gain of fat." (McCance and Widdowson, 2002)

Proportion of cooked edible food "as eaten" from raw food "as purchased" = Edible proportion of food times (100 - % weight loss in cooking)/100

[5] Other common white flesh fish include haddock, halibut, plaice, and whiting.

[6] Other common fatty fish include herring, salmon, and carp.

[7] Amount of fat and bones not only differ between fish but also the amount of fat differs for the same variety of fish and time of year.

Edible proportion of fish used is taken from figures for whole fish.

[8] Bones, head, feet, and insides were considered as inedible. Fat was included as some would be lost in cooking and some eaten.

[a] Includes oligosaccharides.

Source: McCance and Widdowson (2002), 6th edition.

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